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Reforms: More Harm than Good? A Theoretical
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**The G20 Over-the-Counter Derivative Markets
Reforms: More Harm than Good?
A Theoretical Perspective**

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School of Law

Durham University

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ABSTRACT

The Great Financial Crisis (GFC) has revealed that financial theory influences the manner in which financial markets are conceptualised and consequently regulated as evidenced by the deregulation that took place in over-the-counter derivative markets (OTC-DMs) pre-GFC – attributable to the economic ideology proselytised by theories of modern finance. Operating on the premise that theory matters for how we regulate, this thesis explores post-GFC reforms in OTC-DMs. Specifically, this thesis explores the central counterparty prescription, the reporting obligation, and the centralised trading requirement to determine whether there is any congruence between regulatory reforms in OTC-DMs and theories of modern finance. In addition, this thesis assesses these reforms utilising alternative theories of finance, which it argues are better suited for the operation and regulation of real-world financial markets namely behavioural finance, Minsky’s financial instability hypothesis, and imperfect knowledge economics as an evaluative framework. This analysis reveals that the endogenous risk attributable to fundamental uncertainty, irrationality, and the imperfect knowledge constraint is not fully accounted for in current regulatory reforms. Consequently, this thesis argues that regulatory reforms in OTC-DMs may prove ineffective in environments of financial stress. Finally, this thesis makes the case for an approach towards financial regulation that recognises the primacy of endogenous risk in financial markets.

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TABLE OF ABBREVIATIONS

ACER	Agency for the Cooperation of Energy Regulators
All	Alternative Instrument Identifier
APA	Approved Publication Arrangement
CAPM	Capital Assets Pricing Model
CCP	Central Counterparties
CDOs	Collateralised Debt Obligations
CDS	Credit Default Swaps
CEA	Commodity Exchange Act 1936
CFMA	Commodities Futures Modernisation Act 200
CFTC	Commodity Futures Trading Commission
CMH	Contingent Markets Hypothesis
CPSS-IOSCO	The Committee on Payment and Settlement Systems and the Technical Committee of the International Organisation of Securities Commissions
CSA	Credit Support Annexe
DCM	Designated Contract Market
DCO	Derivatives Clearing Organisations
Dodd-Frank Act	Dodd-Frank Wall Street Reform and Consumer Protection Act
DTCC	The Depository Trust and Clearing Corporation
EC	European Commission
EMH	Efficient Markets Hypothesis
EMIR	European Market Infrastructure Regulation
ERISA	Employee Retirement Income Security Act
ESMA	European Securities and Market Authority
ESRB	European Systemic Risk Board
EU	European Union
FC	Financial Counterparties
FCM	Futures Commission Merchant

FIH	Financial Instability Hypothesis
FSB	Financial Stability Board
G20	Group of 20
GAO	General Accountants office
GFC	Great Financial Crisis of 2008
IKE	Imperfect Knowledge Economics
ISDA	International Swaps and Derivatives Association
ISIN	International Securities Identification Number
LBSF	Lehman Brothers Special Financing
LEI	Legal Entity Identifier
LSOC	Legal Segregation with Operational Commingling
LTCM	Long Term Capital Management
MFT	Modern Finance Theory
MiFID II	Markets in Financial Instruments Directive II
MiFIR	Markets in Financial Instruments Regulation
MPR	Margin Period of Risk
MPT	Modern Portfolio Theory
MSP	Major Swap Participant
MTF	Multilateral Trading Facility
NCA	National Competent Authority
NFC	Non-Financial Counterparties
OTC Derivatives	Over-the-Counter Derivatives
OTC-DMs	Over-the-Counter Derivative Markets
OTF	Organised Trading Facility
PAIRS	Portfolio Approach to Interest Rate Scenarios
PWG	Presidential Working Group
REH	Rational Expectations Hypothesis
RM	Registered Market
SCA	Security Clearing Agency
SD	Swap Dealer
SDR	Swap Data Repository
SEC	Securities Exchange Commission

SEF	Swap Exchange Facility
SI	Systemic Internaliser
SPV	Special Purpose Vehicle
TR	Trade Repositories
UPI	Unique Product Identifier
US	United States of America
USI	Unique Swap Identifier
UTI	Unique Trade Identifier
VaR	Value at Risk

Chapter 1: Introduction

1.1. Background

The significant role financial markets play in the growth of a nation's economy cannot be overstated¹ and according to Keynes, financial markets are the key characteristic of market-based economies.² The great financial crisis of 2008 (GFC) has only served to reinforce this notion. The same crisis has also revealed the inability of regulators to detect and mitigate systemic risk in the financial system.³ One of the factors most implicated in the build-up and amplification of the GFC were over-the-counter derivatives (OTC derivatives).⁴ With the opacity, interconnectedness, and complexity in conjunction with reckless risk taking that characterised markets in these instruments being identified as factors that obscured regulators' and market participants' perspective during the crisis.⁵ Additional blame has been ascribed to the reliance by regulators on the assumption of perfect markets fuelled by modern finance theory,⁶ and the consequent deregulation of the OTC derivative

¹ See generally Ross Levine, 'Financial Development and Economic Growth: Views and Agenda' (1997) 35 *Journal of Economic Literature* 688; Raghuram Rajan and Luigi Zingales, 'What do We Know about Capital Structure? Some Evidence from International Data' (1995) 50 *The Journal of Finance* 1421; R. King and R. Levine, 'Finance and Growth: Schumpeter Might be Right' (1993) 108 *The Quarterly Journal of Economics* 717; Joseph Schumpeter, *The Theory of Economic Development* (Harvard University Press 1934); Douglas Arner, *Financial Stability, Economic Growth, and the Role of Law* (Cambridge University Press 2007).

² John Keynes in 'The Consequences to the Banks of the Collapse in Money Values' (1931), as quoted in Hyman Minsky, *Stabilizing an Unstable Economy* (Yale University Press 1986) 230

³ Heikki Marjosola, 'Regulating Financial Markets under Uncertainty: the EU Approach' (2014) *European Law Review* 338; Ross Levine, 'The Governance of Financial Regulation: Reform Lessons from the Recent Crisis' (2011) 12 *International Review of Finance* 45; Rene Stulz, 'Credit Default Swaps and the Credit Crisis' (2009) 24 *Journal of Economic Perspectives* 73; Michael Barr, 'The Financial Crisis and the Path of Reform' (2012) 29 *Yale Journal on Regulation* 103; Mark Roe, 'The Derivatives Market's Payment Priorities as Financial Crisis Accelerator' (2011) 63 *Stanford Law Review* 539; Emiliios Avgouleas, *Governance of Global Financial Markets: The Law, the Economics, the Politics* (Cambridge University Press 2012).

⁴ Dan Awrey, 'Split Derivatives: Inside the World's Most Misunderstood Contract' (2018) *SSRN Electronic Journal* 3 available at <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3229916&download=yes> all material accessed 28 March 2019 unless otherwise indicated.

⁵ Jo Braithwaite and David Murphy, 'Get the Balance Right: Private Rights and Public Policy in the Post-Crisis Regime for OTC Derivatives' (2017) 12 *Capital Markets Law Journal* 481.

⁶ Dan Awrey, 'Complexity, Innovation and the Regulation of Modern Financial Markets' (2012) 2 *Harvard Business Law Review* 235; T. Lawson, 'The Current Economic Crisis: Its Nature and the Course

markets it justified. Some of the criticisms of modern finance theory are that it does not take into account the innovation and dynamism immanent in financial markets,⁷ market participants are not rational actors,⁸ markets are not efficient,⁹ and that public actors are better equipped to make allocative decisions¹⁰ amongst others.¹¹

In the wake of the economic turbulence generated by the GFC, the Group of 20 (G20)¹² made an undertaking at the Pittsburgh summit that: ‘All standardised OTC derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties by end-2012 at the latest. OTC derivative contracts should be reported to trade repositories. Non-centrally cleared contracts should be subject to higher capital requirements.’¹³ The G20 mandate has now been implemented in the US and the EU. In the EU, the European Commission in fulfilment of this mandate enacted the European Market Infrastructure Regulation (EMIR).¹⁴ EMIR imposes clearing requirements on certain OTC derivatives, and requires that all OTC derivatives should be reported to a trade repository. In addition, the Markets in Financial Instruments Regulation (MIFIR)¹⁵ and Markets in Financial Instruments Directive II (MIFID II)¹⁶ require that certain standardised and centrally cleared derivative instruments are to

of Academic Economics’ (2009) 33 Cambridge Journal of Economics 759. Modern finance theory is analysed in detail in Chapter 2 of this thesis.

⁷ Awrey (n 6) 235.

⁸ George Akerlof and Robert Shiller, *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism* (Princeton University Press 2009); Robert Shiller, ‘From Efficient Markets Theory to Behavioral Finance’ (2003) 17 Journal of Economic Perspectives 83. Behavioural finance is discussed in detail in Section 2.5.

⁹ J. Crotty, ‘Structural Causes of the Global Financial Crisis: A Critical Assessment of the ‘New Financial Architecture’ (2009) 33 Cambridge Journal of Economics 563; Frank Partnoy, ‘Why Markets Crash and what Law can do about it’ (1999) 61 University of Pittsburgh Law Review 756.

¹⁰ Dan Awrey, ‘The Dynamics of OTC Derivatives Regulation: Bridging the Public-Private Divide’ (2010) 11 European Business Organization Law Review 155. The limited ability of private actors to regulate financial markets has however been highlighted by the GFC.

¹¹ The criticisms of modern finance theory are discussed in detail in Chapter 2.

¹² Comprised of the world’s top 20 economies. See further Andrew Cooper and Vincent Pouliot, ‘How Much is Global Governance Changing? The G20 as International Practice’ (2015) 50 Cooperation and Conflict 334.

¹³ G20, ‘G20 Leaders Statement: The Pittsburgh Summit (2009)’ https://g20.org/wp-content/uploads/2014/12/Pittsburgh_Declaration_0.pdf. The clearing mandate is hereafter referred to as the ‘CCP prescription.’

¹⁴ Regulation 648/2012.

¹⁵ Directive 2014/65/EU.

¹⁶ Regulation 600/2014.

be centrally traded. In the US, Congress has enacted the Dodd-Frank Wall Street Reform and Consumer Protection Act¹⁷ (Dodd-Frank Act). The Dodd-Frank Act among other reforms requires the central clearing of certain derivative contracts, the reporting of OTC derivative trades, and the centralised trading of certain OTC derivative contracts.

This thesis acknowledges that these reforms may be laudable as a superficial glance through the aforementioned legislation yields the impression that (i) transparency through prompt access to information via the CCP prescription, the reporting obligation, and the centralised trading requirement enable regulators pinpoint areas that pose systemic risk; (ii) that the use of CCPs reduces the counterparty risk inherent in bilateral derivative transactions, and; (iii) that the centralised trading requirement provides much needed liquidity in OTC-DMs. However, this thesis argues that these measures are not sufficient.

To this end, this thesis's analysis makes several arguments to the effect that these reforms seems to be driven by insights from the current economic orthodoxy – modern finance theory, and argues that adherence to this view can preclude the use of alternative and potentially superior strategies for governing financial markets.¹⁸ Evidence of repeated crises in financial systems seem to indicate that financial markets trend towards instability.¹⁹ Consequently, this thesis argues that these reforms do not seem to take into cognisance the fundamental uncertainty, imperfect information, and irrationality inherent in financial markets. Furthermore, given the prodigious amount of reform that has been undertaken in OTC-DMs, regulators will be hard pressed to change extant laws, which can result in a petrification of said laws when another financial crisis occurs. While it is only natural to respond to complex financial markets by producing complex financial regulation, even more complex financial instruments and strategies will be innovated in response to said regulation.²⁰ Consequently this thesis argues that it is

¹⁷ Pub. L. No. 111-203, (codified in Sections of 7 USC. and 15 USC.).

¹⁸ Katharina Pistor, 'On the Theoretical Foundations for Regulating Financial Markets' (2012) SSRN Electronic Journal.

¹⁹ *ibid*; Avougleas also advocates this assumption, see Avougleas (n 3) 79.

²⁰ Chester Spatt, 'Complexity of Regulation' (2012) 3 Harvard Business Law Review Online <http://www.hblr.org/2012/06/complexity-of-regulation/>.

important to reconceptualise the manner in which we perceive financial markets and consequently regulate them. However, before proceeding further, it is essential that a basic understanding of the derivative contracts which are the primary subject of this thesis's analysis is obtained. Consequently, this chapter in its next section provides an overview of derivatives, the manner in which these instruments are traded, the purposes for which they are traded, and the risks that these instruments pose to market participants and the financial system at large.

1.2. Derivatives: The 'Best Thing after Sliced Bread' or the 'Crystal Meth of Finance'?

1.2.1. Definition

The esoteric bad boys of finance, derivatives are hard to define given their wide and varied forms and applications.²¹ Basically, a derivative can be defined as a contingent financial contract, the value of which is derived by reference to external items that are financially meaningful.²² These items include other assets, events, or indexes,²³ and are typically referred to as the underlying.²⁴ Derivatives are not a recent development with their history being traceable from Aristotelian times to medieval Europe, 16th century Japan, and 19th Century America.²⁵ This is unsurprising as derivative contracts reallocate risk by isolating said risks and transferring them from one party to another. This is a result of the engineering of these contracts to reflect future changes in the value of the underlying, consequently transferring the risks that arise

²¹ Raffaele Scalcione, *The Derivatives Revolution* (Kluwer Law International 2011) 10.

²² John Hull, *Options, Futures, and other Derivatives* (8th edition, Pearson 2014) 1; Andrew Chisholm, *Derivatives Demystified: A Step-by-Step Guide to Forwards, Futures, Swaps and Options* (John Wiley & Sons 2004) 1; Alastair Hudson, *The Law of Finance* (Sweet & Maxwell 2012) 1101; David Murphy, *OTC Derivatives: Bilateral Trading and Central Clearing: An Introduction to Regulatory Policy, Market Impact and Systemic Risk* (Palgrave Macmillan 2013) 9; Lynn Stout, 'Derivatives and the Legal Origin of the 2008 Credit Crisis' (2011) 1 *Harvard Business Law Review* 6.

²³ Norman Feder, 'Deconstructing Over-The-Counter Derivatives' (2002) *Columbia Business Law Review* 688.

²⁴ Examples of underlyings include financial assets such as equity, debt, indices, interest rates, and currencies. Commodities such as agricultural products and natural resources are often the underlying for derivative contracts.

²⁵ Chisholm (n 22) 5; Roberta Romano, 'A Thumbnail Sketch of Derivative Securities and their Regulation' (1996) 55 *Maryland Law Review* 8; John-Peter Castagnino, *Derivatives* (Oxford University Press 2009) 9.

from exposure to the underlying. This reallocation of risk mitigates two types of risk, specifically market risk and credit risk. Market risk is a result of exposure to market movements. Credit risk on the other hand is the risk that a counterparty is unable to perform their contractually mandated obligations. Consequently, derivatives allow market participants shift the risk of adverse market movement or a deterioration in counterparty creditworthiness to other market participants. These same features mean that derivatives can be used to replicate the payoffs of financial assets.²⁶

1.2.2. Functions

Derivatives are typically used for two commercial purposes namely: hedging and speculation.²⁷ Hedging is essentially the process through which an entity reduces its risk exposure accruing from a pre-existing obligation.²⁸ This exposed entity enters into a transaction that will generate an entitlement to profit in circumstances that generate a loss under the exposure. Essentially, hedging attempts to counteract losses that may result from the hedging party's investments.²⁹ However, despite this clear advantage, hedging poses its own risks for a number of reasons. First, derivative contracts are subject to counterparty credit risk, that is, the risk that the counterparty to the derivatives contract does not perform its contractual obligations. Second, the use of derivatives raise complex selection and calibration issues and it is entirely possible that the chosen derivative product may not fully protect against the anticipated risk. Third, the derivatives contract may be marked to market, while the underlying is not which results in the hedger having to transfer substantial amounts of collateral if the derivative in question is out of the money.³⁰

²⁶ Robert McDonald, *Derivatives Markets* (Pearson 2014) 14; Murphy (n 22) 9.

²⁷ Darrell Duffie and others, 'Policy Perspectives on OTC Derivatives Market Infrastructure' (2010) 24 Federal Reserve Bank of New York Staff Report 9; Henry Hu, 'Misunderstood Derivatives: The Causes of Informational Failure and the Promise of Regulatory Incrementalism' (1993) 102 Yale Law Journal 1466.

²⁸ Romano (n 25) 9.

²⁹ Paul McBride, 'The Dodd-Frank Act and OTC Derivatives: The Impact of Mandatory Central Clearing on the Global OTC Derivatives Market' (2010) 44 The International Lawyer 1091.

³⁰ Feder (n 23) 718.

As regards the second use of derivative contracts, speculators trade in derivatives despite the absence of exposure to the underlying.³¹ Essentially, speculators are market participants who seek to profit from assuming risk, and predicting the future more accurately than their contractual counterparties.³² Derivatives enable speculators enter derivative contracts in anticipation of price movements in the underlying. Speculation also enables market participants mirror the effects of investing in an underlying by mirroring the effects of trading in the said underlying. For example, a market participant may achieve the same result of trading in the shares of a company by entering into an option; without having to comply with the onerous administrative burden that comes with exchange membership, or the complex intermediation chains inherent in securities transactions.³³

In addition, investing in a derivative as opposed to the underlying securities may assist with mimicking investment in countries where the market participant has no presence,³⁴ and facilitate regulatory arbitrage where this is more cost effective.³⁵ Speculation is even more attractive given the fact that a large amount of leverage is facilitated in derivative transactions, as speculators can take large positions at a fraction of the cost needed for an investment in the underlying. In fact, derivatives may be used solely for the leverage they enable.³⁶ The utility of speculation in derivatives is however questionable given the associated gargantuan information costs.³⁷ Especially in light of the endogenous risk that this thesis will argue is rife in financial markets.

Some academics view arbitrage as separate from speculation as arbitrageurs seek to generate risk free profits by exploiting existing price mismatches, or by

³¹ Stephen Valdez and Philip Molyneux, *An Introduction to Global Financial Markets* (8th edn, Palgrave Macmillan 2016) 398.

³² Stout (n 22) 7.

³³ On the existence and demerits of intermediation in securities holding, see Eva Micheler, 'Custody Chains and Asset Values: Why Crypto-Securities are Worth Contemplating' (2015) 74 *The Cambridge Law Journal* 657.

³⁴ Alastair Hudson, *The Law on Financial Derivatives* (Sweet & Maxwell 2016) 5-27.

³⁵ See for example Frank Partnoy, 'Financial Derivatives and the Costs of Regulatory Arbitrage' (1997) 22 *Journal of Corporation Law* 211; Henry Hu and Bernard Black, 'The New Vote Buying: Empty Voting and Hidden (Morphable) Ownership' (2006) 79 *Southern California Law Review* 811.

³⁶ Stout (n 22) 7-8; Partnoy (n 35) 225.

³⁷ Lynn Stout, 'Betting The Bank: How Derivatives Trading under Conditions of Uncertainty can Increase Risks and Erode Returns in Financial Markets' (1995) 21 *Journal of Corporation Law* 60.

reacting ahead of markets.³⁸ This could involve buying a low priced item, and selling a similar item which has a relatively high price which results in a profit when the spreads for both items converge.³⁹ However, given the lack of an interest in the underlying, arbitrage activities are speculative. Furthermore, given endogenous risk, arbitrage can have disastrous effects as demonstrated in Chapter 2 of this thesis,⁴⁰ especially when considering the leverage and opacity required for the effectiveness of arbitrage strategies.⁴¹ Defenders of speculation state that hedging itself contains speculative elements⁴² in relation to the estimation of the probability of the future event which is being hedged against. However, these arguments don't hold much water when comparison is drawn from the field of insurance which bears striking resemblance to hedging and requires that the holders of insurance have some interest in the subject of the insurance contract.⁴³

1.2.3. Markets

Derivatives are traded in two ways - on an exchange, or bilaterally, that is, over-the-counter.⁴⁴ As their names suggest, exchange traded derivatives are created and traded on exchanges. Examples of exchanges include the Chicago Mercantile Exchange, the Chicago Board of Exchange, and Eurex Exchange. Exchange traded derivatives typically refer to a limited range of underlyings due to the need for liquidity and transparency in the markets for these underlyings. In addition, due to the fungibility required for exchange trading, exchange traded derivatives are highly standardised.⁴⁵ Exchanges provide credit support by clearing and settling trades through clearinghouses.⁴⁶ Furthermore, exchanges govern contracts traded on them, as well as the traders of said contracts pursuant to principles prescribed by

³⁸ Feder (n 23) 720; Stout (n 35) 58.

³⁹ Feder (n 23) 721.

⁴⁰ Infra Section 2.4.

⁴¹ Feder notes that as arbitrage is dependent on market imperfections, and given the propensity for mimicry in financial markets, arbitragers require large volumes, opacity, speed, and leverage. Feder (n 23) 721.

⁴² *ibid* 720.

⁴³ On insurable interest, see Gary Meggitt, 'Insurable Interest – The Doctrine That Would Not Die' (2015) 35 *Legal Studies* 280.

⁴⁴ Hull (n 22) 2-3.

⁴⁵ This includes standardised contractual settlement dates, amounts and maturities.

⁴⁶ The definition, functions and regulation of CCPs are discussed in detail in Chapters 3 and 4.

regulatory authorities.⁴⁷ While the standardisation of exchange traded derivatives may render them incapable of being precisely calibrated to mitigate specific risks, this standardisation and its attendant fungibility are beneficial in a number of ways. First, the uniformity of these contracts renders them liquid, enabling them to be traded several times before their expiration – consequently enabling buyers offset their exposures.⁴⁸ Second is the credit support provided by CCPs.⁴⁹ Third is the fact that these contracts are traded in a highly regulated environment.⁵⁰ Finally, exchange trading engenders transparency and market efficiency.⁵¹

Conversely, OTC derivatives as their name suggests are traded bilaterally.⁵² That is, outside an exchange. Given the fact that these contracts are not subject to the standardisation constraints applicable to exchange traded derivatives, they provide market participants with the flexibility required to tailor the terms of their contracts to address their idiosyncratic risk management needs.⁵³ In addition, counterparties can structure derivative contracts that refer to a wide range of exotic underlyings. Furthermore, given the opacity inherent in bilateral markets, OTC-DMs offer the ability to obscure trading in large quantities.⁵⁴ However, this flexibility comes with a cost. The bespoke nature of OTC derivatives result in limited fungibility as these contracts are usually not assignable. In addition, the credit support provided by an exchange's clearinghouse is absent rendering counterparties susceptible to counterparty credit risk. The lack of standardisation and ability to incorporate myriad terms and underlyings also inhibit the fungibility of OTC derivatives.⁵⁵ To remedy these deficiencies, parties have innovated techniques including

⁴⁷ Exchanges are discussed in Chapter 6.

⁴⁸ Feder (n 23) 732.

⁴⁹ Ibid.

⁵⁰ Ibid.

⁵¹ Jon Gregory, *Central Counterparties: Mandatory Central Clearing and Initial Margin Requirement* (John Wiley & Sons 2014) 16-17; Scalcione (n 21) 12.

⁵² Christopher Culp, 'OTC-Cleared Derivatives: Benefits, Costs, and Implications of the 'Dodd-Frank Wall Street Reform and Consumer Protection Act' (2010) 20 *Journal of Applied Finance* 105.

⁵³ Hull (n 22) 4; Scalcione (n 21) 13.

⁵⁴ McDonald (n 26) 4.

⁵⁵ Gregory (n 51) 16-19.

netting, credit support via collateralisation, and created standardised trading terms.⁵⁶

1.2.4. Taxonomy

While diverse in their structure and complexity, at the most basic level, derivatives can be classified into four types namely options, forwards, futures, and swaps.⁵⁷ An option is the right, not an obligation to purchase or sell the underlying at a set price on a future date.⁵⁸ Options can be traded bilaterally or on exchanges. An option entitling its holder to sell is called a put option while an option entitling its holder to buy is called a call option.⁵⁹ Conversely, a forward is the obligation to purchase or sell said asset at a set price on a stipulated future date.⁶⁰ In the option context, the party obligated to deliver the asset is said to have assumed a short position while the party obligated to receive the asset and pay the price is said to have taken the long position. Forwards are traded OTC, and when traded on exchanges, are called futures.⁶¹ Both options and futures can be contrasted with spot contracts which are agreements to buy or sell an asset today.⁶²

Finally, we have swaps which are basically agreements to intermittently exchange cash flows over a set period of time and have been termed by some as merely a series of mutual forward obligations.⁶³ Particularly worthy of note in this context are credit derivatives.⁶⁴ These subspecies of derivatives contracts address the risk that an obligor fails and is unable to perform its obligations under a contract due to a credit event.⁶⁵ These derivatives isolate

⁵⁶ Murphy (n 22) 11.

⁵⁷ McBride (n 29) 1081. For a detailed account of these taxonomies, see R. Johnson, *Derivatives Markets and Analysis* (Wiley 2017).

⁵⁸ Hull (n 22) 30; Chisholm (n 25) 2; Johnson (n 57) 7. Alternatively, the relevant contract can be settled in cash through the transfer of the associated cash position.

⁵⁹ Hudson (n 22) 1095.

⁶⁰ McBride (n 29) 1082; Hull (n 22) 28; Johnson (n 57) 6.

⁶¹ Alexandra Balmer, *Regulating Financial Derivatives: Clearing and Central Counterparties* (Edward Elgar Publishing 2018) 25; Chisholm (n 25) 2; Johnson (n 57) 3.

⁶² Hull (n 22) 5.

⁶³ Hudson (n 22) 1117.

⁶⁴ A comprehensive history of credit derivatives can be found in Gillian Tett, 'Non-Technical Introduction', in Alexander Lipton and Andrew Rennie (eds) *The Oxford Handbook of Credit Derivatives* (Oxford University Press 2011).

⁶⁵ Antúlio Bomfim, *Understanding Credit Derivatives and Related Instruments* (Elsevier Academic Press 2005) 4.

this credit risk, and transfer it to a willing party. Credit derivatives differ from credit risk protection usually offered by third parties, for example, letters of credit and guarantees in the sense that they separate the protection offered from the reference assets.⁶⁶ Myriad credit derivatives exist with credit default swaps (CDS) and collateralised debt obligations (CDOs) being the most notorious due to the role they played in the GFC.⁶⁷

A CDS separates and transfers the credit risk normally associated with a specific reference asset, and typically involves a bet on the likelihood of a reference entity's bankruptcy, default, or restructuring.⁶⁸ One party known as the protection buyer pays a premium which can be a single or periodic payment to the protection seller who is obligated to pay a specified amount to the protection buyer in the event of a credit event.⁶⁹ It may be noted that this contract is classified as a swap despite the absence of an exchange of cash flows. Given the fact that the protection seller's obligations are only triggered upon the occurrence of a contingent event, CDS could more accurately be described as options. The classification of the CDS as a swap may however be expedient given that the buyer is under periodic payment obligations.⁷⁰

Collateralised debt obligations (CDO) are another type of credit derivative. A CDO is a pool of debt contracts⁷¹ transferred by an originating entity to a special purpose vehicle (SPV),⁷² or a pool of debt instruments purchased by the SPV. The SPV's capital is then sliced into tranches and sold to market participants. The price of the specific tranche being sold is dependent on credit quality.⁷³ A synthetic CDO or CDO squared does not involve the purchase of

⁶⁶ Feder (n 23) 707.

⁶⁷ Tett (n 64).

⁶⁸ Frank Partnoy and David Skeel, 'The Promise and Perils of Credit Derivatives' (2007) 75 *University of Cincinnati Law Review* 1021; Andrew Sutherland and Jason Court, *The Front Office Manual* (Palgrave Macmillan 2013) 194.

⁶⁹ Chisholm (n 25) 75.

⁷⁰ Feder (n 23) 711.

⁷¹ These debt contracts are typically illiquid, and include corporate bonds, asset backed securities, CDS, and other CDOs.

⁷² SPVs are typically bankruptcy remote.

⁷³ Partnoy and Skeel (n 68) 1022. These same techniques underly securitisation which is a process for the repackaging and redistribution of debt. On securitisation, see C Mounfield, *Synthetic Cdos* (Cambridge University Press 2009); Joshua Coval and others, 'The Economics of Structured Finance' (2009) 23 *Journal of Economic Perspectives* 3; Orkun Akseli, 'Securitisation, The Financial Crisis and the Need for Effective Risk Retention' (2013) 14 *European Business Organization Law Review*

debt. Instead, the SPV enters into several CDS transactions to achieve exposure to the relevant debt.⁷⁴ The quality of these tranches are determined by credit rating agencies utilising sophisticated quantitative techniques, with the credit rating of the specified tranche determining its price.⁷⁵

The praises of CDS have been sung by market participants with the then Federal Reserve Chairman Alan Greenspan proselytising the stability and flexibility these instruments brought to the American economy,⁷⁶ and academics describing these instruments as the most significant and successful financial innovation of the last decade.⁷⁷ Further benefits of CDS are the obvious opportunities they provide for hedging credit exposures. This ability to hedge leads to another benefit which is that as CDS supposedly reduce credit risk, they increase liquidity in the banking industry by enabling banks to lend at lower risk consequently increasing access to credit.⁷⁸ Finally, disclosed CDS pricing information provides markets with information about the reference entity's creditworthiness, consequently facilitating market efficiency.⁷⁹

In a similar vein, CDOs were praised as being paragons embodying the virtues of financial innovation which completed markets. This completion of financial markets was possible due to the fact that while CDOs pooled debt, they then issued securities in tranches with market participants free to buy the tranches which suited their risk appetites.⁸⁰ Furthermore, the highly rated CDO tranches

1; Orkun Akseli, 'Was Securitisation the Culprit? Explanation of Legal Processes behind Creation of Mortgage-Backed Sub-Prime Securities' in Joanna Grey and Orkun Akseli (ed), *Financial Regulation in Crisis? The Role of Law and the Failure of Northern Rock* (Edward Elgar 2011).

⁷⁴ Partnoy and Skeel (n 68) 1022; Johnson (n 57) 7; Mounfield (n 73) 16.

⁷⁵ Mounfield (n 73) 5. For a detailed analysis of credit rating agencies, see Lawrence White, 'Markets: The Credit Rating Agencies' (2010) 24 *Journal of Economic Perspectives* 759; Patrick Bolton and others, 'The Credit Ratings Game' (2012) 67 *The Journal of Finance*; Efraim Benmelech and Jennifer Dlugosz, 'The Alchemy of CDO Credit Ratings' (2009) 56 *Journal of Monetary Economics* 617; Stefanie Hiss and Sebastian Nagel, 'Credit Rating Agencies' in Daniel Mügge (ed), *Europe and the Governance of Global Finance* (Oxford University Press 2014).

⁷⁶ Alan Greenspan, 'Risk Transfer and Financial Stability', speech to the Federal Reserve Bank Of Chicago 41st Annual Conference on Bank Structure (5 May 2005).

⁷⁷ Viral Acharya and Timothy Johnson, 'Insider Trading in Credit Derivatives' (2007) 84 *Journal of Financial Economics* 111.

⁷⁸ Stulz (n 3) 76; Partnoy and Skeel (n 68) 1025–1026.

⁷⁹ Partnoy and Skeel (n 68) 1027; Acharya and Johnson (n 77) 111; Yesha Yadav, 'Insider Trading And Market Structure' (2015) 103 *Georgetown Law Journal* 381.

⁸⁰ Partnoy and Skeel (n 68) 1028.

had credit ratings that were higher than those of their underlying,⁸¹ consequently enabling market participants who would have had to pay higher capital charges on the underlying⁸² participate in the market.⁸³ In addition, as the prices of CDOs were sometimes lower than those of the underlying, they presented perfect arbitrage opportunities for market participants. The use of derivatives generally, and credit derivatives specifically was further bolstered by the use of sophisticated quantitative models which were the progeny of the canonical theories of modern finance.⁸⁴ The very foundation of derivatives regulation pre-GFC was predicated on these models. This was demonstrated by the reliance of regulators, credit rating agencies, and other market participants on the quantification of the risks that these instruments posed, and most importantly, the deregulation of OTC-DMs this reliance engendered.⁸⁵ These models relied on stylised and as this thesis will argue, deleteriously unrealistic assumptions about financial markets including costless information, model consistent variables, the irrelevance or absence of transaction costs, and rational market participants. These models also provided justification of the social utility of derivatives.⁸⁶

What financial market participants seem to have failed to properly understand were the risks inherent in the use of derivatives. Credit derivatives in particular are problematic for a number of reasons. First, in addition to being used to hedge credit exposures to obligors, credit derivatives can be used to speculate directly on the credit worthiness of the reference entity.⁸⁷ In the context of speculation, this may be problematic for a number of reasons including the fact that where the specified credit event in connection with the reference entity occurs, the protection buyer is entitled to be paid despite its non-exposure to the reference entity. Protection sellers then have to make payments which are disproportionately high when compared with losses caused by the reference

⁸¹ Mounfield (n 73) 5.

⁸² Due to credit rating dependent regulations.

⁸³ Partnoy and Skeel (n 68) 1028.

⁸⁴ Awrey (n 6) 238.

⁸⁵ The deregulation of OTC-DMs is discussed in detail in Chapter 2.

⁸⁶ Theories of modern finance and their attendant models are discussed in detail in Chapter 2.

⁸⁷ Mounfield (n 73) 7.

entity's default to the financial system.⁸⁸ As default is a discrete event, the occurrence of default resulted in the sharp rise in value of the credit derivative.⁸⁹ This risk was worsened by the leverage endemic in OTC-DMs which encouraged market participants to take positions that were larger and riskier than normal.⁹⁰ Second, as credit derivatives shift risk to willing market participants, they reduce incentives to monitor, as proven by the development of the originate to distribute model.⁹¹ Simultaneously, credit derivatives provided strong incentives to destroy value in the context of debt restructurings.⁹² Third, as a good proportion of credit derivatives were traded OTC, opacity was a natural feature of these markets, a scenario worsened by the deregulation that the markets for these instruments had undergone.⁹³ This opacity subsequently hid the interconnectedness and complexity that these instruments engendered. Most importantly, the models utilised in the quantification failed to take into consideration the fundamental uncertainty, imperfect information, and irrationality that characterise real world financial markets.

1.2.5. Credit Derivatives and the Financial Crisis

The aforementioned use of CDS in the creation of securitisation products created extremely complex instruments, the risk of which was underestimated by market participants.⁹⁴ This complexity and its demerits did not detract from the allure of OTC-DMs generally and credit derivatives specifically. The supposed merits of OTC derivatives firmly rooted in a belief that risk could be definitively quantified, and bolstered by a fanatical belief in the tenets of modern finance theory resulted in the advent of OTC-DMs from relative obscurity to a market colossus worth over \$USD700 trillion.⁹⁵ This complexity and the gargantuan nature combined with the opacity and information

⁸⁸ Hudson (n 22) 1109.

⁸⁹ Stulz (n 3) 82.

⁹⁰ Ibid.

⁹¹ Amiyatosh Purnanandam, 'Originate-to-Distribute Model and the Subprime Mortgage Crisis' (2010) 24 *Review of Financial Studies* 1881; Partnoy and Skeel (n 68) 1032.

⁹² Partnoy and Skeel (n 68) 1034.

⁹³ Ibid.

⁹⁴ Jo Braithwaite, 'The Inherent Limits of 'Legal Devices': Lessons for the Public Sector's Central Counterparty Prescription for the OTC Derivatives Markets' (2011) 12 *European Business Organization Law Review* 93.

⁹⁵ Awrey (n 1).

asymmetries that characterised pre-GFC OTC-DMs rendered conditions in these market extremely combustible.⁹⁶

Further problems could be found in the interaction of the jump to default risk that characterises credit derivatives, and the utilisation of collateral to mitigate credit risk as these factors may result in procyclicality. CDS were particularly attractive as their purchasers could use them to speculate on loans they did not own, which inflated potential losses, a problem exacerbated by the fact that given the unregulated nature of CDS markets, market participants were not required to provide collateral to mitigate losses. This resulted in said market participants⁹⁷ accumulating large risk positions. For example, prior to the GFC, American Insurance Group (AIG) had accumulated CDS of over half a trillion dollars with no requirements for collateral.⁹⁸ In addition, the majority of trading in CDS was also heavily transacted among a few large sophisticated market participants.⁹⁹ These factors resulted in a high possibility of financial contagion spreading between participants in these markets and destabilising the financial system.¹⁰⁰

These risks were exemplified by the ignominious downfall of the American Insurance Group (AIG) which had guaranteed myriad CDS contracts tied to mortgage backed securities entered into by its largely unregulated London based subsidiary – AIG Financial Products. When issues with mortgage backed securities were revealed, the owners filed claims with AIG which struggled to meet these obligations. This situation was worsened by the ‘credit rating triggers’ contained in AIG’s CDS with certain counterparties which resulted in AIG having to source about \$14 billion in cash when its credit rating was downgraded from AAA on 15 September 2008. AIG found it difficult to source this £14 billion from short-term capital markets, raising the possibility

⁹⁶ A Turner ‘The Turner Review: A Regulatory Response to the Global Banking Crisis’ (2009) 14, 22, and 28.

⁹⁷ For example, Bear Sterns and Lehman Brothers.

⁹⁸ See generally Financial Crisis Inquiry Commission (FCIC), *The Financial Crisis Inquiry Report* (Public Affairs 2011).

⁹⁹ Over 97% of trading in US OTC derivatives was concentrated in five institutions (JP Morgan Chase, Citigroup, Bank of America, Wachovia, and HSBC). See further FCIC (n 98) 50.

¹⁰⁰ Thomas Hellmann and others, ‘Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?’ (2000) 90 *American Economic Review* 147; Eric Dickinson, ‘Credit Default Swaps: So Dear to Us, So Dangerous’ [2008] SSRN Electronic Journal.

of its potential failure. A situation worsened by the interconnections AIG's £500 billion portfolio had created in the highly concentrated CDS market. AIG's default on its CDS contracts would have left its counterparties without the protection of their CDS contracts, which would have in turn threatened said counterparties' viability. Resultantly, the US government bailed AIG out.¹⁰¹

This incident as well as the failure of other market participants brought the risks inherent in CDS to light and revealed the severely deleterious costs of leaving OTC-DMs generally, and CDS markets specifically unregulated.¹⁰² Furthermore, the GFC has established the imprudence of basing regulatory attitudes on market fundamentalism and has called into question both the social utility of OTC derivatives, and the adequacy of modern finance theory. It is therefore in this context that this thesis explores reforms in OTC-DMs utilising alternative theories of finance that it argues are better suited for the regulation of real-world financial markets.

1.3. Research Aims

A lesson painfully learnt from the GFC is that some form of regulation is requisite in financial markets principally and in the OTC-DMs specifically. This however raises the question of what form said regulation should adopt, the substance of such regulation, and whether public or private actors or perhaps a combination of both are better suited to make allocative decisions. These questions are particularly crucial as the precepts and methods of modern finance theory have been proved woefully inadequate by the GFC. It is therefore in this context, that this thesis utilising alternative theories of financial economics as an evaluative framework seeks to contribute to the reconceptualisation of the intellectual framework currently underpinning the regulation of the OTC-DMs to educe normative policy distillations on the nature and scope of OTC-DM regulation.¹⁰³ Reforms in OTC-DMs are the focus of this thesis in light of the rapid growth, complexity, and innovation inherent in this market. For clarity's sake, the aims of this thesis are:

¹⁰¹ Braithwaite (n 94) 94.

¹⁰² Ibid 95.

¹⁰³ These theories are discussed extensively in Chapter 2.

- Extrapolating policy distillations from theories of financial economics, articulate normative principles for the regulation of financial markets.¹⁰⁴
- Utilising the normative principles as an evaluative framework, critically examine regulatory reforms in EU and US OTC-DMs. These reforms are:
 - The CCP prescription;
 - The reporting obligation; and
 - The centralised trading requirement.
- Consider the role if any that modern finance theory has played in the aforementioned reforms.
- Building on the above examination, identify the regulatory challenges arising from current reforms in OTC-DMs, and recommend normative solutions to these challenges.

Having set out this thesis's aims; a few caveats are in order. OTC-DMs and the reforms that seek to mitigate the systemic risk these markets engender are complex and constantly evolving. Consequently, while this thesis does attempt a thorough analysis of the selected reforms, said analysis is focused on details that are in its author's opinion essential constituents of said reforms. Furthermore, this thesis is necessarily constrained by the word and temporal limits inherent in doctoral research. Resultantly, this thesis's analysis may circumnavigate specific details of these reforms in some parts.

1.4. Research Methodology

The methodology of this thesis is primarily analytical, grounded in an analysis of the relevant theories of financial economics, as well as of the relevant law and literature. To this end, this thesis employs two methodologies in analysing reforms in OTC-DMs. First, it utilises the interdisciplinary method, and second it engages in comparative analysis of reforms in EU and US OTC-DMs. These methods are briefly discussed below.

¹⁰⁴ The central theme of this thesis will be 'uncertainty' as distinguished from risk. The major difference as stressed by Keynes in his book *General Theory of Employment, Interest and Money* (Palgrave Macmillan 2007) is that risk can be quantified objectively while uncertainty cannot.

1.4.1. Interdisciplinary Method

Given this thesis's use of theories of finance as an evaluative framework, the nature of this thesis's analysis is necessarily interdisciplinary in nature grounded in an analysis of theories of financial economics, and the implications these theories have for the regulation of OTC-DMs. As this thesis discusses further in Chapter 3, financial economics plays a vital role in the regulation of financial markets. There is a large body of literature on the general interaction and dynamics between economics and law¹⁰⁵ that has proved valuable in several fields of law.¹⁰⁶ The law and economics method seeks to determine the effect law has on social welfare.¹⁰⁷

Contributing to this literature, this thesis explores the effect that financial economics has on our conceptualisation of financial markets, and consequently, on any resultant regulation. Specifically, this thesis explores the effect that theories of finance have had or may have on reforms in OTC-DMs, consequently rendering the use of interdisciplinary methods essential in this thesis's analysis. Therefore, this thesis will investigate the effects modern finance theory have had on post-GFC reforms, as well as utilise alternative theories of finance as an evaluative framework. Three alternative theories will be employed in the construction of the evaluative framework. These theories are Frydman and Goldberg's imperfect knowledge economics, Minsky's

¹⁰⁵ See for example Robert Cooter and Thomas Ulen, *Law and Economics* (Pearson 2013); A. Ogus, *Regulation: Legal Form and Economic Theory* (Hart 2004); Richard Posner, *Economic Analysis of Law* (9th edition, Wolters Kluwer Law & Business 2014); Cass Sunstein, *Behavioral Law and Economics* (Cambridge University Press 2000).

¹⁰⁶ For example R. Coase, 'The Problem of Social Cost' (1960) 3 *The Journal of Law and Economics* 1; Mathias Siems, 'Legal Origins: Reconciling Law & Finance and Comparative Law' (2007) 52 *McGill Law Journal* 56; Thomas Ulen, 'The Efficiency of Specific Performance: Toward a Unified Theory of Contract Remedies' (1984) 83 *Michigan Law Review* 541; Guido Calabresi, 'Some Thoughts on Risk Distribution and the Law of Torts' (1961) 70 *The Yale Law Journal* 499; John Brown, 'Towards an Economic Theory of Liability' (1972) 2 *Journal of Legal Studies* 323; Gary Becker, 'Crime and Punishment: An Economic Approach' (1968) 76 *Journal of Political Economy* 168; Paul Rubin, 'Why Is the Common Law Efficient?' (1977) 6 *The Journal of Legal Studies* 51.

¹⁰⁷ This includes both the manner in which law influences the actions of individuals, and the potential benefits law provides from an efficiency and social welfare perspective. See Mathias Siems, 'Legal Originality' (2008) 28 *Oxford Journal of Legal Studies* 159; Nuno Garoupa and Tom Ginsburg, 'Economic Analysis and Comparative Law' in Mauro Bussani and Ugo Mattei (ed), *The Cambridge Companion to Comparative Law* (Cambridge University Press 2012) 57.

financial instability hypothesis an interpretation of Keynes general theory, and behavioural finance.¹⁰⁸

1.4.2. Comparative Method

In addition, this thesis's analysis utilises the comparative method.¹⁰⁹ While the G20's mandate has been implemented on a global scale,¹¹⁰ this thesis's analysis will focus on OTC-DM reforms in the EU and US for a number of reasons. First, the financial crisis has revealed the interconnected nature of EU and US financial markets as exemplified by the AIG debacle.¹¹¹ Second, as at the commencement of this thesis, the EU and US were the most advanced jurisdictions in the implementation of the G20 mandate.¹¹² Third, the majority of trading in OTC-DMs emanates from these two economies.¹¹³ In addition, these economies house a substantial number of OTC-DM participants,¹¹⁴ and consequently pose the greatest threat to global financial stability. Finally, these two economies are central to international financial regulatory coordination.

For this thesis's purposes, comparative law is the 'systematic application of comparison to law.'¹¹⁵ Comparative law in the international context is crucial in determining common solutions to common problems¹¹⁶ and consequently presents an invaluable tool for determining which regulatory approaches are better suited for the regulation of real-world financial markets. The use of the comparative methodology is even more crucial when considering the global

¹⁰⁸ These theories are discussed supra Section 2.5.

¹⁰⁹ For a detailed exposition of comparative law, see Mathias Siems, *Comparative Law* (2nd edition Cambridge University Press 2018); Michael Bogdan, *Concise Introduction to Comparative Law* (Europa Law Publishing 2013); Jaakko Husa, *A New Introduction to Comparative Law* (Hart Publishing 2015).

¹¹⁰ See for example Financial Stability Board, 'Implementation and Effects of the G20 Financial Regulatory Reforms' [2018] 4th Annual Report which follows the progress of the G20 reforms in 24 jurisdictions.

¹¹¹ Supra Section 1.2.5.

¹¹² See Financial Stability Board, 'OTC Derivatives Market Reforms: Tenth Progress Report on Implementation' [2015] 4.

¹¹³ On interest rate derivatives for example, see Bank for International Settlements, 'Turnover of OTC Interest Rate Derivatives, by Country' [2019].

¹¹⁴ Elliot Posner, 'Making Rules for Global Finance: Transatlantic Regulatory Cooperation at the Turn of the Millennium' (2009) 63 *International Organization* 665.

¹¹⁵ W. Kamba, 'Comparative Law: A Theoretical Framework' (1974) 23 *International and Comparative Law Quarterly* 489.

¹¹⁶ Geoffrey Wilson, 'Comparative Legal Scholarship' in Michael McConville and Wing Hong Chui (ed), *Research Methods for Law* (Edinburgh University Press 2007) 88.

nature of OTC-DMs, and the possible transmission of financial contagion beyond national borders. Furthermore, comparative research provides the means through which differences in legal regimes, and the factors precipitating these differences can be analysed and rationalised.¹¹⁷ Finally, as the comparative method is situated at the intersection of disciplinary methods, it presents excellent opportunities for developing novel answers to standard questions,¹¹⁸ especially as the economic analysis of law has been extended to comparative law.¹¹⁹

Linking this comparative analysis to this essay's utilisation of alternative theories of finance as an evaluative framework, as mentioned above, comparative law in the international context is crucial in determining common solutions to common problems.¹²⁰ In this thesis's context, the comparative method is an invaluable tool for determining which regulatory approaches follow the precepts of modern finance theory, with potentially deleterious effects. This method also reveals which regulatory approaches towards OTC-DMs are better suited to the regulation of real-world financial markets. As highlighted above, the use of the comparative methodology is even more crucial when considering the global nature of OTC-DMs, and the possible transmission of financial contagion beyond national borders. Especially as pre-GFC, European policy-makers had expressed concerns about what were perceived to be the shortcomings of the American approach to regulation.¹²¹ Furthermore, this comparative approach follows the established school of comparative law and finance which seeks to explain the evolution of financial markets,¹²² and asserts that different legal traditions prioritise the rights of investors differently, which has implications for the regulation of financial

¹¹⁷ Ibid 92.

¹¹⁸ Ibid 5.

¹¹⁹ Gerrit De Geest, *Economics of Comparative Law* (Edward Elgar 2009); Ugo Mattei, *Comparative Law and Economics* (Univ of Michigan Press 2004). For examples, see Andrei Shleifer and Robert Vishny, 'A Survey of Corporate Governance' (1997) 52 *The Journal of Finance* 737; Rafael La Porta and others, 'Law and Finance' (1998) 106 *Journal of Political Economy* 1113; Simeon Djankov and others, 'The New Comparative Economics' (2003) 31 *Journal of Comparative Economics* 595.

¹²⁰ Wilson (n 116) 88.

¹²¹ Stefano Pagliari, 'A Wall around Europe? The European Regulatory Response to the Global Financial Crisis and the Turn in Transatlantic Relations' (2013) 35 *Journal of European Integration* 391.

¹²² See further Mathias Siems and Simon Deakin, 'Comparative Law and Finance: Past, Present, and Future Research' (2010) 166 *Journal of Institutional and Theoretical Economics* 120.

markets.¹²³ For clarity's sake, this thesis's comparative analysis supports its interdisciplinary aspect by also seeking to determine whether EU or US regulatory approaches to OTC-DMs follow the tenets of modern finance theory, or alternative theories of finance.

1.5. Contribution to Research

A considerable plethora of literature exists in legal academia on the subject of financial regulation.¹²⁴ In addition, derivatives themselves have been the subject of vigorous academic debate; with academics exploring the nature of these contracts,¹²⁵ the public and private law aspects of derivatives,¹²⁶ the risks derivatives pose,¹²⁷ and the clearing of derivative contracts.¹²⁸ In addition, academic discourse can also be found on the economics of: derivatives,¹²⁹

¹²³ Thorsten Beck and others, 'Law and Finance: Why Does Legal Origin Matter?' [2002] World Bank Policy Research Working Papers.

¹²⁴ Avgouleas (n 3); Niamh Moloney, *EU Securities and Financial Markets Regulation* (Oxford University Press 2014); John Armour and others, *Principles of Financial Regulation* (Oxford University Press 2016); Niamh Moloney and others, *The Oxford Handbook of Financial Regulation* (Oxford University Press 2017); Colin Paul and Gerald Montagu, *Banking and Capital Markets Companion* (6th edn, Bloomsbury 2011); Alastair Hudson, *Securities Law* (Sweet & Maxwell 2013); Hal Scott and Anna Gelper, *International Finance: Law and Regulation* (Sweet & Maxwell 2012); Rosa María Lastra, *International Financial and Monetary Law* (Oxford University Press 2015).

¹²⁵ Hudson (n 22); Chisholm (n 25); Romano (n 25); Ligia Catherine Arias-Barrera, *Regulation and Supervision of the OTC Derivatives Market* (Routledge 2018); Balmer (n 61).

¹²⁶ Jo Braithwaite, 'Thirty Years of Ultra Vires: Local Authorities, National Courts and the Global Derivatives Markets' (2018) *Current Legal Problems* 369; Jo Braithwaite, 'OTC Derivatives, the Courts and Regulatory Reform' (2012) 7 *Capital Markets Law Journal* 364; Jo Braithwaite, 'Standard Form Contracts as Transnational Law: Evidence from the Derivatives Markets' (2012) 75 *Modern Law Review* 779.

¹²⁷ Lynn Stout, 'Why the Law Hates Speculators: Regulation and Private Ordering in the Market for OTC Derivatives' (1999) 48 *Duke Law Journal*; Stout (n 22); Stout (n 37); Dan Awrey, 'Toward a Supply-Side Theory of Financial Innovation' (2013) 41 *Journal of Comparative Economics* 401; Dan Awrey 'The Mechanisms of Derivatives Market Efficiency' (2016) 91 *New York University Law Review* 1104; Awrey (n 6); Yadav (n 79).

¹²⁸ Hester Pierce, 'Derivatives Clearinghouses: Clearing the Way to Failure' (2016) 64 *Cleveland State Law Review* 589; Mark Roe, 'Clearinghouse Overconfidence' (2013) 101 *California Law Review* 1641; Julia Lees Allen, 'Derivatives Clearinghouses and Systemic Risk: A Bankruptcy and Dodd-Frank Analysis' (2012) 64 *Stanford Law Review* 1079; Jo Braithwaite, 'The Dilemma of Client Clearing In The OTC Derivatives Markets' (2016) 17 *European Business Organization Law Review* 355; Michael Greenberger, 'Diversifying Clearinghouse Ownership in Order to Safeguard Free and Open Access to the Derivatives Clearing Market' (2013) 18 *Fordham Journal of Corporate and Financial Law* 245; Sean Griffith, 'Governing Systemic Risk: Towards a Governance Structure for Derivatives Clearinghouses' (2012) 61 *Emory Journal of Law* 1154; Stephen Lubben, 'Always Crashing in the Same Car—Clearinghouse Rescue in the United States under Dodd–Frank' (2017) 3 *Journal of Financial Regulation* 133.

¹²⁹ Donald Mackenzie, 'Is Economics Performative? Option Theory and the Construction of Derivatives Markets' (2006) 28 *Journal of the History of Economic Thought* 29; Hull (n 22).

clearing,¹³⁰ transparency in derivative markets,¹³¹ and derivatives trading.¹³² However, with the exception of a recent strand of literature, exploring the interaction of law and finance from non-conventional perspectives,¹³³ little literature outside the hegemonic orthodoxy of modern finance theory exists in legal academia on the construction of OTC-DMs, how they operate, why they collapse, and the implications these issues have for the regulation of these markets specifically, and financial markets generally. A reconception of the manner in which financial markets are perceived, and consequently regulated is therefore necessary in order to break the vicious cycle of financial crisis and subsequent regulatory action. In other words, to overcome our challenges, we have to understand our challenges, especially as the GFC has revealed that 'bad' theories can have very real and severely detrimental consequences.

In light of these facts, this thesis operating on the presumption that theory matters for the manner in which financial markets are regulated argues that it is pertinent not to consider the debate on the optimal regulation of financial markets settled. In this vein, this thesis attempts to shift the spotlight from the

¹³⁰ Darrell Duffie and Haoxiang Zhu, 'Does a Central Clearing Counterparty Reduce Counterparty Risk?' (2011) 1 *Review of Asset Pricing Studies* 74; Darrell Duffie and others, 'Central Clearing and Collateral Demand' (2015) 116 *Journal of Financial Economics* 237; Duffie and others (n 27); Craig Pirrong, 'The Inefficiency of Clearing Mandates' (2010) SSRN Electronic Journal; Craig Pirrong, 'Clearing and Collateral Mandates: A New Liquidity Trap?' (2012) 24 *Journal of Applied Corporate Finance* 67; Craig Pirrong, 'The Economics of Central Clearing: Theory and Practice' (2011) 1 ISDA Discussion Papers Series; Craig Pirrong, 'The Economics of Clearing in Derivatives Markets: Netting, Asymmetric Information, and the Sharing of Default Risks Through a Central Counterparty' (2010) SSRN Electronic Journal.

¹³¹ Marco Avellaneda and Rama Cont, 'Trade Transparency in OTC Equity Derivatives Markets' (2010) *Finance Concepts*; Mackenzie (n 129) 29.

¹³² European Central Bank, 'OTC Derivatives and Post-Trading Infrastructures' (2009) <http://www.ecb.europa.eu/pub/pdf/other/overthecounterderivatives200909en.pdf>; Guido Ferrarini and Paolo Saguato, 'Reforming Securities and Derivatives Trading in the EU: From Emir to Mifir' (2013) 13 *Journal of Corporate Law Studies* 319; Andreas Fleckner, 'The Regulation of Trading Practices' in Niamh Moloney and others (ed), *The Oxford Handbook of Financial Regulation* (Oxford University Press 2015); Peter Gomber and others, 'The Mifir Trading Obligation: Impact on Trading Volume and Liquidity' (2018) SSRN Electronic Journal.

¹³³ Emiliios Avgouleas, 'The Global Financial Crisis, Behavioural Finance and Financial Regulation: In Search of a New Orthodoxy' (2009) 9 *Journal of Corporate Law Studies* 23; Katharina Pistor, 'A Legal Theory of Finance' (2013) 41 *Journal of Comparative Law* 315; Simon Deakin, 'The Legal Theory of Finance: Implications for Methodology and Empirical Research' (2013) 41 *Journal of Comparative Economics* 338; David DeRosa, 'Sponsored Transactional Patterns: Comments on Mehrling's 'Essential Hybridity: A Money View of FX'' (2013) 41 *Journal of Comparative Economics* 364; Max Weber, 'Central Counterparties in the OTC Derivatives Market from the Perspective of the Legal Theory of Finance, Financial Market Stability and the Public Good' (2016) 17 *European Business Organization Law Review* 71; Awrey (n 109).

hegemonic theories of finance, which currently hold regulators and market participants alike in their thrall.

To do this, this thesis considers insights from alternative theories of finance which it suggests may yield superior strategies for the regulation of OTC-DMs specifically, and financial markets generally. Consequently, this thesis contributes to the academic debate and policy discussions on the regulation of financial markets by adding law to the economic analysis of financial markets and facilitating a fresh perspective on issues central to this debate. This thesis advocates an approach towards financial regulation that captures the nuances of endogenous risk which it argues is a result of the irrationality, fundamental uncertainty and conditions of imperfect knowledge endemic in real world financial markets and the economy at large. This approach is generated through the analysis and utilisation of insights from alternative theories of finance as an evaluative framework. Furthermore, this thesis analyses two aspects of the G20 reforms in OTC-DMs which have not been the subject of much research in academia namely the reporting obligation and the centralised trading requirement.

1.6. Structure of the Thesis

In light of the research questions outlined in Section 1.3, this thesis is divided into 7 chapters. This chapter has contextualised the background against which this thesis is predicated. It has provided an overview of derivatives, the various genus of derivatives, the markets in which these instruments are traded, and has briefly discussed the risks that these instruments pose. In addition, this chapter has laid out the research aims and methodology of this thesis.

Chapter 2 examines the effect that financial economics has on the manner in which we conceptualise and consequently regulate financial markets. To this end, Chapter 2 first argues that economics matters for financial markets. It subsequently examines seminal theories of modern finance as well as the regulatory implications of these theories and argues that these theories had a profound effect on the conceptualisation and regulation of pre-GFC OTC-DMs. This chapter then provides a detailed discussion of alternative theories of

finance which it argues are better suited for the regulation of real-world financial markets and outlines the regulatory implications of these theories.

Chapter 3 analyses the CCP prescription. It provides a brief outline of clearing and settlement in financial markets, and then proceeds to discuss CCPs and the risk mitigation mechanisms these market infrastructures utilise. Subsequently, this chapter provides a general overview of current regulation in relation to the CCP prescription itself, then proceeds to detail the scope of the CCP prescription, as well as regulatory prescriptions on extra territoriality. This chapter also analyses these reforms utilising alternative theories of finance as an evaluative framework, and investigates the effects that modern finance theory may have had on this reform. This analysis reveals several deficiencies present in regulatory utilisation of central clearing as a risk mitigation tool in OTC-DMs.

Proceeding from Chapter 3's examination of the CCP prescription, Chapter 4 explores the regulation of CCPs, an exploration that it argues is important as the mandated nature of clearing in OTC-DMs transforms the stability of CCPs into a priority on the global regulatory agenda. Utilising comparative and theoretical perspectives, it examines regulatory prescriptions on the manner in which CCPs operate and are accessed. First, it examines CCP authorisation, organisation, and corporate governance. This analysis reveals that irrationality, fundamental uncertainty and imperfect knowledge may engender agency costs and moral hazard. This chapter then turns its attention to regulatory prescriptions on CCP financial resources. This analysis yields crucial insights, which reveal that CCP financial resources may be insufficient in environments of financial stress. It subsequently examines regulatory prescriptions on client clearing and, consequently examines provisions on the segregation and portability of client collateral. This examination reveals that not only does client clearing increase the amount of complexity in the financial system, but that it may also increase moral hazard and adverse selection.

Chapter 5 turns this thesis's focus on another G20 mandate, that is, the reporting obligation. As the primary purpose of this mandate is illuminating previously opaque markets, this chapter first examines the role transparency

plays in financial markets, as well as the use of transparency as a regulatory tool. Having provided some context on transparency in the pre and post trade context, it then proceeds to examine the reporting obligation from an analytical, comparative and theoretical perspective. It argues that the ersatz transparency provided by the reporting obligation fails to achieve its purpose, which is the mitigation of systemic risk – a failure attributable to fundamental defects in assumptions by modern finance theory on the importance of information in financial markets. This chapter then turns its attention to regulatory prescriptions on counterparty, trade, and product identifiers given the key role these identifiers play in mitigating information costs, and their consequent promotion of transparency. It notes with some caveats that identifiers may go some way in promoting transparency. Finally, this chapter examines the regulation of trade repositories. Particular emphasis is placed on the public-private hybridisation engendered by regulatory reliance on trade repositories' tools. The chapter concludes with a synthesis of its various findings and makes a few recommendations.

Chapter 6 examines the last of the three major G20 mandates, that is, the centralised trading requirement. Prior to discussing the substantive aspects of EU and US implementation of this mandate, it sets the scene by discussing bilateral trading in OTC-DMs. It subsequently analyses the scope of the centralised trading requirement and notes that the centralised trading requirement subject to a few caveats may promote transparency and liquidity in good times but may prove to be of little utility in environments of financial stress. The chapter then turns its attention to the regulation of trading venues and highlights the failure of this regulation to account adequately for market fragmentation, innovation, and regulatory arbitrage. It further notes that the centralised trading requirement treats OTC derivatives like ordinary securities, an approach that may prove fatal in periods of crisis.

Having examined the three major G20 mandates, Chapter 7 concludes and attempts to synthesise general themes and regulatory challenges resulting from this thesis's analysis in preceding chapters. These themes highlight the fact that modern finance theory remains the dominant paradigm in OTC-DMs, with the production of information taking priority on regulatory agendas. Other

themes emerging from this thesis's analysis include the treatment of derivatives as securities, hybridity in regulatory approaches, and regulatory fragmentation. These themes highlight the need for regulatory approaches that discourage excessive speculation and leverage in OTC-DMs, promote global regulatory cooperation, decentralise information collection, and make provision for lender of last resort assistance. This chapter concludes the thesis with a brief outline of its authors' future research agenda, and a warning that current reforms may not succeed in mitigating systemic risk in OTC-DMs, and in fact, may do more harm than good.

Chapter Two: Synthesising a Normative Framework for the Regulation of Financial Markets

2.1. Introduction

The GFC and the economic turbulence generated in its wake has led to the questioning of the canonical foundations of Modern Finance Theory (MFT) particularly: Modigliani and Miller's capital structure irrelevancy theorem, portfolio selection theories, the rational expectations hypothesis and most crucially, the efficient markets hypothesis.¹ These doubts can be attributed to the deregulation of financial markets specifically the deregulation of over-the-counter derivative markets (OTC-DMs) that was informed by MFT's assumptions. These assumptions include perfect information, zero transaction costs, and rational market participants² which do not cohere with real world financial markets.³ This resulted in OTC-DMs being one of the factors most implicated in the build-up and amplification of the GFC.

Understanding this debate requires a thorough examination of the relevant theories underpinning our conceptualisation of financial markets. Consequently, this chapter in Section 2.2 examines the relevance of economics to financial markets. Concluding that economics shapes our conceptualisation of financial markets, this chapter then examines the evolution and tenets of MFT in Section 2.3. Subsequently, this chapter examines the effects of MFT in real world financial markets in Section 2.4. Critiques of MFT raise fundamental questions on the nature of financial markets, how they should be regulated and who should design and implement said regulation. Due to the failure of MFT as exemplified by the GFC, this chapter examines alternative theories of finance more suited to the operation and regulation of real-world financial markets namely: behavioural finance, Minsky's financial instability hypothesis, and Frydman and Goldberg's imperfect knowledge economics, as well as their regulatory implications in Section 2.5. Based on insights from these theories of finance, this chapter then

¹ These theories are discussed in detail in Section 2.3.

² Dan Awrey, 'Complexity, Innovation and the Regulation of Modern Financial Markets' (2012) 2 Harvard Business Law Review 295.

³ Discussed supra Section 1.1.

concludes by making general recommendations for the regulation of OTC-DMs in Section 2.6, which are followed by specific recommendations in subsequent chapters of this thesis.

2.2. Why does Economics Matter in Financial Markets?

Callon posits that economics does not passively observe the economy's structure but instead, actively moulds, performs, and formats it.⁴ Consequently, economics is an integral part of the broad infrastructure of modern financial markets. Callon understands economics in this sense to mean 'all activities whether academic or not... aimed at understanding, analysing and equipping markets.'⁵ In other words, economics as an academic discipline is endogenous to economic processes.⁶ This idea has been dubbed the 'performativity of economics.'⁷

The term 'performativity' was coined by Austin who deemed it essential to separate active utterances from utterances that were merely descriptive.⁸ For Austin, a performative statement was 'one that established its referent through the very act of uttering.'⁹ Mackenzie questions what it means for economics to be performative deeming it an issue significantly more complex than the examination of individual utterances.¹⁰ Mackenzie further posits that economic performativity exists on four levels. Generic performativity is the lowest level of performativity and involves the use of an aspect of economics not just in academia but also in the real world.¹¹ The test of the existence of this level of

⁴ Michel Callon, *Laws of the Markets* (Wiley 1998) 2.

⁵ Michel Callon, 'Why virtualism paves the way to political impotence: A Reply to Daniel Miller's Critique of the Laws of the Markets' (2005) 6(2) *Economic Sociology: European Electronic Newsletter* 3-20.

⁶ Donald MacKenzie, *An Engine, not a Camera: How Financial Models Shape Markets* (MIT Press 2006) 16.

⁷ *Ibid.*

⁸ L. Austin and others, *Philosophical Papers* (third edn, Oxford University Press 1970) 235.

⁹ Lucia Siu and others, *Do Economists Make Markets? On the Performativity of Economics* (Princeton University Press 2008) 3.

¹⁰ Mackenzie (n 6).

¹¹ By market participants, policy makers, and regulators.

performativity involves observing whether economics is employed in the process in question.¹²

The next form of performativity, effective performativity requires that the use of an aspect of economics make an actual difference. Observation in this case does not satisfy the test to establish effective performativity, as while the application of economics in economics processes may be observed, there is the possibility that it is a façade and the process would have been the same without it.¹³ The ideal test for effective performativity is a comparison of economic processes with and without the use of the allegedly applied aspect of economics. However, this test is problematic as in general, the use of economics in various economic processes is not uniform and the various processes differ in several aspects. Furthermore, elements of conjecture and the exercise of individual judgment are required to determine whether or not the use of economics has made a difference in economic processes.¹⁴

The third form of performativity is termed ‘barnesian performativity’ by Mackenzie¹⁵ who theorises that it occurs where, the use of an aspect of economics alters the end result of an economic process to better conform to the aspect of economics.¹⁶ Detecting barnesian performativity can be accomplished by comparing market conditions before the widespread adoption of the aspect of economics being examined.¹⁷ Where market conditions substantially correspond with the aspect of economics, this evidence is congruous with barnesian performativity but does not constitute conclusive proof as there may be other factors unrelated to barnesian performativity that could have resulted in the change. This makes the detection

¹² Mackenzie (n 6) 18. Mackenzie however cautions that what must be observed to determine whether generic performativity is present is whether the processes in question incorporates economic processes and not only the representations of the participants.

¹³ Ibid. Mackenzie gives by way of illustration Mirowski and others’ investigations of the use of game theory in the auctions of the communication spectrum in the United States (US), see Phillip Mirowski and others, ‘Markets Made Flesh: Callon, Performativity and a Crisis in Science Studies Augmented with Consideration of the FCC Auctions’ in Lucia Siu and others, *Do Economists make Markets? On the Performativity of Economics* (Princeton University Press 2008) 190.

¹⁴ Mackenzie (n 6) 18.

¹⁵ Named after sociologist Barry Barnes who stressed the importance of self-validating feedback loops in social life. Ibid 19.

¹⁶ Ibid.

¹⁷ Ibid.

of barnesian performativity a complex issue.¹⁸ Finally, the existence of barnesian performativity gives weight to an assumption in favour of a converse position, that the practical use of an aspect of economics in an economic process alters economic processes so that they conform less to the aforementioned aspect of economics; this is called counter-performativity.¹⁹

2.3. Modern Finance Theory

The above discussion on the performativity of economics leads to the question: has the application of theories of economics and finance in the design of the conceptual frameworks underpinning the regulation of financial markets led financial markets to greater congruence with economic theory or conversely, has said application impaired market conditions, processes and price patterns? If the former is the case, then a process for shaping financial markets has been identified and needs to be explored fully. However, if the latter is the case, there may be significant danger where reality exists independent of theory. In order to answer this question, this section explores theories of economics and finance that it argues were performative in financial markets particularly in connection with OTC-DMs in the US pre-GFC. OTC-DMs in the US are particularly relevant due to the fact that the intellectual origins of MFT and the GFC can be traced to them.²⁰

2.3.1. Efficient Markets Hypothesis

The distinctive centrepiece of MFT,²¹ and the foundation on which other canonical theories were built,²² Fama in his seminal statement of this hypothesis describes an efficient market as one where the price of a security fully reflects all available information.²³ Fama then posits that real world

¹⁸ These factors include political and social changes.

¹⁹ Mackenzie (n 6). Mackenzie notes that while this concept is not explicitly discussed in Callons work, it can be construed as what Callon calls 'over-flow' and is deserving of special attention. See further Callon (n 4) 18.

²⁰ Dan Awrey, 'The FSA, Integrated Regulation, and the Curious Case of OTC Derivatives' (2012) 13 University of Pennsylvania Journal of Business Law 34.

²¹ Andrei Shleifer, *Inefficient Markets: An introduction to Behavioral Finance* (Oxford University Press, USA 2000) 1.

²² Including theories of portfolio selection, Modigliani and Millers' Theorem, and the Black-Scholes-Merton model.

²³ Eugene Fama, 'Efficient capital markets: A Review of Theory and Empirical Work' (1970) 25 The Journal of Finance 383.

financial markets are actually efficient, a proposition described as ‘dazzling’ by Shleifer.²⁴ The efficient markets hypothesis (EMH) has enjoyed an enormous amount of theoretical and empirical success with Michael Jensen declaring that ‘there is no other proposition in economics which has more solid empirical evidence supporting it than the EMH.’²⁵ However, before proceeding any further it is necessary to investigate the intellectual origins of this juggernaut in order to fully understand its tenets.

a. A Random Walk

In his 1900 paper, Bachelier hypothesised that past, present, and discounted future events were incorporated into the price of securities by modelling the stochastic process now called ‘Brownian motion.’²⁶ A feat unique for its time due to its application of advanced mathematics to finance - specifically to the various problems in the theory of options.²⁷ Unfortunately, Bachelier’s work and the insights it provided were largely ignored until the 1950s. However, independent research producing empirical observations corroborating Bachelier’s work was already taking place. For instance, in 1933, Cowles analysing thousands of stock selections made by investment professionals found that there was no apparent evidence of any capacity to beat the market.²⁸ In addition, empirical research in 1934²⁹ and 1937³⁰ found that the prices of stocks fluctuate randomly.

Subsequently, the random walk model was increasingly applied to price series whose successive returns were not serially correlated. The first of these

²⁴ Shleifer (n 21) 1.

²⁵ Michael Jensen, ‘Some Anomalous Evidence Regarding Market Efficiency’ (1978) 6 *Journal of Financial Economics* 95.

²⁶ Brownian motion is the irregular movement exhibited by particles introduced into a colloidal suspension. This movement is a result of the particles’ collisions with the rapidly moving atoms or molecules of the colloidal suspension. See further, Richard Feynman and others, *The Feynman Lectures on Physics* (3rd edn, Addison-Wesley Educational Publishers 1970).

²⁷ Louis Bachelier, ‘Theorie de la Speculation’ (1900) 17 *Annales Scientifiques de l’Ecole Normale Supérieure*, third series 21. For a translation, see Louis Bachelier, ‘Theory of Speculation’ in Paul Cootner (ed), *The Random Character of Stock Market Prices* (MIT Press 1964).

²⁸ Alfred Cowles, ‘Can Stock Market Forecasters Forecast?’ (1933) 1(3) *Econometrica* 309; ‘Stock Market Forecasting’ (1944) 12(3/4) *Econometrica* 206.

²⁹ Holbrook Working, ‘A Random-Difference Series for Use in the Analysis of Time Series’ (1934) 29(185) *Journal of the American Statistical Association* 11.

³⁰ Alfred Cowles and Herbert Jones, ‘Some a Posteriori Probabilities in Stock Market Action’ (1937) 5(3) *Econometrica* 280.

empirical studies was conducted in 1953 by Kendall analysing 22 price series at weekly intervals looking for ‘serial correlation.’ His results indicated very low levels of correlation, and where such a correlation was present, its weakness precluded any possibility of use in prediction.³¹ Kendall then concludes that if his findings are indeed representative of real-life stock markets, then what looked like purposeful movement in an economic time series was nothing more than a ‘kind of economic Brownian motion.’ This rendered any ‘trends or cycles’ observed in the series ‘illusory.’³² In 1965, Fama’s doctoral dissertation was published in its entirety in the *Journal of Business*. Fama reviewed the current literature on stock market trends and concluded that there was strong evidence supporting the assertion that stock markets followed a random walk.³³

b. Market Efficiency

Unfortunately, no formal understanding of the implications of these empirical findings existed at the time. While they corroborated the random walk model of stock returns, the economic implications of these results were not understood until the 1965 work of Samuelson. Samuelson’s insight into price formation in competitive markets led to the view that the random walk model was congruent with EMH was published.

In 1965, Samuelson published his seminal paper: ‘Proof that Properly Anticipated Prices Fluctuate Randomly’³⁴ in which he put forward the first economic argument for efficient markets. This argument was to the effect that in a market that was informationally efficient, all information available to market participants was incorporated into price.³⁵ He then went on to demonstrate that an efficient market generated a martingale memoryless property reminiscent

³¹ M. Kendall, ‘The Analysis Of Economic Time-Series-Part I: Prices’ (1953) 116(1) *Journal of the Royal Statistical Society* 18; Harry Roberts, ‘Stock-Market ‘Patterns’ and Financial Analysis: Methodological Suggestions’ (1959) 14(1) *The Journal of Finance* 1.

³² Kendall (n 31) 18.

³³ Eugene Fama, ‘The Behavior of Stock-Market Prices’ (1965) 38(1) *The Journal of Business* 34.

³⁴ Paul Samuelson, ‘Proof that Properly Anticipated Prices Fluctuate Randomly’ (1965) 6(2) *Industrial Management Review* 41.

³⁵ *Ibid* 42.

of a random walk.³⁶ The importance of Samuelson's work lay in his mathematical formalisation of the implications of arbitrage as well as the concept of the incorporation of all information regarding a security into its price by the market. Followed by his conclusion that any leftover disparity in price followed some sort of random walk. Samuelson's 'no arbitrage' paradigm is to the effect that self-interested investors individually use any information they can obtain to their advantage with the implication being that all arbitrage opportunities are eliminated leaving the ability to move prices to random unpredictable events.³⁷

The fact that a discernible pattern in financial markets could not be extrapolated from past price movements gave rise to the presumption that financial markets could be understood as reaching equilibrium outcomes. The separation of past and present prices and the pronounced lack of arbitrage opportunities gave rise to a presumption in favour of stable equilibria.³⁸ It should however be noted that Samuelson warned about reading too much into this hypothesis noting that:

'One should not read too much into the established theorem. It does not prove that actual competitive markets work well. It does not say that speculation is a good thing or that the randomness of price changes should be a good thing. It does not prove that anyone who makes money in speculation is ipso facto deserving of the gains or even that he has accomplished something good for society or for anyone but himself. All or none of these may be true but that would require a different investigation.'³⁹

While Samuelson was slightly sceptical about the exact implications of the information content of prices, those who came after him proselytised an expanded version of EMH with great ardour and conviction and successfully

³⁶ Therefore, departing from the classic random walk as posited by Einstein. That is, molecules colliding with each other from all angles.

³⁷ Samuelson (n 34) 44.

³⁸ Katharina Pistor, 'On the Theoretical Foundations for Regulating Financial Markets' (2012) SSRN Electronic Journal 9.

³⁹ Samuelson (n 34) 48.

added greater gradation to the definition of efficiency. Building on Samuelson's microeconomic approach, Fama eschewed the esoteric mathematics of Samuelson's informational properties for simple ideas that could be more widely understood. In what is undoubtedly the most prolific paper on the EMH: 'Efficient Markets: A Review of Theory and Empirical Work'⁴⁰ Fama synthesised existing work, defining an efficient market as one in which security prices fully reflected all available information.⁴¹ Fama then classified market efficiency into three forms namely weak form efficiency, semi-strong form efficiency, and strong form efficiency.

In weak form efficiency, prices fully reflect information that can be implied from past prices. Past returns and trading data cannot be used to anticipate future prices,⁴² therefore precluding technical analysis. Semi-strong form efficiency asserts that all relevant publicly available information about economic fundamentals is incorporated into the price of a security.⁴³ This nullifies both technical and fundamental analysis as it is impossible for an investor in this instance to beat the market when trading on publicly available information. The distinction between weak form and semi-strong efficiency is that while it is practically costless to observe public market data as is the case in weak form efficiency, a high level of fundamental analysis has to be undertaken if prices are to fully reflect all publicly available information. Strong form efficiency is the most demanding as it asserts that all information known to any market participants whether public or private has been fully incorporated into the price of a publicly held security.⁴⁴ With this form of efficiency only being limited by institutional constraints or difficulty in accessing capital.

c. Opposition to EMH

EMH has been criticised on various grounds with its major criticisms being: first, that the idea of a competitive equilibrium does not cohere with EMH. Second, that the market for information does not work perfectly. Third,

⁴⁰ Fama (n 23).

⁴¹ *ibid* 383.

⁴² *ibid* 389.

⁴³ *ibid* 404.

⁴⁴ *ibid* 409.

empirical evidence also indicates that financial markets do not necessarily follow the tenets of EMH. These criticisms are examined below.

i. Failure of a Competitive Equilibrium

In 1977, Beja identified a potential imperfection of the EMH arguing that actual efficiency is impossible in real markets. Market efficiency is predicated on the assumption that all market participants are small which leads to the conclusion that an agent with private information only has a negligible effect on price if said market participant is to remain small relative to the market. However, where an agent has enough capital to conduct trades that capitalise entirely on private information its relatively small size to the market is violated.⁴⁵

Additionally, where it is assumed that the market process is consistent with rational agents all of whom can view the trades of others but not what information they hold, and an auctioneer orchestrates trades at an equilibrium; it can safely be concluded that any private information is almost immediately incorporated into the market price. Therefore, a change in a security's price signals new information with an efficiency that makes it impossible to earn profits through speculation with the implication that the price fully incorporates new information but not through the corrective mechanism of arbitrage.

ii. Failure in the Market for Information

In 1976, Grossman identified an informational paradox in EMH as informationally efficient systems in aggregating diverse information perfectly eliminate the private incentive to seek out information.⁴⁶ In 1979, Harrison and Kreps introduced the 'no trade theorem' which posits that while under the economic idea of gains of trade, due to differences in individual preferences, income, commodities, and resources; a traded good or service is typically more valuable to the demand side, while on the supply side, the good is valued

⁴⁵ Avraham Beja, 'The Limits of Price Information in Market Processes' (1977) No 61 Research Program in Finance Working Papers, University of California at Berkeley; Paul Milgrom and Nancy Stokey, 'Information, Trade and Common Knowledge' (1982) 26(1) Journal of Economic Theory 17.

⁴⁶ Sanford Grossman, 'On the Efficiency of Competitive Stock Markets where Trades have Diverse Information' (1976) 31(2) The Journal of Finance 573.

at an amount lower than its price.⁴⁷ Consequently, each trader⁴⁸ has a gain of trade termed the consumer or producer's surplus as appropriate.

This is however not the case in financial markets as in complete financial markets market participants on both the demand and the supply side should assign equal values to the asset. Furthermore, due to the absence of informational differentials in informationally efficient markets, there should be no differentials in equilibrium. This implies that there should be no equilibrium unless differences are inserted into the model or financial traders are assumed to be heterogeneous.⁴⁹ This model leads to the presumption that any heterogeneities would be quickly resolved. Operating on the fact that only an immensely and rapidly evolving informational landscape could trigger the billions of trades that occur daily in financial markets, it can be inferred that all traders are of the opinion that the prices prescribed by the efficient markets are incorrect; which begs the question of whether trades are irrational as opposed to driven by rational arbitrageurs.⁵⁰

Finally, in 1980 Grossman and Stiglitz defined the problem Grossman had identified in his 1976 paper⁵¹ in clear and precise terms. Gathering information for the purpose of making profit is expensive and where a competitive equilibrium awards the same returns to both public and private holders of information, then those who actively seek information perform a positive externality attributable to their contribution to market efficiency and discipline. This however results in an inability on the part of market participants to obtain full returns on their investment in information. Grossman and Stiglitz observe that this in itself is a form of market failure as it discourages and might even totally prevent investment in price sensitive information with the consequence of market efficiency becoming unattainable.⁵²

⁴⁷ Michael Harrison and David Kreps, 'Martingales and Arbitrage in Multiperiod Securities Markets' (1979) 20(3) *Journal of Economic Theory* 381.

⁴⁸ Perhaps, with the exception of the marginal trader.

⁴⁹ Harrison and Kreps (n 47) 387.

⁵⁰ *Ibid* 401.

⁵¹ Grossman (n 46).

⁵² Sanford Grossman and Joseph Stiglitz, 'On the Impossibility of Informationally Efficient Markets' (1980) 31(2) *The American Economic Review* 393.

iii. Empirical Challenges

Several studies have been published which demonstrate glaring inconsistencies between observed market returns or market volatility and the tenets of EMH. One of the first of such studies was carried out by Shiller in 1979 and showed that the volatility of long-term interest rates were greater than EMH had predicted.⁵³ Two years later, Shiller demonstrated that stock prices tended to overshoot to an extent that could not be justified as a rational response to dividend announcements.⁵⁴ In 1988, Lo and MacKinlay developed the variance ratio test. This test operated on the premise that where the random walk was accurate, the ratio predicted by the random walk methodology would be maintained by the logarithm of price changes for weekly or monthly changes.⁵⁵ This methodology provided Lo and MacKinlay with compelling evidence that the market did not follow random walks. In 1990, Laffont and Maskin demonstrated that EMH may fail in conditions of imperfect competition.⁵⁶ Reversals and strong evidence of predictable behaviour in security returns have also led to the rejection of EMH.⁵⁷ Corroboratively, in 2010 Lee and others, analysing the variance of stock prices in 58 countries over a period of eight years find that stock markets cannot be said to be efficient.⁵⁸

d. Conclusion on EMH

To summarise, EMH developed from the notion that security prices follow a random walk and hypothesises that all relevant information is incorporated into

⁵³ Robert Shiller, 'The Volatility of Long-Term Interest Rates and Expectations Models of the Term Structure' (1979) 87(6) *Journal of Political Economy* 1190.

⁵⁴ Robert Shiller, 'Do Stock Prices Move too much to be Justified by Subsequent Changes in Dividends?' (1981) 71(3) *The American Economic Review*, 421; Werner De Bondt and Richard Thaler, 'Does the Stock Market Overreact?' (1985) 40(3) *The Journal of Finance* 793; James Poterba and Lawrence Summers, 'Mean Reversion in Stock Prices' (1988) 22(1) *Journal of Financial Economics* 27.

⁵⁵ Andrew Lo and Craig MacKinlay, 'Stock Market Prices do not Follow Random Walks: Evidence from a Simple Specification Test' (1988) 1(1) *Review of Financial Studies* 41.

⁵⁶ Jean-Jacques Laffont and Eric Maskin, 'The Efficient Market Hypothesis and Insider Trading on the Stock Market' (1990) 98(1) *Journal of Political Economy* 70.

⁵⁷ See Narasimha Jegadeesh, 'Evidence of Predictable Behavior of Security Returns' (1990) 45(3) *The Journal of Finance* 881; Bruce Lehmann, 'Fads, Martingales, and Market Efficiency' (1990) 105(1) *The Quarterly Journal of Economics* 1.

⁵⁸ Chien-Chiang Lee and Jun-De Lee, 'Stock prices and the Efficient Market Hypothesis: Evidence from a Panel Stationary Test with Structural Breaks' (2010) 22(1) *Japan and the World Economy* 49.

the price of a security. EMH has however been criticised in three major areas namely: the failure of a competitive equilibrium, failure in the market for information and finally, EMH has been criticised by empirical studies which show that real world financial markets do not adhere to the tenets of EMH. Having examined this foundational theory, this chapter in the next section examines the rational expectations hypothesis which is central to the operation of MFT generally and EMH in particular.

2.3.2. Rational Expectations Hypothesis

Often mistaken for a school of economic thought, the rational expectations hypothesis (REH) is actually an ubiquitous modelling method employed in most spheres of economics. At the time of REH's development, the development of accurate models was dependent on the development of quantitative knowledge on how expectations of crucial economic variables were formulated.⁵⁹ Unfortunately, there was no general hypothesis on how expectations were formed at that time.⁶⁰

Recognising this problem, Muth in his seminal 1961 paper 'Rational Expectations and the Theory of Price Movements'⁶¹ put forward his REH. Muth argued that while it is not essential that individuals possess homogenous expectations, their expectations should however be distributed around the true anticipated value of the variable to be predicted. Consequently, the average of individual predictions should be the anticipated value of the true variable despite differences in individual beliefs.⁶² Basically, Muth's idea is that a highly educated economist's prediction is no better than that of the common man.⁶³ Assuming rational expectations infers that while agent's expectations may be incorrect over a period of time, they are correct on average. Consequently, while the future cannot be fully predicted, it is assumed that agent's expectations of economic variables are formed using all relevant information and free from systematic biases. In other words, under REH, agents in a model

⁵⁹ Steven Sheffrin, *Rational Expectations* (Cambridge University Press 1983) 4.

⁶⁰ *ibid* 4. Nor is there one today.

⁶¹ John Muth, 'Rational Expectations and the Theory of Price Movements' (1961) 29(3) *Econometrica* 315.

⁶² *ibid* 316.

⁶³ Deirdre McCloskey, *The Rhetoric of Economics* (2nd edn, University of Wisconsin Press 1998) 53.

generally assume that the assumptions of the model are valid. In response to economists who were of the opinion that theories of rational behaviour do not adequately explain observable phenomena,⁶⁴ Muth argues that not enough rationality was assumed by economics. A rationality that could be ensured by an insistence on consistency in the expectations of economic actors and the models used to explain their behaviour.⁶⁵

In the field of finance, REH is the cornerstone of EMH. From the perspective of arbitrage, incorporating the assumption that all that is needed to ensure the continuity of a vibrant price system, are a few individuals who respond to price signals into REH leads to the conclusion that if there is any profit to be made from collecting and examining information in order to predict future prices, a number of individuals will pursue this strategy and where a number of individuals pursue arbitrage, markets will act as if they are rational despite the fact that several individuals in the market are passive.⁶⁶ This creates the inference that REH is particularly suited to application in financial markets in which arbitrage is assumed to be relatively costless. EMH uses REH to reach the conclusion that with proper adjustments made for discounting and returns, changes in security prices follow a random walk. This is based on the reasoning that in their attempts to predict future security price, rational investors search for information including patterns in past security prices.

Investing in securities has been described as a 'fair game,'⁶⁷ which implies that to beat the market, a market participant has to possess an informational advantage. In essence, today's security price reflects the expectations of investors upon their receipt of all available information with the consequence of this mechanism being that investor's expectations of future events are the only factors that change tomorrow's price. Consequently, security prices adapt until they reach a level at which their expected returns adjusted for risk are equal for all securities. The achievement of equilibrium of expected returns

⁶⁴ See for example Herbert Simon, 'Theories of Decision-Making in Economics and Behavioral Science' (1959) 49(3) *The American Economic Review* 253.

⁶⁵ Muth (n 61) 316.

⁶⁶ Sheffrin (n 59) 11.

⁶⁷ Samuelson (n 34) 42.

become built into the price of the security. That is, the price of securities adjusts to reflect the market's best forecast of the future price. As a result, the only factors that can affect the price of a security are random factors, which cannot be predicted in advance.

To summarise, the REH assumes that economic agents are rational and use all available information when making economic decisions. REH forms the foundation for most microeconomic and macroeconomic theories and models as it hypothesises that economic agents assume that the assumptions of the particular economic model or theory are valid. Having examined this foundational aspect of MFT, this chapter in the subsequent sections examines other canonical theories of MFT.

2.3.3. The Modigliani and Miller Capital Irrelevancy Theorem

Proposed by Modigliani and Miller in a 1958 paper called 'The Cost of Capital, Corporation Finance and the Theory of Investment',⁶⁸ this theorem posits that in a 'perfect market' neither a company's total market value⁶⁹ nor its average cost of capital⁷⁰ is affected by its capital structure.⁷¹ In a second paper published in 1961, Modigliani and Miller argue that the the manner in which the proceeds of a corporation's assets are arranged for disbursement to investors is irrelevant.⁷² High dividends diminish investor's capital gains while conversely, low dividends mean higher capital gains. Proceeding on the assumption that a firm's substantive activities remain unchanged, Miller and Modigliani argued that a change in the dividend policy of a company would only affect 'the distribution of the total return in any period as between dividends and capital gains.'⁷³

⁶⁸ Franco Modigliani and Merton Miller, 'The Cost of Capital, Corporation Finance and the Theory of Investment' (1958) 48(3) American Economic Review 261.

⁶⁹ The total market value of its stocks and bonds.

⁷⁰ Modigliani and Miller define a firm's average cost of capital as 'the ratio of its expected return to the total market value of all its securities.' Modigliani and Miller (n 68) 286

⁷¹ Ibid.

⁷² Merton Miller and Franco Modigliani, 'Dividend policy, growth, and the valuation of shares' (1961) 34(4) The Journal of Business 414.

⁷³ Ibid 425.

Prior to Modigliani and Miller's claims, bonds were viewed as a much safer investment than stocks while conversely, taking on too much debt implied that a company was very risky. An optimum balance would therefore have to be struck between the issuing of debt and the issuing of stock. This balance was dependent on investors risk appetites and 'psychological and institutional pressures'⁷⁴ placed on investors at the time. Modigliani and Miller however sought to dispel these behavioral and institutional issues by suggesting that the two investments are perfect substitutes for each other.⁷⁵ The only assumption made about the investor is about his preference for more wealth as opposed to less.⁷⁶ The exchange of the expensive asset for the cheaper is more advantageous to the investor independent of his risk appetite.

Modigliani and Miller's theorem is based on the assumption of perfect markets. These assumptions include: (i) no buyer or seller of securities could be large enough to have a significant impact on the price of securities, (ii) information on the prevalent price and other pertinent features of securities is costless and readily available for market traders, (iii) no transaction costs are incurred in the buying, selling, and issuance of securities and, (iv) no distinction is made tax wise in relation to distributed and undistributed profits or between dividends and capital gains.⁷⁷

Having established the irrelevancy of capital structure, Modigliani and Miller then launched an inquiry into the effects of reality on their hypothesis but disagreed as to exactly how far they could go in calibrating their perfect world into corresponding better with reality with Modigliani being more cautious and Miller prepared to set aside the question of how valid their assumptions were. The Modigliani and Miller theorem has however been criticised as investors are often precluded from taking advantage of arbitrage opportunities due to insufficient funds. Some investors are also deterred from buying certain securities either by law or as a result of personal circumstance, taxation, or

⁷⁴ Modigliani and Miller (n 68) 279.

⁷⁵ Franco Modigliani and Merton Miller, 'The Cost of Capital, Corporation Finance, and the Theory of Investment: Reply.' (1959) 49 American Economic Review 655.

⁷⁶ Therefore excluding assumptions on risk preferences, psychological or institutional matters. Modigliani and Miller (n 68) 269.

⁷⁷ Miller and Modigliani (n 72) 412.

bias. These constricted investors ⁷⁸ consequently bid for high-grade investments without considering the yield differentials or appeal of lower grade investments. These constrained investors also possess enough funds to ensure that yield differentials are constantly well above risk differentials. This results in a type of super premium for safety which can be exploited by corporation management through the constant issuance of as many bonds as can be maintained at a high rating grade.⁷⁹ Despite these criticisms, this theorem has been seminal in financial markets, and resulted in the normalisation of high leverage levels.

2.3.4. Modern Portfolio Theory

Prior to the development of modern portfolio theory (MPT), portfolios were perceived very differently. William's 1938 book titled 'The Theory of Investment Value'⁸⁰ perfectly captured sentiments on portfolio management at that time in its 'dividend discount model' which states that the goal of most investors should be finding a good stock and buying it at the best price with the value of a company's stock conceptualised as an entitlement to future streams of dividends.⁸¹ However, it is not possible to calculate future dividends in order to reach the optimal price for a corporation's stock partly due to the effect of inflation. Even in the absence of inflation, the value of a dollar received a year before is different from the value of a dollar received a year later as the former can be invested. Consequently, to work out the value of a stock, the value of that stock had to be calculated by reference to a relevant interest rate, ergo the name 'dividend discount model.' Inspired by the fact that no consideration was given to the role risk played in portfolio selection, Markowitz's seminal 1952 article 'Portfolio Selection'⁸² explains how investment returns can be optimised. Markowitz formulated the portfolio selection problem as one of finding the portfolio that was the most 'efficient' that is one that offered the least risk for a provided minimum expected rate of return or the highest level

⁷⁸ For example, all banks and insurance companies

⁷⁹ David Durand, 'Costs of debt and equity funds for business: Trends and problems of measurement' (2007) <http://www.nber.org/chapters/c4790.pdf>.

⁸⁰ John Williams, *The Theory of Investment Value* (Harvard University Press 1938).

⁸¹ *ibid* 55. A position contrary to the postulations of Modigliani and Millers Theorem.

⁸² Harry Markowitz, 'Portfolio Selection' (1952) 7(1) *The Journal of Finance* 77.

of return for a provided maximum level of risk. A Markowitz efficient frontier is the set of all portfolios that will give the highest expected return for each provided level of risk. Markowitz's 1952 paper is described as the forerunner in the new epoch in finance and the mathematical and model-building revolution.⁸³

In summary, the importance of Markowitz's theory was that it demonstrated how to quantify the risk of several securities and combine these securities in a portfolio to get the maximum return for a given risk. An investor could consider how a security interacted with other securities. In addition, considering these interactions resulted in the ability to select a portfolio that gave the same return for less risk than portfolios that ignored the interactions between securities.⁸⁴ Markowitz's theory was also instrumental in the development of the capital assets pricing model (CAPM) discussed in this chapter's next section.

2.3.5. Capital Assets Pricing Model

While in a technical sense, all asset-pricing models are capital asset pricing models, the moniker 'capital assets pricing model' (CAPM) is reserved exclusively by the finance profession for the CAPM of Sharpe,⁸⁵ Linter,⁸⁶ Treynor,⁸⁷ and Black.⁸⁸ CAPM provides a systematic account of the risk premium demanded by investors in return for investing in a risky asset and provides a framework for understanding the effect an investment's risk on its expected return. CAPM dictates that not all risks should affect the price of an asset. Risks that can be diversified away when combined with other

⁸³ Robert Kavesh, 'The American Finance Association: 1939-1969' (1970) 25(1) *The Journal of Finance* 5.

⁸⁴ Edwin Elton and Martin Gruber, 'Modern Portfolio Theory, 1950 to Date' (1997) 21 *Journal of Banking & Finance* 1745.

⁸⁵ William Sharpe, 'Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk' (1964) 19(3) *The Journal of Finance* 425.

⁸⁶ John Lintner, 'The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets' (1965) 47(1) *The Review of Economics and Statistics* 13.

⁸⁷ Jack Treynor, *Treynor on Institutional Investing* (Wiley, John & Sons 2007).

⁸⁸ Fischer Black, 'Capital Market Equilibrium with Restricted Borrowing' (1972) 45(3) *The Journal of Business* 444.

investments held in a portfolio are not dangerous. CAPM consequently provides some guidance as to what type of risk affects return.

CAPM turns MPT's algebraic condition on asset weights in mean-variance-efficient portfolios into a testable prediction about the relationship between risk and expected return by identifying portfolios that have to be efficient if asset prices are to clear the market of all assets.⁸⁹ To determine a portfolio that is mean-variance-efficient, Sharpe and Linter introduce two critical assumptions. The first being complete agreement by investors on the distribution from which the returns used to test the models are drawn. The second assumption is that there is borrowing and lending at a risk free rate, which is uniform for all investors and is independent of the amount borrowed or lent.

In simple terms, the conclusion can be drawn from CAPM that an individual combination of risky assets fits into all investors' portfolios. Investors interested in high rates of return hold portfolios with a substantial amount of risky assets while conversely those who want low rates of return hold portfolios heavily weighted with riskless assets. Risk that cannot be diversified away by combining assets is known as 'beta.'⁹⁰ Therefore, the return on a portfolio which is in excess of a riskless return should be beta multiplied by the excess return of the market. It should however be noted that a cursory perusal of various portfolios in the market contradicts CAPM's assumption that investors hold the same portfolio of risky assets. This has been described as being unsurprising as taxes alone can trigger idiosyncratic investor behaviour.⁹¹ The prevalence of suboptimal diversification has been attributed to the expense of diversification,⁹² behavioural biases, and lack of sophistication.⁹³

⁸⁹ Eugene Fama and Kenneth French, 'The Capital Asset Pricing Model: Theory and Evidence' (2004) 18(3) *Journal of Economic Perspectives* 25.

⁹⁰ Sharpe (n 85) 436.

⁹¹ André Perold, 'The Capital Asset Pricing Model' (2004) 18(3) *Journal of Economic Perspectives* 3 18; George Constantinides, 'Capital Market Equilibrium with Personal Tax' (1983) 51(3) *Econometrica* 611.

⁹² *Ibid* 19.

⁹³ *ibid*.

2.3.6. The Black Scholes Merton Model

The first mathematically advanced investigation of options was performed by Louis Bachelier.⁹⁴ Unfortunately, there was little theoretical interest in this topic until the late 1950's and 1960's when as has been highlighted in Section 2.3.1 of this thesis, an amended version of Bachelier's random walk (the log-normal random walk) became the standard in the field of financial economics. Theoretical interest included expanding the model to understanding the pricing of options.⁹⁵ This sudden interest in options was not born of their importance as financial instruments.⁹⁶ Interest was instead focused on warrants a type of call option traded on liquid, coordinated markets. A warrant grants its holder the right to buy stock of a corporation at a predetermined price. Warrants are issued by corporations and upon their exercise, the corporation creates new stock which it allots to the warrant holder. Conversely, call options are issued by traders or investor and when the option right is exercised, the option writers who will ordinarily be in possession of the stock or buy it from the market supplies the option holder with the stock.

This interest in warrants itself was a means to an end as the development of a theory of options and warrant pricing was viewed an avenue for expanding the random-walk model of stock prices. Armed with a clear-cut mathematical model of stock price fluctuation, it was believed that all that had to be done was some comparatively simple mathematical analysis to create a formula determining the expected value of a warrant or option. This formula could then possibly be reverse engineered from the destination of option or warrant prices to investors' expectations about the movement of stock prices. The researcher whose work reflected this approach the most was Sprenkle. Using the log-normal model of stock price movements he argued that the expected value would be the value of a warrant to an investor if the investor was risk neutral.⁹⁷ Warrants and other options are generally more risky than the underlying stock

⁹⁴ Bachelier (n 27)

⁹⁵ Paul Cootner, *The Random Character of Stock Market Prices* (M.I.T. Press 1964).

⁹⁶ At the time, due to the Great Crash of 1929, options were viewed with hostility due to the blame attributed to them for the misdeeds committed in the 1920's.

⁹⁷ A risk investment is only worth the value of its payoff to a risk neutral investor.

due to the use of leverage.⁹⁸ Previous research was however deficient as it is difficult to gauge the correct discount rate to be used in calculating the payoff of an option. Black, Scholes, and Merton however solved this problem by presenting an elegant model that could be used for the pricing of European options.⁹⁹ Following in the footsteps of Bachelier, the Black Scholes Merton model provides the change of a stock price as a lognormal random walk, and dispenses with the need for a discount rate by utilising the CAPM to determine the correlation between the markets' required return on the option, and on the stock.¹⁰⁰ Basically, the Black Scholes Merton model utilises the volatility¹⁰¹ of an underlying to obtain the theoretical price of a vanilla option. This model shows that the theoretical price of an option is independent of the risk of the underlying. This risk neutrality is achieved through the dynamic revision of a portfolio.¹⁰² This formula legitimised trading in derivatives and alongside its numerous offspring is still widely used in OTC-DMs today.

Having examined the canonical theories that comprise MFT, this chapter now turns its attention to the practical application of these theories in financial markets in the next section.

2.4. Modern Finance Theory in Practice

This chapter in Section 2.2 argued that economics is performative in financial markets and that this performativity takes several forms and in Section 2.3 has examined the building blocks of MFT. Subsequently, this Chapter examines MFT in practice by first deducing the policy implications of MFT in Section 2.4.1. It then utilises a case study that is the deregulation of OTC-DMs to exemplify the practical effects of MFT in Section 2.4.2. Finally, this section critiques the postulates of MFT from a post-GFC perspective arguing that the use of MFT in financial markets generally and in OTC-DMs specifically was

⁹⁸ A change in the price of the stock will result in a larger change in the price of an option.

⁹⁹ An European option can only be exercised at the date of its expiry.

¹⁰⁰ Fischer Black and Myron Scholes, 'A Theoretical Valuation Formula for Options, Warrants, and other Securities' (1970) Myers Papers; Fischer Black and Myron Scholes, 'The Pricing of Options and Corporate Liabilities' (1973) 81 *Journal of Political Economy* 637; Robert Merton, 'Theory of Rational Option Pricing' (1973) 4 *The Bell Journal of Economics and Management Science* 141.

¹⁰¹ Volatility being the annual (normally distributed) standard deviation of a security's price.

¹⁰² A strategy called continuously revised delta dynamic hedging.

counter-performative in Section 2.4.3. Due to the fact that the intellectual origins of both MFT and the GFC can be traced to the US, the OTC-DMs and relevant regulation examined here will be those of the US.

2.4.1. Policy implications of MFT

The discussions above indicate that MFT attempts to build upon scientific foundations when interpreting the action and behaviour of economic agents. The foundational ideas of MFT that asset prices take a random walk, that returns are constant, that a linear relationship exists between risk and return, that in perfect markets, a company's leverage can be dismissed, and the presumed ability to create risk free portfolios legitimised trading in financial markets. MFT was interpreted as evidence that economic agents could not beat the market consequently creating the assumption that the creation of myriad financial assets was a good thing as it led to the dispersion and subsequent abolition of risk.

While developed at different times in economic thought and for diverse purposes, MFT's central theories all share fundamental assumptions that is: perfect markets, no taxes, no transaction costs, costless and readily available information, homogenous expectations, and in the case of the Modigliani & Miller theorem, no danger of bankruptcy. The core hypothesis of these theories posit that all assets are tradeable and have a price and rate of return designated by rational and efficient markets. In these markets, arbitrage opportunities are absent, prices are equal to the present discounted value of expected future pay offs over the asset's life, the riskless rate is applicable due to the fact that the mode of financing of an asset is independent of its return and is instead dictated by the asset's beta, and that hedging can significantly reduce systemic risk and ensure that assets are risk free.

These central prescriptions of MFT have been performative in financial markets and provide a unique example of academia affecting the manner in which real world financial markets are conceptualised. EMH is the basis for MFT and has been rapidly incorporated into legal jurisprudence dictating the manner in which financial markets are regulated. Legal institutions are

believed to play a key role in strengthening market efficiency an example being the use of EMH by the US Securities Exchange Commission (SEC) as the basis of its integrated disclosure requirements,¹⁰³ and by the US Supreme court in developing its 'Fraud on the Market Theory.'¹⁰⁴ EMH has also weathered several crises and crashes despite the fact that the existence of efficient markets rules out the possibility of crisis as financial markets trend towards equilibrium. Crises are usually either attributed to exogenous shocks or alternatively, to information asymmetries between borrowers and lenders.¹⁰⁵

Legal backing of EMH is in itself surprising as in its strongest form, EMH negates the need for corporate and financial law as all investors have to do is track the market price. However, this assumes that markets are already efficient. Markets are unfortunately not fully efficient but there is the assumption that they can be altered to be more efficient which emphasises the role of lawyers and regulators. Gilson and Kraakman argue that certain institutional mechanisms contribute to the relative efficiency of markets.¹⁰⁶ In the event that markets still do not act efficiently, they can be made even more efficient. This gives rise to the presumption that the best way to regulate financial markets is through the creation of efficiency improving regulation. Pricing mechanisms are at the heart of EMH and therefore where information costs abound efficiency cannot be achieved but with the proper management of information cost, efficiency can be achieved.¹⁰⁷ Another goal of financial market regulation under EMH is the removal of obstacles to market efficiency to ensure efficient and liquid markets.

¹⁰³ Paolo Cioppa, 'The Efficient Capital Market Hypothesis Revisited: Implications of the Economic Model for the United States Regulator' (2005) 5(1) *Global Jurist Advances* 1.

¹⁰⁴ See *Basic Inc v. Levinson*, 485 U.S. 224 (1988) at 225 where the court states that in open and developed financial markets, price is determined by all available information on a company and its businesses. Therefore, any misleading statements defrauded purchasers of the company's stock.

¹⁰⁵ Joseph Stiglitz and Andrew Weiss, 'Credit Rationing in Markets with Imperfect Information' (1981) 71(3) *The American Economic Review* 393.

¹⁰⁶ Ronald Gilson and Reinier Kraakman, 'The Mechanisms of Market Efficiency' (1984) 70(4) *Virginia Law Review* 590; Ronald Gilson and Reinier Kraakman, 'The Mechanisms of Market Efficiency Twenty Years Later: The Hindsight Bias' (2003) 28 *Journal of Corporation Law* 715.

¹⁰⁷ *ibid.*

Moving on to portfolio selection theories, rapid advancements have been made in the development of increasingly sophisticated mathematical processes for the quantification and management of risk. The deployment of these mathematical tools involved the use of significant computing power and advanced the idea that analysis of past price movement pattern could deliver statistically sound inferences on future price movement and risk.¹⁰⁸ The introduction of the Black Scholes Merton model in particular led to an exponential growth in derivative markets and a shift from banks towards market based financial intermediaries.¹⁰⁹ The development of option pricing was also crucial in the creation of new financial instruments which was also justified on the policy grounds of allocative efficiency as there was a demand side and it was assumed that risk was best distributed to market participants with risk appetites. The development of these asset-pricing models consequently fed regulators' assumptions that risk could be properly quantified and managed by market participants, which negated any need for market intervention by the regulators. The Modigliani and Miller theorem has also had significant implications for the leverage ratios of financial market participants especially in relation to the asset side of these financial firms as it encouraged the deployment of large amounts of leverage especially in OTC-DMs.

Having observed the policy and regulatory implications of MFT, this section presents a case study to exemplify the effect of MFT on the regulation of OTC-DMs.

2.4.2. Case Study: The Deregulation of US OTC-DMs

The principal regulation governing OTC derivatives in the US pre-GFC was the Commodity Exchange Act 1936 (CEA) which initially only applied to derivatives on agricultural products. In 1974, an amendment requiring that futures and options on virtually all commodities including financial instruments be traded on exchanges was enacted. The same amendment also created the Commodity Futures Trading Commission (CFTC) to oversee and regulate

¹⁰⁸ Awrey (n 1) 238.

¹⁰⁹ Donald MacKenzie, 'An Equation and its Worlds: Bricolage, Exemplars, Disunity and Performativity in Financial Economics' (2003) 33(6) *Social Studies of Science* 831.

these markets.¹¹⁰ At this time, swaps had developed outside the extant regulatory framework a position threatened by the expansion of the CEA's regulatory ambit but later preserved by regulatory intervention on the part of the US Treasury department.¹¹¹ This ensured that all foreign exchange transactions in OTC-DMs were exempted from regulatory oversight a move it justified with the reasoning that participants in the markets were large, sophisticated, and already regulated by the Federal Reserve and Comptroller of the Currency.¹¹²

In 1987, the regulation of OTC-DMs was raised again when the CFTC commenced an investigation into Chase Manhattan Bank's commodity swaps programs and issued an advance notice of its intention to create rules regulating swap transactions.¹¹³ It was also noted by commentators that the rationales for regulating exchange traded derivatives were applicable to OTC derivatives.¹¹⁴ However, due to negative reactions to the CFTC's monitoring of swap transactions, the CFTC exempted swaps from the CEA's provision requiring that they be traded on regulated markets.¹¹⁵ To qualify for the exemptions, swaps had to be negotiated between two parties, based on discrete credit determinations, documented in non-standardised agreements, and were not to be advertised to the public.¹¹⁶ Unfortunately, the CFTC lacked the power to grant said exemption under the CEA but refusing to be thwarted, President Bush signed the Futures Trading Practices Act 1992, which

¹¹⁰ Financial Crisis Inquiry Commission (FCIC), *The Financial Crisis Inquiry Report* (Public Affairs 2011) 74.

¹¹¹ In a letter to congress. See Letter to the Hon. Herman E. Talmadge, Chairman, Committee on Agriculture and Forestry, U.S. Senate, from Donald L.E. Ritger, Acting General Counsel, Department of the Treasury, July 30, 1974, contained in p. 49–51, Senate Report, No. 93-1131, 93d Congress, 2d Session, 29 August 1974.

¹¹² Rachel Harvey, 'The Legal Construction of the Global Foreign Exchange Market' (2013) 41(2) *Journal of Comparative Economics* 343.

¹¹³ Mark Young and William Stein, 'Swap Transactions Under the Commodity Exchange Act: Is Congressional Action Needed?' (1988) 76 *Georgetown Law Journal* 1918.

¹¹⁴ *Ibid*; Lynn Stout, 'Why the Law Hates Speculators: Regulation and Private Ordering in the Market for OTC Derivatives' (1999) 48(4) *Duke Law Journal* 703.

¹¹⁵ Roberta Romano, 'A Thumbnail Sketch of Derivative Securities and Their Regulation' (1996) 55(1) *Maryland Law Review* 55; Gillian Tett, *Fool's Gold: How the Bold Dream of a Small Tribe at J.P. Morgan was Corrupted by Wall Street Greed and Unleashed a Catastrophe* (Simon & Schuster 2009) 27–28.

¹¹⁶ Michael Greenberger, 'Derivatives in the Crisis and Financial Reform' in Martin Wolfson and Gerald Epstein (ed), *The Oxford Handbook of the Political Economy of Financial Crises* (Oxford University Press 2013) 4.

authorised the CFTC to grant exemptions. With this new power, the CFTC exempted swaps and hybrid instruments from regulation.¹¹⁷

In 1993, the Group of 30 comprised of the world's leading financial institutions presented its 1993 report¹¹⁸ in which it recommended that governments resolve all legal and regulatory uncertainty and support swaps netting positions to enable OTC-DMs thrive.¹¹⁹ A recommendation easily recognizable as a call for less regulation and attributable to the 'markets know best' tenets of MFT.¹²⁰ Conversely, the General Accountants office (GAO) issued a report, which highlighted the adverse implications increasing interconnectedness in OTC-DMs posed to systemic stability.¹²¹ GAO consequently recommended that all major OTC derivative dealers be brought under federal regulatory oversight. The International Swaps and Derivatives Association (ISDA) responded swiftly and negatively to these recommendations with a critical response to the GAO report.¹²²

With the rapid growth of the swaps market, observers raised the issue of regulation of OTC-DMs again due to dangers that had become apparent in these markets. For instance, in 1994 both Proctor and Gamble and Gibson Greetings suffered massive losses on swap transactions.¹²³ In December of the same year, Orange County, Los Angeles filed for bankruptcy after losing over \$1.5 billion¹²⁴ speculating in derivatives. In 1998, Long Term Capital Management (LTCM) a large US hedge fund suffered crippling losses on its portfolio of high-risk debt securities worth \$125 billion a situation worsened by

¹¹⁷ Ibid.

¹¹⁸ Working Group on Global Derivatives, 'Global Derivatives: Practices and Principles,' Appendix I Sub-Committee Working Papers (1993).

¹¹⁹ Ibid 54.

¹²⁰ This recommendation was unsurprising as the G30 as at that time was headed by the Chairman of J.P. Morgan who could hardly be called an independent observer of the rapidly growing OTC-DMs.

¹²¹ Charles Bowsher, 'Financial Derivatives: Actions Needed to Protect the Financial System' (1994a) 2 <http://www.gao.gov/assets/160/154342.pdf>.

¹²² Ibid.

¹²³ Proctor and Gamble reported a pretax loss of \$157 million stemming from OTC interest rate and foreign exchange derivatives while Gibson Greetings involvement in interest rate swaps suffered a mark-to-market loss of \$23 million. See James Overdahl and Barry Schachter, 'Derivatives Regulation and Financial Management: Lessons From Gibson Greetings' (1995) 24(1) *Financial Management* 68; Alan Morrison and William Wilhelm, *Investment Banking: Institutions, Politics, and Law* (Oxford University Press 2007).

¹²⁴ The largest bankruptcy filed by a municipality at that time. See FCIC (n 110) 47.

the fact that LTCM had amassed a titanic amount of leverage by entering into OTC derivative contracts whose notional value exceeded \$1 trillion. This level of leverage was even more shocking in light of the fact that it was amassed on capitalization of \$4.8 billion and without the knowledge of LTCM's derivative counterparties or regulators.¹²⁵ LTCM had also posted very little collateral against these derivative exposures. If LTCM's counterparties had all tried to liquidate their positions at once, this would have caused a dramatic drop in asset prices, and created exaggerated losses. In testimony to congress, Alan Greenspan stated that LTCM's failure had the potential for adverse systemic effects and would have caused severe losses for creditors, counterparties and even market participants with no direct exposures to LTCM.¹²⁶ The failure of this firm highlighted the fact that even firms run by Nobel prize winning economists could fail,¹²⁷ and represented a significant failure of the prevalent economic orthodoxy as LTCM's trading strategy strictly followed the tenets of MFT utilising EMH and a variation of CAPM. LTCM's potential failure was however averted by a Federal Reserve orchestrated recapitalisation to the tune of \$3.6 billion.¹²⁸

Momentum to regulate OTC derivatives reached its zenith when a concept release was issued in 1998 by the CFTC in which it stated its intention to rethink its current regulatory strategy in OTC-DMs making reference to the financial scandals that had emanated from OTC-DMs which had highlighted faults in the justifications used to exempt swaps from regulation. For instance, capital requirements were not enforced in swap markets. The CFTC also noted that there was a lack of transparency in OTC-DMs due to a lack of record keeping or reporting requirements.¹²⁹ The implications of these recommendations were that if implemented, OTC derivatives would be treated

¹²⁵ General Accounting Office, 'Long-Term Capital Management: Regulators Need to Focus Greater Attention on Systemic Risk,' GAO/GGD-00-3 (1999) 7, 18, 39-40 <http://www.gao.gov/assets/230/228446.pdf>.

¹²⁶ FCIC (n 110) 48.

¹²⁷ Franklin Edwards, 'Hedge Funds and the Collapse of Long-Term Capital Management' (1999) 13(2) *Journal of Economic Perspectives* 189.

¹²⁸ With the exception of Bear Sterns. See Roger Lowenstein, *When Genius Failed: The Rise and fall of Long-Term Capital Management* (Random House Trade Paperbacks 2001) 208.

¹²⁹ Bruce Carruthers, 'Diverging Derivatives: Law, Governance and Modern Financial Markets' (2013) 41(2) *Journal of Comparative Economics* 395.

like off exchange futures making them illegal.¹³⁰ It should come as no surprise that this proposal was met with swift opposition from all angles. Top officials from the Treasury Department, Federal Reserve, and SEC voiced strong dissent with the support of various OTC derivative industry players.¹³¹ These officials essentially argued that market participants were sophisticated enough to handle the risks inherent in OTC-DMs, and that regulatory intervention in these markets would result in decreased market efficiency.¹³² Joseph Bauman a managing director at Bank of America claimed that the CFTC's concept release had 'undercut and imperilled the legal certainty that has until now existed for swaps.'¹³³

This non-interventionist approach to the regulation of OTC-DMs was particularly evident in the regulatory ideology of Alan Greenspan, then chairman of the Federal Reserve, and a key figure in the US regulatory space. For example, on two separate occasions, he noted that:

'[T]he need for U.S. government regulation of derivatives instruments and markets should be carefully re-examined. The application of the Commodity Exchange Act to off-exchange transactions between institutions seems wholly unnecessary – private market regulation appears to be achieving public policy objectives quite effectively and *efficiently*.'¹³⁴

'The unbundling of financial products is now extensive throughout our financial system. Perhaps the most obvious example is the ever expanding array of financial derivatives available to help firms manage interest rate risk, other market risks, and increasingly, credit risks... Another far reaching

¹³⁰ Lynn Stout, 'Derivatives and the Legal Origin of the 2008 Credit Crisis' (2011) 1 Harvard Business Law Review 20.

¹³¹ Ibid.

¹³² U.S. Treasury Department Press Release, 'Joint Statement by Treasury Secretary Robert E. Rubin, Federal Reserve Board Chairman Alan Greenspan and Securities and Exchange Commissioner Arthur Levitt' (7 May 1998).

¹³³ 'Regulation of the Over-The-Counter Derivatives Market,' 72 http://commdocs.house.gov/committees/ag/hagOTC.000/hagOTC_Of.htm

¹³⁴ Alan Greenspan, 'Government Regulation and Derivatives Contracts remarks to the Financial Markets Conference of the Federal Reserve Bank of Atlanta (21 February 1997),'

innovation is the technology of securitization – a form of derivative – which has encouraged unbundling of the production processes for many credit services... These and other developments facilitating the unbundling of financial products have surely *improved the efficiency of our financial markets*.¹³⁵

Additionally, in testimony to congress, Greenspan stated that:

‘...professional counterparties to privately negotiated contracts also have demonstrated their ability to protect themselves from losses, from fraud, and counterparty insolvencies... Aside from the safety and soundness regulation of derivatives dealers under the banking and securities laws, regulation of derivatives transactions that are privately negotiated by professionals is unnecessary. Regulation that serves no useful purpose *hinders the efficiency of markets* to enlarge standards of living.’¹³⁶

These statements lend credence to arguments that theory affects the manner in which real world financial markets are conceptualised and consequently regulated. These statements further support arguments that regulatory conceptualisation of OTC-DMs was primarily centred on MFT. Influential regulators viewed OTC-DMs as essential for market efficiency. A position no doubt predicated on the assumption that the financial innovation taking place in these markets was beneficial and carried out by rational market participants utilising sophisticated quantitative tools.

Ignoring evidence of the endemic systemic risks in OTC-DMs, the Presidents Working Group Report on the failure of LTCM merely recommended in its report that private actors improve risk management techniques and increase transparency.¹³⁷ The report however contained a weak suggestion for the

¹³⁵ Alan Greenspan, ‘Financial Derivatives’ remarks to the Futures Industry Association, Boca Raton, Florida (19 March 1999).

¹³⁶ Alan Greenspan, ‘The Regulation of OTC Derivatives,’ testimony before the House Committee on Banking and Financial Services, (24 July 1998).

¹³⁷ Presidents Working Group on Financial Markets, ‘Hedge Funds, Leverage and the Lessons of Long-Term Capital Management: Report of the President’s Working Group on Financial Markets’ (1999) 36-37 <http://www.cftc.gov/tm/tmhedgefundreport.htm>.

regulation of hedge funds if they did not improve.¹³⁸ The Counterparty Risk Management Policy Group in the aftermath of the LTCM collapse also offered advice which it emphasised was not to be taken as supporting regulation.¹³⁹ A Presidential Working Group (PWG) was subsequently assigned the task of determining the best way to modernise the regulation of derivatives and issued a report signed by Federal Reserve Chairman Alan Greenspan and Treasury Secretary Robert Rubin which criticised and dismissed the CFTC's concerns about LTCM and once again referred to the fact that 'a cloud of legal uncertainty has hung over the OTC derivatives markets in the United States in recent years;'¹⁴⁰ a situation the PWG worried would 'discourage innovation and growth of these important markets.'¹⁴¹ The PWG therefore deemed it necessary to exclude swaps from the purview of regulators;¹⁴² and the reach of state regulation and laws.¹⁴³ The PWG's suggestion laid the foundations for the removal of restrictions placed on speculation in OTC derivatives.

This was achieved through the enactment of the Commodities Futures Modernization Act 2000 (CFMA) which incorporating much of the 1999 PWG's report basically deregulated OTC-DMs. CFMA removed OTC derivatives from the regulatory purview of both the SEC and CFTC¹⁴⁴ and forestalled the application of state laws on gaming and bucket shops¹⁴⁵ that had the potential to make speculative OTC derivatives illegal. The SEC however retained anti-fraud powers over OTC derivatives based on securities. It can therefore be concluded that CFMA effectively removed OTC derivatives from regulatory oversight. The drive for deregulation did not end at the dismantling of regulation as its proponents were disinclined to permit the passing of new regulation and responded hostilely to any critic who pointed out the risks of

¹³⁸ Ibid 42.

¹³⁹ ISDA, 'Improving Counterparty Risk Management Practices' (1999) 56 <http://www.isda.org/educat/pdf/CRMPG-Report6-99.pdf>.

¹⁴⁰ President's Working Group on Financial Market, 'Over-The-Counter Derivatives Markets and the Commodity Exchange Act' (1999) 1 <https://www.treasury.gov/resource-center/fin-mkts/Documents/otcact.pdf>.

¹⁴¹ Ibid.

¹⁴² Ibid 1, 6, 12.

¹⁴³ Ibid 16.

¹⁴⁴ For the CEA's ban on off exchange trading, see Sections 2(h) and 25(a)(4); For CFMA's exempting Sections, see Sections 103 and 120.

¹⁴⁵ Illegal brokerage operations.

financial innovation in OTC-DMs. They justified this deregulation by relying on the supposed self-correcting nature of efficient markets populated by rational participants. This position was further justified by an overreliance on both risk management protocols and a combination of sophisticated asset pricing models with advanced technology. This sentiment is illustrated by a speech given by Fed Vice Chairman Roger Ferguson commending the ‘truly impressive improvement in methods of risk measurement and management and the growing adoption of these technologies by mostly large banks and other large financial intermediaries.’¹⁴⁶

Following their deregulation, there was explosive growth in OTC-DMs with the total notional value of OTC derivatives increasing from \$88 Trillion in 1999¹⁴⁷ to \$670 Trillion in 2008.¹⁴⁸ Theoretically, a \$670 trillion OTC-DM could generate positive externalities for the economy if used for hedging purposes. However, a close analysis of OTC-DMs pre-GFC gives rise to the presumption that the contracts were mainly speculative for a number of reasons. First, the sheer size of OTC-DMs when compared to the economy gives rise to the presumption that speculation was rife in OTC-DMs. Stout compares the size of OTC-DMs relative to the global economy as ‘buying a \$1 million dollar fire insurance policy for a \$250,000 house.’¹⁴⁹ This sentiment is reinforced when considering the fact that most OTC derivatives pre-GFC were CDS on select mortgage backed securities and corporate bonds issued by elite issuers; a point proven by the fact that all corporate and asset backed bonds in the US added up to only \$15 trillion.¹⁵⁰ Second, OTC-DMs grew to \$670 trillion only after the CFMA was enacted and permitted speculative derivative transactions which gives rise to the inference that the growth can be attributed to the entry of more speculators than hedgers into the market. Third, while parties seeking to hedge risks were present in OTC-DMs, majority of post-CFMA trading was

¹⁴⁶ Roger Ferguson, ‘The Future of Financial Services -Revisited’ (remarks at the Future of Financial Services Conference. University of Massachusetts, Boston, 2003) <http://www.bis.org/review/r031013h.pdf>.

¹⁴⁷ Bank for International Settlements ‘The global OTC derivatives market continues to grow’ (2000) 3 http://www.bis.org/publ/otc_hy0011.pdf.

¹⁴⁸ Stout (n 130) 23.

¹⁴⁹ *ibid* 24.

¹⁵⁰ *ibid* 24.

performed by financial firms whose very livelihood is derived from speculation or arbitrage as it would be called by MFT.

The adverse results of speculation in OTC-DMs can be traced to Enron which while occupying the ignominious position of perpetuating one of the greatest frauds in accounting history committed said fraud to cover up losses it had suffered speculating in energy derivatives.¹⁵¹ Losses that were made possible through the enactment of CFMA.¹⁵² Shortly afterwards, other financial institutions followed Enron's stygian path in OTC-DMs. Investment bank Bear Stearns was the first major financial firm to fail due to losses suffered in OTC-DMs and only surviving through its rescue which took the form of its sale by the Federal Reserve to JP Morgan Chase.¹⁵³

On 15 September 2008, brokerage firm Merrill Lynch revealed that it had suffered major losses similar to those suffered by Bear Sterns and was going to be sold to Bank of America.¹⁵⁴ The crisis reached a fevered peak when the same day Lehman brothers declared bankruptcy¹⁵⁵ and was allowed to fail by the government; a move that drove the market into a frenzied panic.¹⁵⁶ When the next day, AIG which had been heavily involved in the CDS market announced that it was suffering huge losses in said CDS to the tune of several billions of dollars, not even regulatory intervention through a government bailout could stop the crisis. The market froze with banks refusing to lend to each other due to the opaque nature of OTC-DMs which fed fears that their counterparties were already insolvent due to speculative bets made in the OTC-DMs. The Federal Reserve had to act as lender of last resort by introducing more than \$3.3 trillion into the economy in the form of short-term loans to restore a measure of confidence.¹⁵⁷

¹⁵¹ Mark Jickling, 'The Enron collapse: An overview of financial issues' (2002) 4 <http://fpc.state.gov/documents/organization/8038.pdf>.

¹⁵² Stout notes the existence of Sections 2(h)&(g) in CFMA shielding Enron's electronic energy derivatives trading platform from the regulatory effects of being deemed an exchange. Stout (n 130) 26.

¹⁵³ Ibid.

¹⁵⁴ Ibid.

¹⁵⁵ Ibid.

¹⁵⁶ Ibid.

¹⁵⁷ Awrey (n 1) 237.

Having argued that theory played a role in the deregulation of OTC-DMs, this thesis admits that it is entirely possible that the deregulation of OTC-DMs in the US could also have been influenced by other factors including regulatory capture and just plain bad policy. However, this section's arguments demonstrate that there was significant commonality between the tenets of MFT and the statements of influential regulators at the time. Furthermore, the deregulation of OTC-DMs embodied a regulatory conceptualisation of OTC-DMs that was significantly based on MFT – even if only superficially.

Before concluding, it is also interesting to note that while in the EU, exchange traded derivatives were regulated by the Markets in Financial Instruments Directive,¹⁵⁸ OTC derivatives were not regulated prior to the GFC. In fact, the United Kingdom blocked EU attempts to regulate these instruments to ensure that US markets did not gain a competitive advantage.¹⁵⁹ This exemplifies the transfer of ideology from the US to the EU, whether intentional or not, and justifies this section's focus on the (de)regulation of US OTC-DMs.

In conclusion, this section has demonstrated the role MFT played in the deregulation of OTC-DMs, and resultantly, in the build-up and amplification of the GFC. This chapter's next section engages in a critical analysis of MFT and the assumptions on which it is predicated.

2.4.3. Critiquing Modern Finance Theory: A Post-GFC Perspective

Post-GFC, questions have been raised about the deregulation of financial markets in general and in OTC-DMs specifically that was justified by MFT. It has been argued that the GFC can partly be attributed to an excessive reliance on the tenets of MFT for example, the self-correcting nature of markets¹⁶⁰ and the rational nature of market participants¹⁶¹ by regulators. Additional factors include a disregard for excessive leverage, and an overreliance on sophisticated probability models in predicting risk fuelled by MFT's claims that the most complex and persistent economic problems could be resolved by

¹⁵⁸ Directive 2004/39/EC

¹⁵⁹ Lucia Quaglia, *The European Union and Global Financial Regulation* (Oxford University Press 2014) 93-95.

¹⁶⁰ *ibid.*

¹⁶¹ *ibid.*

markets through the conversion of present day savings into future investments.¹⁶²

The predominant theoretical orthodoxy in financial markets generally and in OTC-DMs specifically for the past 20 to 30 years was first, that allocative efficiency could be achieved through the full range of contracts made possible by efficient and liquid markets. This supposedly enabled providers and users of funds manage their risk, return and liquidity preferences effectively.¹⁶³ Second, that the presumption of rational and efficient markets justified market deregulation;¹⁶⁴ and finally, that even if markets exhibited irrational behaviour, policy makers lacked the ability to judge when and to what extent they were irrational and consequently could not justify market interventions.¹⁶⁵

This view was however erroneous due to its lack of consideration of three key characteristics of financial markets. First, is their proclivity to recurrent crises attributable to information asymmetries. Second, that market participants are neither fully nor consistently rational. Finally, that the effect of financial innovation on systemic risk was still a mystery.¹⁶⁶ Regulators however ignored these glaring inconsistencies and enforced a regime which deferred to the judgment of the market imbued with the belief that markets were both better informed and more motivated by sound economic principles than the government.¹⁶⁷ This led to the resultant argument that the only effect government intervention in financial markets would have was to distort allocative efficiency which could be better achieved by market forces due to their efficient and stable nature and a powerful ability to withstand shocks. An almost fanatical adherence to the controversial tenets of MFT led governments and regulators to conclude that market prices were the best indicators of the

¹⁶² Emiliios Avgouleas, *Governance of Global Financial Markets: The Law, the Economics, the Politics* (Cambridge University Press 2012) 110.

¹⁶³ Financial Services Authority, 'The Turner Review: A regulatory response to the global banking crisis' (2009) (Turner Review) 40 http://www.fsa.gov.uk/pubs/other/turner_review.pdf.

¹⁶⁴ *ibid.*

¹⁶⁵ *ibid.*

¹⁶⁶ Avgouleas (n 162) 110.

¹⁶⁷ *ibid.*

state of markets and that market prices were the best defence against market failure.¹⁶⁸

This conclusion was problematic for a number of reasons. The first being that the assumption of efficient and rational markets are not verified truths.¹⁶⁹ Second, market efficiency as hypothesised by EMH does not infer rationality on the part of the market. The random walk of prices does not in any way preclude the possibility of herding and volatility. Third, irrational exuberance and cognitive biases can result in mispricing in financial markets.¹⁷⁰ A serious consequence of which is a severe allocative inefficiency in the market which can result in severe economic dysfunction which can in turn lead to crisis.¹⁷¹ The benefits of allocative efficiency that is, a certain amount of liquidity and market completion do not outweigh the additional instability that can be created by increasing complexity.¹⁷² Fourth, the presumption of individual rationality does not necessarily lead to collective rationality.¹⁷³ This is because even where individuals are rationally self-interested, when they make decisions in conditions of imperfect information, or where their actions are directed by relationships between investors and their asset manager agents, a likely consequence is market price movement exhibiting self-reinforcing momentum.¹⁷⁴

It is also noteworthy that there has long been a tradition of intellectual scepticism towards the rationality of markets from certain economists. Traceable from Keynes's who famously argued against the idea of equity prices being driven by a rational assessment of available information¹⁷⁵ to Minsky who building on Keynes's analysis argued that financial markets have

¹⁶⁸ *ibid* 41, 48-49.

¹⁶⁹ *Ibid* 111.

¹⁷⁰ The arguments of behavioural Finance are addressed in Section 2.3.1 of this chapter.

¹⁷¹ Avougleas (n 162) 111.

¹⁷² Turner Review (n 163) 41. The Turner Review for instance argues that the allocative efficiency benefits of the creation of markets for several structured finance products were at best trivial even where they did not play a role in financial market instability.

¹⁷³ *Ibid* 40.

¹⁷⁴ George Soros, *The New Paradigm for Financial Markets: The Credit Crisis of 2008 and what it Means* (PublicAffairs, U.S. 2008).

¹⁷⁵ Keynes in fact compares securities markets to beauty contests. See John Keynes, *The General Theory of Employment, Interest, and Money* (Palmgrave Macmillan 1936) chapter 12.

an affinity for speculative bubbles which if left unattended can result in crisis,¹⁷⁶ and Kindleberger who traces the predilection of financial markets to episodes of speculative excess across various markets, countries and centuries.¹⁷⁷ Regulators pre-GFC relied excessively on the use of sophisticated economic models to measure and manage risks in financial markets generally and OTC-DMs specifically assuming that the analysis of past price patterns could yield insights as to price movements in the future. The GFC has however revealed several problems with these methods. The Turner Review which was set up to review the causes of the crisis and make recommendations on changes to regulatory strategies identifies four categories of problem in this regard namely: short observation periods, non-normal distributions, systemic versus idiosyncratic risk, and non-independence of future events; distinguishing risk and uncertainty.¹⁷⁸

First, financial models pre-GFC often used short observation periods, which introduced procyclicality which led to current periods of low risk leading to an underestimation of future risk. Second, MFT relies on normal (Gaussian) distributions. These distributions fail to take into account the possibility of large shocks to the financial system and in fact calculated crisis to be of small probability. The use of normal distributions has not been well justified in economic literature and in fact the use of fat-tailed (Levy) distributions was advocated by Mandelbrot who identified the potential problems that could arise from using Gaussian distributions in financial markets.¹⁷⁹ Proponents of MFT due to the difficult and time-consuming mathematics involved however rejected this idea. Third, MFT and its models assess the actions of market participants individually assuming that their actions are small in scale and cannot affect market equilibrium. This is however problematic as market prices can induce simultaneous and homogenous market wide reactions. Finally, the

¹⁷⁶ Hyman Minsky, *Stabilizing an Unstable Economy* (McGraw-Hill 2008). Minsky's Financial Instability Hypothesis is discussed infra Section 2.5.2.

¹⁷⁷ Charles Kindleberger, *Manias, Panics and Crashes: A History of Financial Crises* (4th edn, Palgrave Macmillan 2001); Charles MacKay, *Extraordinary Popular Delusions & the Madness of Crowds* (Marboro Books 1985).

¹⁷⁸ Turner Review (n 163) 44.

¹⁷⁹ Benoit Mandelbrot and others, *The (Mis) Behaviour of Markets: A Fractal View of Risk, Ruin and Reward* (Profile Business 2008); Nassim Taleb, *The Black Swan: The Impact of the Highly Improbable* (2nd edn, Penguin Books 2008).

assumption that future market events can be extrapolated from past distribution patterns is dangerous as it applies Newtonian physics to real world financial markets. While valid in the realm of science, its application to economic relationships is of doubtful efficacy as financial markets are fraught with uncertainty and not by risk that can be modelled.¹⁸⁰

However, these criticisms do not mean that efficient and liquid markets are not advantageous as efficient and liquid markets can prove useful in signalling the attractiveness of different securities even where said prices are subject to frequent irrational overshoots. These criticisms however indicate that regulators should have struck a balance between the advantages of market completion and liquid markets and the disadvantages that flow from inherently instable markets. These critiques lead to the question of what role the state is to play in financial markets post-GFC. MFT disregards the fundamentally instable and irrational nature of financial markets. As will be shown in Chapters 3 to 7 of this thesis, post-crisis reforms still substantially reflect pre-crisis ideology, which is that the only role to be played by states in financial markets is the promulgation and enforcement of efficiency enhancing rules. Reforms in financial markets particularly in the OTC derivative sector largely focus on the fortification of financial market infrastructure. While these rules will no doubt prove useful in preventing the accumulation of risk, they do not address the inherent instability of said markets. It would therefore appear that the ideology of MFT has survived the crisis which poses a significant danger to financial stability.

2.5. Alternative Theories of Finance

The methodologies of MFT revolutionised the study of finance by bringing rigorous logic and hypothetical testing to the field, but its hypotheses have left several lacunae. To this end, it is necessary to consider alternative theories of finance that may prove useful in understanding the manner in which financial markets function, how they are structured, why they are prone to crisis, and what the regulatory implications of these facts are. Therefore, in the

¹⁸⁰ For the classicised distinction between uncertainty and risk, see Frank Knight *Risk, Uncertainty and Profit* (Dover Publications 2006).

subsequent parts, this chapter considers three alternative theories of finance namely: behavioural finance in Section 2.5.1, Minsky's financial instability hypothesis in Section 2.5.2, and imperfect knowledge economics in Section 2.5.3.

2.5.1. Behavioural Finance

Behavioural finance consolidates insights from psychology and finance to explain why market actors make irrational or illogical decisions when investing, saving, or borrowing money.¹⁸¹ It argues that certain financial phenomena are better understood using models in which economic agents are not fully rational.¹⁸² Behavioural finance relaxes MFT's core assumption that market participants are rational by incorporating departures from rationality into models of financial markets.¹⁸³ Behavioural finance criticises most of the tenets of MFT. With such criticisms including the fact that while for followers of MFT it is an article of faith that markets achieve rational aggregate outcomes notwithstanding the irrational trading of some market participants due to the corrective influence of sophisticated arbitrageurs, there have been speculative fads in financial markets,¹⁸⁴ which can hardly be interpreted as rational. Behavioural finance therefore looks to theories of psychology to explain these anomalies.¹⁸⁵ Behavioural finance has also been increasingly applied in the growing field of law and economics.¹⁸⁶

The foundation of behavioural finance's critique of the EMH is that it is difficult to prove that market participants are rational. Fischer posits that a cursory examination reveals that market participants incorporate irrelevant information

¹⁸¹ Gary Belsky and Thomas Gilovich, *Why Smart People Make Big Money Mistakes and how to Correct Them: Lessons from the Life-Changing Science of Behavioral Economics* (Simon & Schuster 2010).

¹⁸² Richard Thaler (ed), *Advances in Behavioral Finance, volume II* (Princeton University Press 2005) 1; Hersh Shefrin, *Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing* (Oxford University Press USA 2002) 34.

¹⁸³ Brad Barber and Terrance Odean, 'The Courage of Misguided Convictions' (1999) 55(6) *Financial Analysts Journal* 41.

¹⁸⁴ Ranging from the Dutch tulip mania to junk bonds.

¹⁸⁵ Jayendu Patel and others, 'The Rationality Struggle: Illustrations from Financial Markets' (1991) 81 *The American Economic Review* 232.

¹⁸⁶ Christine Jolls and others, 'A Behavioral Approach to Law and Economics' (1998) 50(5) *Stanford Law Review* 1471; Cass R. Sustein (ed.), *Behavioral Law and Economics* (Cambridge University Press 2000); Klaus Mathis, *European Perspectives on Behavioural Law and Economics* (Springer International Publishing 2015).

when creating their demand for securities¹⁸⁷ terming this phenomenon ‘noise trading.’¹⁸⁸ Furthermore, Shleifer notes that market participants act on the advice of investment experts, often fail to diversify, hold on to losing stocks while selling off winning stocks, and follow security price patterns amongst others.¹⁸⁹ These deviations from the tenets of economic rationality also seems to be systematic and endemic. This is encapsulated by Kahneman and Riepe who show that people deviate from the classic decision making model in important ways.¹⁹⁰ These deviations can be grouped into three broad categories which are: attitudes to risk, non-Bayesian expectation formation, and sensitivity of decision making to the framing of problems.¹⁹¹

First, individuals’ attitudes towards risky speculation do not follow the prescription of Von Neumann Morgenstern rationality.¹⁹² When assessing such speculation, market participants prioritise gains and losses relative to some reference point which may vary depending on the situation over the final wealth they can obtain therefore displaying loss aversion. This predilection was first reported and modelled in Kahneman and Tversky’s prospect theory.¹⁹³ Second, market participants routinely violate Bayes rule and other tenets of probability theory when predicting uncertain outcomes.¹⁹⁴ While these violations can prove useful in real life situations, they can also lead market participants astray. For example, where market participants extrapolate a company’s short term income growth too far into the future which results in said company’s shares becoming overpriced.¹⁹⁵ The consequence of this overreaction is a reduction in future returns which in turn is a result of prices adjusting to more realistic valuations when past growth rates do not

¹⁸⁷ Fischer Black, ‘Noise’ (1986) 41(3) *The Journal of Finance* 528.

¹⁸⁸ *ibid.*

¹⁸⁹ Shleifer (n 21) 11.

¹⁹⁰ Daniel Kahneman and Mark Riepe, ‘Aspects of Investor Psychology’ (1998) 24(4) *The Journal of Portfolio Management* 52.

¹⁹¹ Shleifer (n 21) 10.

¹⁹² John von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior* (3rd edn, Princeton University Press 1992).

¹⁹³ Daniel Kahneman and Amos Tversky, ‘Prospect theory: An Analysis of Decision under Risk’ (1979) 47(2) *Econometrica* 263.

¹⁹⁴ Daniel Kahneman and Amos Tversky, ‘On the Psychology of Prediction’ (1973) 80(4) *Psychological Review* 237.

¹⁹⁵ Shleifer (n 21) 11.

repeat themselves.¹⁹⁶ Third and perhaps most radical is the fact that individuals' choices when trying to solve a problem are dependent on how the problem is framed with the consequence that the framing of a problem affects investment decisions. For example, investors allocate more wealth to stocks than bonds when presented with an impressive track record of long term stock returns compared to bond returns, than where they're only provided with volatile short-term stock returns.¹⁹⁷

The above evidence shows several shortcomings of EMH and demonstrates that market participants may demonstrate bounded rationality.¹⁹⁸ However, it can be counter argued that while irrational traders exist, their random trades should cancel each other out.¹⁹⁹ Kahneman and Tversky's prospect theory however countermands this defence as it has been shown that people do not randomly deviate from rationality but typically herd in the same direction.²⁰⁰ This is because while noise traders form their investment opinions individually, they do not trade randomly with each other but try to buy and sell the same securities at the same time a problem exacerbated by noise traders listening to each other and amplifying each other's mistakes.²⁰¹

a. Limitations of Arbitrage

The aforementioned criticisms lead to EMH's central defence which is that even where noise trading is correlated, arbitrageurs who are unaffected by psychological biases move prices back to their fundamental values by taking the opposite side of unsophisticated demand. Behavioural finance counters this argument by stating that in real world financial markets arbitrage is extremely risky and costly and consequently limited and mispricing's may

¹⁹⁶ *ibid.*

¹⁹⁷ S. Benartzi and R. Thaler, 'Myopic Loss Aversion and the Equity Premium Puzzle' (1995) 110(1) *The Quarterly Journal of Economics* 75.

¹⁹⁸ Daniel Kahneman, 'Maps of Bounded Rationality: Psychology for Behavioral Economics' (2003) 93 *American Economic Review* 1449.

¹⁹⁹ Shleifer (n 21) 12.

²⁰⁰ Kahneman and Tversky (n 190).

²⁰¹ Robert Shiller and others, 'Stock Prices and Social Dynamics' (1984) 1984(2) *Brookings Papers on Economic Activity* 465.

consequently not be corrected.²⁰² Behavioural finance indicates three problems with arbitrage as posited by EMH namely: fundamental risk, noise trader risk, and implementation costs. These are considered below.

i. Fundamental Risk

This refers to the risk of bad information arriving in the market after the purchase of a security. While theoretically, this risk can be perfectly hedged by purchasing a closely related substitute, substitute securities are rarely perfect and hard to find²⁰³ which makes fundamental risk inevitable. Consequently, arbitrage cannot always be used to correct the prices of securities.²⁰⁴ The only option then available is a reduction of the arbitrageur's exposure to the securities, which in itself is not entirely riskless considering the fact that the average expected returns are high and positive.²⁰⁵

ii. Noise Trader Risk

Noise trader risk refers to the risk of the mispricing being exploited by the arbitrageur worsening in the short term because of pessimistic or optimistic traders becoming even more optimistic or pessimistic about the future.²⁰⁶ Noise trader risk is perhaps the most crucial risk due to its strong link to the agency problem. In real world financial markets, arbitrageurs are professional investment fund managers who invest the money of other people.²⁰⁷ In cases where investors lack the requisite knowledge required to evaluate investment managers, fund managers are assessed based on their returns and if the mispricing worsens in the short term and causes negative returns; investors may decide to withdraw their funds. This forces professional investment funds managers to liquidate their portfolios early resulting in prohibitively steep

²⁰² Nicholas Barberis and Richard Thaler, 'A Survey of Behavioral Finance' in G. Constantinides and Rene Stulz (ed), *Handbook of The Economics of Finance: Financial Markets and Asset Pricing* (Elsevier 2003) 1055.

²⁰³ *ibid* 1056.

²⁰⁴ Stephen Figlewski, 'Subjective Information and Market Efficiency in a Betting Market' (1979) 87(1) *Journal of Political Economy* 75; J. Campbell and others, 'Trading Volume and Serial Correlation in Stock Returns' (1993) 108(4) *The Quarterly Journal of Economics* 905.

²⁰⁵ Jeremy Siegel, *Stocks for the Long Run: The Definitive Guide to Financial Market Returns and Long-Term Investment Strategies* (McGraw-Hill Companies 2008).

²⁰⁶ Barberis and Thaler (n 202) 1056.

²⁰⁷ Andrei Shleifer and Robert Vishny, 'The Limits of Arbitrage' (1997) 52(1) *The Journal of Finance* 35.

losses. Consequently, fear of a premature liquidation might temper the arbitrageur's ability to correct mispricing. Barberis and Thaler also point out that in attempts to avoid fundamental risk, arbitrageurs might sell a security short and where the original owner of the securities demands its return, the arbitrageur might be forced to close out his position. If this occurs in a period where the mispricing has temporarily worsened, the arbitrageur will suffer losses.²⁰⁸ This makes arbitrageurs even more cautious from the start.

iii. Implementation Costs

Transaction costs such as commissions, bid-ask spreads, and price impacts can also diminish the attractiveness of arbitrage. While these fees are usually negligible, D'Avolio finds that they can be much larger and in some cases, arbitrageurs will not be able to find securities to borrow at any price.²⁰⁹ Furthermore, transaction costs such as lending fees can expose arbitrageurs to horizon risk, which is the risk that the mispricing takes so long to correct that any profits obtained have to be used to satisfy accumulated transaction costs. This cost is a possibility even where the arbitrageur is confident that no outsider can make him liquidate his position. Barberis and Thaler also identify legal constraints as an implementation cost ascribable to the fact that most pension fund and mutual fund managers are barred from short selling.²¹⁰ This category also includes the cost of finding and learning about the mispricing in addition to the resources required to implement arbitrage strategies.²¹¹

b. Evidence

This discussion leads to the question of whether or not there is any evidence of limited arbitrage. Certain financial market occurrences have been revealed to be evidence of market inefficiency. In 1907 Royal Dutch and Shell Transport two completely independent companies incorporated in the Netherlands and Britain respectively decided to merge their business interests on a 60:40 basis.

²⁰⁸ Barberis and Thaler (n 202) 1057.

²⁰⁹ Gene D'Avolio, 'The Market for Borrowing Stock' (2002) 66(2) *Journal of Financial Economics* 271.

²¹⁰ Barberis and Thaler (n 202) 1057.

²¹¹ Robert Merton, 'A Simple Model of Capital Market Equilibrium with Incomplete Information' (1987) 42(3) *The Journal of Finance* 485; Robert Shiller and others, 'Stock Prices and Social Dynamics' (1984) *Brookings Papers on Economic Activity* 457; Lawrence Summers, 'Does the Stock Market Rationally Reflect Fundamental Values?' (1986) 41(3) *The Journal of Finance* 591.

This ratio was also approximately the basis for the distribution of cash flows between the two sections of Royal Dutch Shell until 2005. The two sections maintained their listings separately, with Royal Dutch trading primarily in the US²¹² and the Netherlands; Shell traded primarily in London.²¹³ Following the precepts of EMH, adjusted for exchange rates, the shares of the two sections of the company should have traded at a 60:40 ratio. However, this was not the case as the history of price movements showed that Royal Dutch's shares traded at an under-price of 35% a disparity that could not be explained even when factors like taxes and transaction costs were taken into consideration. This mispricing is therefore clear evidence of the limits of arbitrage.

Second, research has also shown that when a stock is added to an index for example, the S&P 500 its price appreciates permanently by an average of 3.5%.²¹⁴ An extreme illustration of this phenomenon is the addition of Yahoo to the S&P 500 which resulted in its shares appreciating by 24% in the period of a day. This sudden increase in the price of a stock is clear evidence of mispricing as while the fundamental value of the share remains stationary, its price does not. This mispricing therefore lends credence to the limits of arbitrage

c. The Regulatory implications of Behavioural Finance

The inefficiency of markets has profound implications for the manner in which we conceptualise financial markets. This raises the question of what role the state is to play in financial markets. Regulatory intervention to correct market failures is particularly important in the context of investor protection, lender of last resort, and the imposition of curbs on trading. These grounds for regulatory intervention are consequently briefly examined below.²¹⁵

²¹² Where it was a part of the S&P 500 Index.

²¹³ Where it was a major constituent of the Financial Times Stock Exchange Index (FTSE 100).

²¹⁴ See Andrei Shleifer, 'Do Demand Curves for Stocks Slope Down?' (1986) 41(3) *The Journal of Finance* 579; Lawrence Harris and Eitan Gurel, 'Price and Volume Effects Associated with Changes in the S&P 500 List: New Evidence for the Existence of Price Pressures' (1986) 41(4) *The Journal of Finance* 815.

²¹⁵ It should however be noted that market efficiency is only one of several elements informing policy decisions.

First, regulatory intervention can take the form of investor protection legislation. This can take the form of disclosure requirements, legal protection from abuse and expropriation by directors and the creation of bankruptcy rules favourable to the creditor. The protection of investors' interests extends to the satisfactory enforcement of rules of investor protection. This is evidenced by research which documents that countries deficient in strong legal regimes protecting minority shareholders and creditors suffered adverse consequences while countries with strong legal regimes had larger capital markets, firms, initial public offerings, more dispersed share ownership,²¹⁶ and more efficient markets.²¹⁷ Second, another avenue though controversial for regulatory intervention in financial markets is as lender of last resort. While in efficient markets, the need for a lender of last resort is negated, history has shown time and again that the risk of a financial panic escalating into a full blown financial crisis due to the failure of arbitrage and the presence of market inefficiencies is very real. To prevent the fall of security prices, further liquidations, and the prospect of a recession, the lender of last resort usually the central bank of a country can inject liquidity into the financial system.²¹⁸

Third, and the most controversial aspect of regulatory intervention in financial markets is the use of trade restrictions that is, regulatory policies designed to stabilise or fix the prices of securities. Restrictions on trading in securities markets are usually advocated on two grounds, the first of which is the amelioration of a financial panic with the second being the prevention of speculation. It has however been argued that government intervention in financial markets via price stabilisation policies only engender speculation against the government.²¹⁹ Trade restriction policies are extremely contentious and the question of their efficacy is dependent on whether their deterrent effect primarily affects noise traders or arbitrageurs. Where they primarily discourage noise traders, it has been argued that such policies may

²¹⁶ Rafael La Porta and others, 'Corporate Ownership around the World' (1999) 54(2) *The Journal of Finance* 471.

²¹⁷ Randall Morck and others, 'The Information Content of Stock Markets: Why Do Emerging Markets Have Synchronous Stock Price Movements?' (2000) 58(1) *Journal of Financial Economics* 215.

²¹⁸ Walter Bagehot, *Lombard Street* (Hyperion Press 1979); Kindleberger (n 171).

²¹⁹ Shleifer (n 21) 193.

not be advantageous as limiting participation in financial markets can keep prices down and discourage investment, which could be advantageous from an investor point of view. Where trade restrictions primarily deter arbitrageurs, this can engender excess volatility in markets as in the absence of arbitrageurs, market inefficiencies synonymous with panics can be exacerbated.

d. Conclusion on Behavioural Finance

To summarise, behavioural finance is best described as a challenge to the concepts of market efficiency, rationality, and arbitrage. Unexplained lacunae also known as anomalies in financial markets have been left unexplained by MFT generally and EMH specifically. Consequently, behavioural finance employs insights from psychology to explain these anomalies. The failure of arbitrage as a corrective force and of market efficiency generally also have profound implications for the regulation of financial markets. This mandates stronger regulatory oversight in financial markets through the enactment of investor protection legislation, the provision of lender of last resort services and the placement of restriction on trades. Having considered a theoretical challenge to MFT, this essay in its next section examines an alternative theory of finance that belongs to a strand of finance developed independently from modern day economics namely Minsky's financial instability hypothesis.

2.5.2. Financial Instability Hypothesis

The Financial Instability Hypothesis (FIH) is built on Keynes's insight that capitalism is a result of activity in financial markets. Therefore, financial markets are an intrinsic part of any capitalist economy. FIH also extracts certain elements of Joseph Schumpeter's credit view of money and finance.²²⁰ In the FIH, Minsky introduces the notion of uncertainty into our conceptualisation of financial markets. Every investment decision requires a 'supply function of investment which depends on labour costs and short-term interest rates, a demand function of investment, which is derived from the price

²²⁰ Joseph Schumpeter, *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle* (Harvard University Press 1949).

of capital assets, and the anticipated structure and conditions of financing.²²¹ This inherently involves an element of uncertainty when investing which is independent of whether the investment performs as predicted by technologists and the strength of the market for the investment's output.²²²

This capital development of the economy is followed by the exchange of present money for future money.²²³ Existing money pays for resources utilised in the production of investment outputs while future money is the profit to be gained by the capital asset owning firm. Due to the manner in which investment is financed, ownership of items in capital stock are funded by liabilities.²²⁴ Liabilities for each economic unit therefore determine a time series of preceding payment obligations whereas, assets create a time series of projected cash receipts. This structure has been well described by Keynes who terms it a 'Veil of money' interposed between the real asset and the wealth owner and characterises it as an 'expectedly marked characteristic of the modern world.'²²⁵

The above implies a connection between money and financing through time with the flow of money seen as a response to assumptions of future profits. Where assumptions on future profits change for the worse, financing is scaled accordingly resulting in an expansion or contraction in the supply of money, that is, liquidity. Consequently, in a capitalist economy; past, present, and future are connected not only by capital assets and labour force attributes but also by financial relationships and changes in this structure. Additionally, complicated institutional structures can result in several levels of intermediation between the original owners of community wealth and the economic units administering said wealth. The manner in which capital assets are financed is constantly evolving as financial innovation²²⁶ is a prominent

²²¹ Minsky (n 176) 207.

²²² *ibid.*

²²³ Financing takes place in various forms inclusive of shares, deposits, notes, bonds, and insurance policies.

²²⁴ Liabilities are commitments to pay money at a specified future date or upon the occurrence of a specified contingency.

²²⁵ John Keynes, *The Collected Writings of John Maynard Keynes: Essays in Persuasion* (Palgrave Macmillan 1972) 151.

²²⁶ Financial innovation in this context is the creation of new financial instruments.

characteristic of capitalist financial market based systems. Market participants confronted with the need to balance their accounts deal with the apprehension that their contractual counterparties will default. In times of plenty, substitutes almost identical to cash alleviate this liquidity constraint however, in times of crisis, all obligations and financial instruments must be liquid.²²⁷ Minsky posits that financial innovation is motivated by profit which is most easily obtainable through the management of capital assets.²²⁸ Where income from the products of a capital asset can cover the cost of financing the production of said goods and services, all is well; but where it cannot, refinancing is essential.²²⁹ This situation is made even more complicated by an increasing involvement on the part of governments in acting as lenders of last resort for financial institutions. This provision of assurances results in a diminution in down side susceptibility of aggregate profit flows. Conversely, this intervention can introduce or exacerbate a higher degree of inflationary bias in the economy.

The ability of financing to create money is one with important consequences for the operation of the system for pricing capital assets. Minsky argues that the allocation of resources²³⁰ or the distribution of income do not fully explain the pricing of capital assets. Furthermore, Minsky posits that 'in a capitalist economy resource allocation and price determination are integrated with the financing of outputs, positions in capital assets, and the validating of liabilities.'²³¹ Consequently, despite the growing complexity of the financial system, the level of profits realised remains the central determinant of system behaviour.²³² Expectations of profits are dependent on future investment and realised profits are decided by investment. Therefore, FIH is a theory on the effect of debt on the behaviour of the financial system taking into consideration

²²⁷ That is, they must be liquid. See Pistor (n 38) 23.

²²⁸ Capital assets are assets that are expected to yield income; that is the difference between the total revenue generated by a capital asset and the cost of production of goods and services.

²²⁹ Pistor (n 38) 23.

²³⁰ An argument advocated by proponents of MFT in general.

²³¹ Minsky (n 176) 159.

²³² A clear incorporation of the Kalecki and Levy view of profits wherein the construction of aggregate demand decides profits. See Michal Kalecki, 'Theory of Economic Dynamics' in Jerzy Osiatynski (ed), *Collected works of Michal Kalecki: Volume II: Capitalism: Economic dynamics* (Oxford University Press 1991); Sidney Levy and David Levy, *Profits and the Future of American Society: How the Private Enterprise Economic System can Save our Country* (Joanna Cotler Books 1982).

the manner in which debt is validated. Consequently, the composition of financial obligations and the variety of cash flows used to fulfil them as they mature are important in assessing the stability of a financial system. Minsky identifies three forms of cash flow namely: income, balance sheet, and portfolio.²³³

Income cash flows are a result of the process of production encompassing wages and salaries, payments made between different stages of production and gross profits after tax. Balance sheet cash flows are cash flows used to satisfy existing and inherited liabilities²³⁴ and are determined by debt contracts. Minsky then further divides balance sheet cash flows into 'dated cash flows,' 'demand cash flows,' and 'contingent cash flows' for example, guarantees. Portfolio cash flows result from transactions involving the exchange of capital and financial assets, the buying and selling of assets and finally, the issuance of new liabilities.²³⁵ The prioritisation of these different forms of income in meeting debt obligations has important implications for systemic stability. FIH delineates three distinct forms of income-debt relationships classifying them as hedge, speculative, and Ponzi finance.²³⁶

Hedge finance units fulfil their contractual obligations using their cash flows. Units with greater weights of equity financing are more likely to be hedge financing units. Speculative finance units can meet their payment obligations on an 'income account' basis. They cannot repay the principal of the loan amount and depend on 'rolling over' their liabilities.²³⁷ Finally, there are Ponzi financing units whose cash flows cannot meet the repayment of both principal and interest. These units can sell assets or borrow. However, borrowing or selling assets to pay interest reduces the unit's equity increasing its liabilities and the prior commitment of future cash flows. Consequently, a Ponzi unit lowers the margin of safety afforded the holders of its debt. All modes of financing are vulnerable in various degrees with hedge financing being only

²³³ Minsky (n 176) 223.

²³⁴ Including principal and interest.

²³⁵ Minsky (n 176) 200-4.

²³⁶ Ibid 79.

²³⁷ Refinancing by issuing new to debt to meet new obligations on mature debt.

vulnerable to miscalculations on future income,²³⁸ and speculative and Ponzi finance being vulnerable to volatility in financial markets. In a system dominated by hedge financing, it can be demonstrated that the economy may be an equilibrium seeking and accommodating system. Conversely, where there are higher levels of Ponzi or speculative finance, there is a greater probability that the economy becomes a deviation escalating system.

a. Financial Instability Hypothesis Theorems

The first FIH theorem states that there are financing regimes under which the economy is stable and Instable.²³⁹ The second theorem is to the effect that during long periods of prosperity, the economy moves from financial relationships that stabilise it to financial relationships that destabilise it.²⁴⁰ While financing regimes are basically an issue of choice, and can be moulded by institutional guidance, capitalist economies inherently tend to destabilise. This can be attributed to the fact that in an economy in which hedge financing enjoys hegemony, a competitive advantage can be obtained by promoting the use of speculative finance.²⁴¹ This increases a demand for assets and consequently creates capital gains. The presence and expectation of capital gains leads to an increase in speculative finance due to the assumption that capital gains will erase any discrepancies between liabilities and future income. In an economic atmosphere permissive of recurring rollover of debt, even more economic units switch to Ponzi finance due to competitive pressures. It can therefore be concluded that the shifts from states of economic health to states of fragility are endogenous phenomena.²⁴²

In other words, capitalist economies transit from financial constructs dominated by hedge finance units to structures dominated by speculative and Ponzi finance units. Moreover, where an economy in an inflationary state has a substantial number of speculative finance units, authorities intervene to curb inflation through a restricted monetary policy this turns the speculative units to

²³⁸ Attributable to changes in the performance of the firm or in the general economic atmosphere.

²³⁹ Hyman Minsky, 'Financial Instability Hypothesis' in Philip Arestis and Malcolm Sawyer (ed), *The Elgar Companion to Radical Political Economy* (Edward Elgar Publishing 1994) 157.

²⁴⁰ *ibid.*

²⁴¹ Offering short-term finance at high interest rates. See Minsky (n 176) 234.

²⁴² *Ibid* 234.

Ponzi units with their net worth rapidly deteriorating as a result of which Ponzi units will try to meet their maturing obligations by selling out positions which can result in a systemic collapse in asset values. FIH as a model of the modern capitalist economy does not rely on exogenous shocks to explain business cycles as MFT does.

b. Regulatory implications of the Financial Instability Hypothesis

Under FIH, where there is no precautionary intervention on the part of regulators, financial systems can swing from states of robustness to states of fragility and ultimately, crisis. When individual units are unable to refinance their debt, this invalidates past expectations that obligations will be met in the future. This decreases liquidity in the financial system which leads to a scaling back of lending and refinancing on the part of banks who will also be faced with restrictions necessary for their survival. A downwards spiral in the amount of liquidity available in financial markets then activates major downward adaptations of asset prices in the economy which can lead to a recession or depression.

Following Keynes's precept, FIH contextualises the role of regulatory bodies particularly that of Central Banks as central in financial systems. To avoid the recessions that are a natural result of financial systems swings, Central Banks have to offer lender of last resort provisions. This means that regulators have to be ready to refinance debt of systemically important by injecting liquidity into the system. They also have to be ready to buy or guarantee unattractive assets.²⁴³ However, these government sponsored bailouts come at great cost to the tax payer and create a moral hazard problem. To address this issue, Minsky suggests that regulatory bodies need to address the root cause of financial instability²⁴⁴ or they are rest assured that there will be another crisis and that 'lender of last resort interventions must lead to legislated or administered changes that favour hedge finance.'²⁴⁵

²⁴³ Ibid 43.

²⁴⁴ Ibid 101.

²⁴⁵ Ibid 364.

The FIH addresses issues connected with banks which Minsky regarded as the most central financial institution of a capitalist economy.²⁴⁶ Though this is no longer the situation in today's market based credit systems, this assertion was certainly true at the time it was made. Katharina Pistor notes that Minsky's definition of banks as entities that create and market any credit instrument is very broad.²⁴⁷ Pistor further notes that distinctions between banks and other types of financial institutions that deal with money are merely 'historical accidents.'²⁴⁸ Fixing financial institutions into a typology of regulated financial entities can obstruct adaptation in a quickly evolving economic environment.²⁴⁹ Regulation should therefore address activities in financial markets that encourage financing that has destabilising effects on the economy. For instance through ensuring that banks keep certain liquidity reserves in cash, and requiring banks to contribute to a stability fund during boom years.

c. Conclusion on the Financial Instability Hypothesis

To summarise, FIH posits that financial markets swing between states of health and fragility. That is, financial systems tend towards crisis. Following the precepts of FIH regulators have to address the root cause of financial instability which boils down to curbing speculative activities to prevent the recurrence of crisis.

2.5.3. Imperfect Knowledge Economics

Opposing the approach canonised by MFT and ignoring the emphasis placed on irrationality by behavioural finance, Imperfect Knowledge Economics (IKE) centres its economic analysis on non-routine change and imperfect knowledge.²⁵⁰ Incorporating elements of the FIH and building on the concept of Knightian uncertainty, IKE hypothesizes that financial markets are inherently unstable²⁵¹ and cites protracted swings in asset prices which can alter

²⁴⁶ *ibid* 354.

²⁴⁷ Pistor (n 38) 28.

²⁴⁸ *ibid*.

²⁴⁹ *ibid*.

²⁵⁰ Roman Frydman and Michael Goldberg, *Imperfect Knowledge Economics* (Princeton University Press 2007) 6.

²⁵¹ *ibid* 1.

consumption and investment behaviour as evidence of this instability.²⁵² IKE consequently seeks to explain these changes in asset prices. IKE further theorises that due to their awareness of the imperfection of information and the inherent instability of financial markets, rational market participants formulate strategies to keep up with the imperfect knowledge constraint on a daily basis by revising their investment strategies.²⁵³ It is therefore these strategies and their subsequent revisions that are responsible for swings in asset prices over protracted periods of time.²⁵⁴ IKE characterises the functions of financial markets in a manner similar to MFT describing said functions as: first, the provision of evaluations of an entity's asset. Second, ensuring prices reflect projected returns of previous investments in addition to evaluations of fresh investments seeking capital/financing. Third, the allocation of capital/financing based on these price signals.²⁵⁵ However, the paths of MFT and IKE diverge when it comes to issues of change and knowledge as IKE emphasises 'non-routine change' and 'imperfect knowledge' noting that innovation is a prominent feature of modern economies. Especially in the financial context and innovation itself influences future profits from investment in an unpredictable manner.²⁵⁶

Due to the inherently non-routine nature of economic change, investments decisions are coloured with an element of the 'non-routine.' Regardless of this fact, market participants still invest expecting future returns. This leads to an ineluctable revision of expectations in the future upon the receipt of new information. These revisions can be non-routine events which pose systemic risk. While IKE agrees with MFT that market participants are rational,²⁵⁷ IKE posits that market participants are not omniscient and consequently can neither predict the future nor extrapolate lessons from the past. Information can however be used to formulate investment strategies until new information is revealed or an event occurs that necessitates a change. This explains the constant hunt for information by market participants as it is used to evaluate

²⁵² *ibid.*

²⁵³ *ibid* 117-147.

²⁵⁴ A situation that renders the theories and models of modern finance theory useless, *Ibid* 46.

²⁵⁵ *Ibid* 149.

²⁵⁶ *ibid* 41.

²⁵⁷ Implicitly disagreeing with proponents of behavioural finance.

the continued efficacy of their investment strategies. Prices created by this process consequently reflect the relative value of several assets at a fixed point in time. This price in turn dictates what level of access an economic unit has to finance.

While generally, the behaviour of rational market participants is uniform; imperfect knowledge and non-routine change can transmute this uniform, rational behaviour at unpredictable times.²⁵⁸ This peaks when a sufficient amount of market participants change their investment strategies as this can dictate swings in asset prices. Based on this hypothesis, IKE critiques MFT's postulations that markets reach equilibrium outcomes therefore ensuring efficient allocation of society's capital²⁵⁹ due to the fact that the basis for the derivation of consistent economic models involves the assumption that financial markets can be reasonably predicted. A consequence of this assumption is the absence of a need to adapt investment strategies to unforeseen events.²⁶⁰ EMH's assertions to the effect that assets have an intrinsic value which is fully reflected by their price in EMH's strongest form is also dismissed by IKE²⁶¹ as the process of obtaining this value assumes that market participants are prescient when experience dictates that market participants can not anticipate future prices.²⁶²

One might imagine that in capitalist economies, spurning the tenets of MFT negates the very function of financial markets but IKE argues that financial markets are the best option available as their purpose is to evaluate assets and allocate capital in a world characterised by imperfect knowledge and non-routine change therefore helping society deal with these two elements. Once an analysis of financial markets is centred on imperfect knowledge and non-routine change, the effect of imperfect knowledge on asset swings and consequently financial instability are recognised and can be effectively dealt with.²⁶³

²⁵⁸ Frydman and Goldberg (n 250) 12.

²⁵⁹ *ibid* 150.

²⁶⁰ *ibid* 58.

²⁶¹ *ibid* 81.

²⁶² *ibid* 91.

²⁶³ *ibid* 228-229.

a. Regulatory Implications of Imperfect Knowledge Economics

The major purpose of regulation under IKE is the coordination of investment strategy correction before asset prices reach exorbitant heights. Therefore, regulations should ameliorate the effects of imperfect knowledge and non-routine change. IKE insists that regulatory bodies are not better positioned to make allocative decisions and do not possess information of higher calibre than that of private actors. Therefore, the role of government agents is not to supplant that of markets but rather to guide an intrinsically instable system as this instability negates any assumptions that capital is allocated efficiently. This can be achieved through two methods namely: 'guidance range measures' and 'excess dampening measures.'²⁶⁴

Guidance range measures signal the fact that markets have surpassed historical benchmarks for asset prices. IKE argues that the use of historical benchmarks in setting guidance ranges is supported by a substantial body of evidence.²⁶⁵ While the calculation of these benchmarks will no doubt be the source of much controversy, employing established data curtails the discretion of regulators.²⁶⁶ State actors could therefore actively monitor trends in asset prices and give public warnings when asset prices overshoot standardised benchmarks therefore enabling market participants bring their investment strategies into harmony.²⁶⁷ This analysis necessarily involves the consideration of an extremely broad range of factors such as technological and financial innovation and other non-routine economic, political and social changes as these factors can nullify historical data.²⁶⁸ Just as market participants are constantly on the hunt for new information and forms of financial innovation and subsequently revise their investment strategies, regulators must also be mindful of these factors when developing guidance ranges and must undertake painstaking research on the contemporary level of such change as well as on the impact of said change on market participants.

²⁶⁴ *ibid* 217.

²⁶⁵ For an in-depth analysis of said evidence, see Chapter 10, Frydman and Goldberg (n 250).

²⁶⁶ *ibid* 230.

²⁶⁷ *ibid* 231.

²⁶⁸ For an analysis of how significant non-routine changes can fundamentally affect economic values, see Ben Benarke, 'Asset-price 'Bubbles and Monetary Policy' Speech at the National Association for Business Economics, New York, (2002) 6.

However, just as is the case with market participants, regulators cannot rely solely on models when assessing risk but must also utilise their intuition and wealth of experience when setting these guidance ranges.

Excess dampening measures are a more proactive regulatory strategy requiring regulatory intervention in financial markets when the trading behaviour of market participants leads to excessive swings in asset prices. The purpose of this intervention should therefore be to encourage the trading behaviour of market participants whose bids are moving prices back to more moderate levels.²⁶⁹ Due to the uncertain efficacy of guidance ranges, more proactive measures might have to be implemented. Guidance measures are however certain to have a stronger deterrent effect on market participants when regulators announce that they are ready to follow up their guidance ranges with positive prudential action.

One of these excess dampening measures is the use of differential margin requirements for Bulls and Bears which involves the announcement of changes in collateral requirements which should be set differently for bulls and bears therefore operating to influence market participant's assessment of risk.²⁷⁰ A stratified version of this approach is recommended for financial intermediaries who have strong exposures to certain markets, for example, housing.²⁷¹ Katharina Pistor however points out that capital requirements should be used with caution as past experiences show that the efficacy of margin requirements can be undermined by regulatory arbitrage. Financial markets and products are evidence of the fact that the imposition of capital requirements can prompt the exploration of avenues to comply with said regulations while ensuring that assets remain unencumbered.²⁷² A consequence of this is that margin requirements are rendered ineffective and even worse, additional risk is created which might not be recognised by market participants or regulators.

²⁶⁹ Frydman and Goldberg (n 250) 235. This strategy has been ignored by MFT due to its explanation of asset pricing through the actions of a representative agent.

²⁷⁰ Frydman and Goldberg (n 250) 243.

²⁷¹ Ibid.

²⁷² Pistor (n 38) 46.

b. Conclusion on Imperfect Knowledge Economics

To summarise, IKE posits that the wild swings in asset prices which can trigger financial crisis are a result of imperfect information and non-routine change. To curtail the possibility of financial crisis, regulators can make use of guidance range measures and excess dampening tools.

2.6. Conclusion

This chapter has established that theory matters for the regulation of financial markets. The tenets of MFT declare that asset prices are set by rational and efficient markets, the mode of financing of an asset is irrelevant, that risk can be quantified and finally, that systemic risk can definitively be accounted for using quantitative methods. This led to the deregulation of financial markets generally and OTC-DMs specifically due to regulators' belief in MFT's ideology. This chapter has however argued that this problematic reliance on MFT in developing regulatory strategy contributed in part to the GFC. This finding has profound implications for the manner in which financial markets generally and OTC-DMs specifically are regulated and calls for a shift away from the economic orthodoxy that enjoyed hegemony prior to the GFC. To this end, this chapter has considered alternative theories of finance which emphasise endogenous risk, that is, the irrational and instable nature of financial markets as opposed to the rational equilibrium seeking financial markets advocated by MFT. In this respect, behavioural finance argues that financial markets are neither rational nor efficient, FIH posits that financial markets swing between states of robustness and fragility and IKE argues that swings in asset prices are a result of uncertainty and imperfect information.

The perspectives afforded by these alternative theories of finance on the pricing of assets and the effect of said pricing on financial stability depart radically from that of MFT. While MFT makes the pricing mechanism central to its various hypotheses, behavioural finance asserts that financial markets are beset with irrationality which can cause substantial deviations in the pricing mechanism; IKE argues that prices created in the manner propounded by EMH are prone to sudden swings. FIH goes beyond the thesis of uncertainty advocating that uncertainty about the future is not limited to imperfect

knowledge but is also linked to the availability of liquidity in financial markets. Therefore, while MFT concentrates on the elimination of information costs to ensure the proper pricing of financial assets, behavioural finance mandates the placement of constraints on irrational exuberance in financial markets and the recognition of bounded rationality, IKE advocates the amelioration of the information constraint, and FIH mandates that financial institutions have to be transformed into more stable forms and promotes the use of hedge as opposed to Ponzi finance to correct deviations in financial markets.

Governing financial markets beset with irrationality, uncertainty and imperfect information requires providing solutions to vexing questions on the appropriate market infrastructure and governance systems. The major difficulty for any governance regime would be ensuring financial stability and continued innovation simultaneously. This would be a departure from the tenets of MFT focused legislation which views innovation in financial markets as improving allocative efficiency. IKE and FIH both note that financial innovation is an intrinsic part of modern financial markets which leads to the inference that markets adapt quickly to new information. To ensure that enacted regulation does not calcify, regulation governing financial markets should be dynamic and invest substantial discretion in regulators to determine when financial market activity poses a threat to systemic stability.

Due to the imperfect nature of information in the IKE world, regulators would have to be granted flexibility and discretion to design and adapt rules to better fit with current information. A regulatory strategy that constantly focuses on the creation of rules after periods of crisis may not keep up with innovation in financial markets and can therefore be rendered ineffective by non-routine change in financial markets.²⁷³ These rules can also lead to the practice of regulatory arbitrage especially where the governance system is rigid and specific.²⁷⁴ From an FIH perspective, financial innovation utilising Ponzi finance can obscure regulator's abilities to predict interruptions in the flow of

²⁷³ William Simon, 'Optimization and its Discontents in Regulatory Design: Bank Regulation as an Example' (2010) 4(1) Regulation & Governance 3.

²⁷⁴ Katharina Pistor and Chenggang Xu, 'Incomplete law' (2003) 35 Journal of International Law and Politics 931.

liquidity. Pistor notes that competitive financial markets naturally engender the creation of new types of financial instruments which even though illiquid may be made attractively liquid through the use of dealer mediated liquidity risk management services, the use of insurance, and the derivation of opaque financial instruments from other financial instruments.²⁷⁵ This can result in the systemic risks inherent in these instruments going unrecognised until there is an interruption in flow of liquidity which poses a threat to the financial system and the economy as a whole. Consequently, regulators need to adequately monitor all financial instruments and extrapolate the risks inherent in them. This might however prove difficult due to the rapid pace of innovation in competitive financial markets. In conclusion, the inference can be made that regulation should evolve along with markets with direct state intervention in markets to ensure stability as and when needed.²⁷⁶ A behavioural finance perspective on the other hand gives rise to a presumption in favour of strong investor protection law, the restriction on trades in financial markets to guard against the irrational exuberance of noise traders and in the worst case scenario a willingness on the part of the state to act as a lender of last resort.

This analysis points to the need for wide spread institutional reform in financial markets. Reforming financial markets particularly OTC-DMs goes beyond the reduction of information costs and requires pro-active state regulation to preclude the proliferation of systemic risk. OTC-DMs embody the financial innovation and dynamism inherent in financial systems in capitalist economies²⁷⁷ and as the GFC has proven, are also of significant systemic importance. Regulating OTC-DMs requires an ability on the part of regulators to regulate new products and keep up with innovations in these markets. To this end, the subsequent Chapters 3, 4, 5 and 6 investigate post-GFC reforms in OTC-DMs as embodied in the G20 undertaking.²⁷⁸

²⁷⁵ Pistor (n 38) 55.

²⁷⁶ Charles Sabel, 'Learning by Monitoring: The Institutions of Economic Development' in Neil Smelser and Richard Svedberg (ed), *Handbook of Economic Sociology* (1995).

²⁷⁷ Awrey (n 1) 240.

²⁷⁸ G20, 'G20 Leaders Statement: The Pittsburgh Summit (2009)' https://g20.org/wp-content/uploads/2014/12/Pittsburgh_Declaration_0.pdf

Chapters 3 and 4 examine the implementation of the CCP prescription in the EU and US, investigating the effects if any of MFT on reforms in OTC-DMs, and utilising insights from alternative theories of finance examined in this chapter as an evaluative framework assesses the viability of these reforms. Similarly, Chapter 5 first investigates the influence if any of MFT on the implementation of the reporting obligation in the EU and US, it also subsequently critiques this reform using alternative theories of finance as an evaluative framework. Chapter 6 performs the same investigation in relation to the centralised trading requirement.

Chapter 3: The Central Counterparty Prescription: Placebo or Cure?

3.1. Introduction

Pre-GFC, the clearing and settlement of OTC derivatives did not garner much attention due to the inherently bilateral nature of OTC-DMs. However, the GFC highlighted several lacunae in the management of the counterparty credit risk by systemically important financial institutions - accentuated by the failure of several systematically important financial institutions in G20 countries.¹ Post-GFC the clearing of OTC derivatives trading has become a priority on the global financial reform agenda as evidenced by the G20 recommendation at its 2009 meeting in Pittsburgh that all standardised OTC derivatives be cleared through central counterparties (CCPs)² to mitigate credit risk.

At first glance, the CCP prescription and its attendant positive implications, for example, increased liquidity and transparency, standardisation, legal and operating efficiencies, and increasingly efficient credit risk management³ are laudable. However, Chapter 2 of this thesis has shown that theory moulds our conceptualisation of financial markets and consequently shapes the manner in which we regulate financial markets. This thesis in Section 2.4 has also shown that 'flawed' theories can have adverse consequences. Operating on the presumption that theory matters for how we regulate, this chapter first comparatively analyses the implementation of the CCP prescription in the US and EU, and then interrogates the theoretical rationales for the CCP prescription, investigating what influence MFT might have had, and utilising alternative theories of finance as an evaluative framework. To this end, in section 3.2, this chapter provides some background on the clearing and settlement of securities and the nature of CCPs. Subsequently, this chapter provides an analytical, comparative and theoretical analysis of clearing generally in the EU and US in section 3.3. This chapter subsequently

¹ Tariq Rasheed, 'We Live in Regulatory Times: The Regulatory Capital Implications for Cleared Derivatives' (2014) 6 *Journal of International Financial Law* 385.

² G20, 'G20 Leaders Statement: The Pittsburgh Summit' (2009) https://g20.org/wp-content/uploads/2014/12/Pittsburgh_Declaration_0.pdf

³ Gerry Kounadis, 'European Market Infrastructure Regulation and Central Clearing: A Conceptual, Legal and Compliance Perspective' (2014) 29(9) *Journal of International Banking Law and Regulation* 562.

considers the scope of the CCP prescription in Section 3.4 and the extraterritoriality of EU and US CCP prescriptions in Section 3.5. This chapter concludes in Section 3.6 that the CCP prescription may be a placebo and not a panacea. This chapter subsequently tenders non-exhaustive recommendations, which may increase the efficacy of the CCP prescription. In addition, this chapter does not discount the utility of the CCP prescription entirely due to the yet unexplored interconnections between the CCP prescription, regulatory prescriptions on CCP operation and access, and other aspects of the G20 reforms.

3.2. Clearing, Settlement, and CCPs

In modern financial markets, intermediated structures have become vital in ensuring the efficient operation of security transactions.⁴ Upon the conclusion of a financial transaction involving securities, two processes known as clearing and settlement take place. Clearing and settlement describes the process after the agreed sale of a security by which the rights and obligations of the parties to the trade are ascertained and subsequently performed.

Clearing is defined as ‘the process of establishing positions, including the calculation of net positions, and ensuring that financial instruments, cash, or both are available to secure the position.’⁵ These processes include the transmission, reconciliation, and where necessary confirmation of transfer orders before settlement. Clearing derivative transactions also involves the calculation of net positions. Consequently, clearing ensures that all requisite steps necessary for settlement have taken place.⁶ Additionally, in the case of standardised derivatives, clearing involves the interposition of a CCP between the trading parties.⁷ It should be noted that while CCP clearing focuses on trade, collateral, risk, position, and delivery administration; central securities

⁴ Klaus Lober, ‘The Developing EU Legal Framework for Clearing and Settlement of Financial Instruments’ ECB Legal Working Paper Series No. 1 2006 6.

⁵ Article 2(3) EMIR. Lober notes that it is widely acknowledged that the definitions of clearing and settlement vary in several jurisdictions. See Lober (n 4) 6; Tina Hasenpusch, *Clearing Services for Global Markets* (Cambridge University Press 2012) 1.

⁶ European Commission, ‘Functional Definition of a Central Counterparty Clearing House’ 1 <https://www.esma.europa.eu/file/5752/download?token=1lcjakov>

⁷ Jon Gregory, *Central Counterparties: Mandatory Central Clearing and Initial Margin Requirements* (John Wiley & Sons 2014) 236.

depository clearing focuses on verifying and matching delivery mandates. Settlement describes the process through which the contractual obligations of parties to a trade are fulfilled.⁸ Settlement typically occurs on a delivery-versus-payment basis which involves the delivery of the contractually agreed securities in exchange for the payment of the contractually agreed price.⁹ Where a transaction has not been netted by a CCP at the clearing stage, netting can be utilised at the settlement stage to minimise the number of settlement transactions. In the case of derivatives, there may be several instances of clearing and settlement due to the multiple requests for the delivery of variation margin during the life of the contract.

Despite the important role played by financial market infrastructure particularly clearing and settlement in facilitating the smooth operation of the financial system as highlighted above, clearing and settlement procedures were not a priority in OTC-DMs pre-GFC. OTC derivative contracts were typically settled by contractual parties themselves, with the parties individually taking on the counterparty credit risk inherent in derivative transactions. These risks were mitigated by restricting derivative contracts to counterparties with high credit ratings,¹⁰ obtaining guarantees from a third party, adopting contractual credit risk mitigating strategies in the ISDA master agreement,¹¹ using a credit support annex to provide collateral against liabilities, and appointing a third party to administer collateral and payment requirements for a particular transaction.¹²

Post-GFC, the use and fortification of financial market infrastructure has gained prominence in regulatory strategies worldwide.¹³ Consensus that OTC derivatives should be centrally cleared was reached as evidenced by the G20 leader's commitment at their London Summit that: 'we will promote the standardisation and resilience of credit derivatives markets, in particular

⁸ Hasenpusch (n 5) 1.

⁹ James Moser, 'Contracting Innovations and the Evolution of Clearing and Settlement Methods at Futures Exchanges' (1998) SSRN Electronic Journal 4–5.

¹⁰ Hester Pierce, 'Derivatives Clearinghouses: Clearing the Way to Failure' (2016) 64 Cleveland State Law Review 597.

¹¹ For example, cross default clauses.

¹² This however increases transaction costs.

¹³ Pierce (n 10) 598.

through the establishment of central clearing counterparties subject to effective regulation and supervision.¹⁴ A position reinforced by the mandate at the 2009 G20 meeting in Pittsburgh extending the CCP prescription to all OTC derivatives. However, before going any further, an examination of the nature and operation of CCPs is necessary.

The Bank of International Settlements defines a CCP as ‘an entity that interposes itself between the counterparties to trades, acting as the buyer to every seller and the seller to every buyer.’¹⁵ The CCP’s default management procedures and resources protect parties to a derivative trade; significantly reducing the counterparty credit and liquidity risks inherent in OTC derivative transactions.¹⁶ CCPs achieve this mitigation of counterparty credit risk by guaranteeing the obligations of the respective traders’ contracts.¹⁷ The two counterparties are exposed to the CCP as opposed to their being exposed to each other, which involves some counterparty credit risk.¹⁸ This usually takes place through novation.¹⁹ Parties who deal directly with the CCP are known as clearing members and are bound by the CCP’s rules if they are to access the CCP’s clearing and attendant benefits. CCPs utilise ‘matched books’ which means that any position taken by one counterparty is counterbalanced by an

¹⁴ G20, ‘Declaration on Strengthening the Financial System’ (2009) <http://www.g20.utoronto.ca/2009/2009ifi.pdf>

¹⁵ Bank for International Settlement (BIS), ‘Recommendations for Securities Settlement Systems’, (2004) 5. It should be noted that CCPs are distinct from clearinghouses. A clearinghouse is a central mechanism through which market participants exchange payment obligations, and ensures that payment and delivery take place. Crucially, clearinghouses do not assume counterparty credit risk. See further Heikki Marjosola, ‘Missing Pieces in the Patchwork of EU Financial Stability Regime? The Case of Central Counterparties’ (2015) 52 *Common Market Law Review* 1491; Philipp Haene and Andy Sturm, ‘Optimal Central Counterparty Risk Management’ (2009) *Swiss National Bank Working Papers* 6.

¹⁶ Rehlon and Dan Nixon, ‘Central Counterparties: What are They, why do they Matter and how does the Bank Supervise Them?’ (2013) 2 *Bank of England Quarterly Bulletin* 1.

¹⁷ Jo Braithwaite and David Murphy, ‘Central Counterparties (CCPs) and the Law of Default Management’ (2017) 17 *Journal of Corporate Law Studies* 294.

¹⁸ Darrell Duffie and others, ‘Policy Perspectives on OTC Derivatives Market Infrastructure’ (2010) 24 *Federal Reserve Bank of New York Staff Report* 4; Stephen Lubben, ‘Always Crashing in the Same Car—Clearinghouse Rescue in the United States under Dodd–Frank’ (2017) 3 *Journal of Financial Regulation* 145.

¹⁹ Novation is a legal technique via which a contract is terminated and replaced by another contract. It is the only legal technique under English Law that can transfer contractual rights and obligations to a third party. See further Jo Braithwaite, ‘The Inherent Limits of ‘Legal Devices’: Lessons for the Public Sector’s Central Counterparty Prescription for the OTC Derivatives Markets’ (2011) 12 *European Business Organization Law Review* 105.

obverse position taken by a second counterparty. This results in CCPs avoiding market risks inherent in OTC derivative transactions.

While CCPs are greatly exposed to counterparty risk, which has the potential to leave their books unmatched, CCPs manage this risk in a number of ways the most important of which is obtaining margin from parties to the transaction. CCPs also perform a number of economically vital functions. The first benefit of CCP clearing is the ability to use multilateral netting (as opposed to bilateral netting).²⁰ CCPs also play an even more important role in the event of a members' default. CCPs as a matter of procedure usually have a number of rules and resources used to manage this default.²¹ These risk mitigation benefits of CCPs are considered in more detail in Sections 3.2.1 and 3.2.2.

3.2.1. Multilateral Netting

OTC-DM participants typically enter into offsetting transactions. These offsetting contracts and amounts owed on the relevant individual contracts can be netted.²² Netting can take two forms: payment netting and close out netting. Payment netting entails the netting of cash flows occurring on the same day – allowing for the combination of same day cash flows into one payment on a specified day consequently reducing settlement risk, and promoting operational efficiency.²³ Conversely, close out netting is triggered by the occurrence of an event of default.²⁴ These events of default are usually specified in the clearing agreement between clearing members and the CCP. Close out netting has been described as an 'advanced form of insolvency setoff that operates for executory contracts.'²⁵ For analytical purposes, closeout netting can be broken down into two components namely close out

²⁰ Rehlon and Nixon (n 16) 2.

²¹ Chryssa Papathanassiou, 'Central Counterparties and Derivatives' in Alexander Kern and Rahul Dhumale (ed), *Research Handbook on International Financial Regulation* (Edward Elgar 2012) 219.

²² Carl Pirrong, 'The Economics of Central Clearing: Theory and Practice' (2011) 1 ISDA Discussion Papers Series 7; Jon Gregory, *The Xva Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital* (John Wiley & Sons 2015) 50–51; Gregory (n 7) 240.

²³ Gregory (n 7) 60.

²⁴ Christian Chamorro-Courtland, 'The Trillion Dollar Question: Can a Central Bank Bail out a Central Counterparty Clearing House Which Is too Big to Fail?' (2012) 6 Brooklyn Journal of Corporate, Financial and Commercial Law 442.

²⁵ Ibid 441.

which involves the termination of derivative transactions with the defaulting counterparty and cessation of all contractual payments; and netting, which confers the right to setoff amounts due upon the termination of the contracts, and obtain a net balance comprised of gains and losses.

Counterparty risk is reduced when a CCP nets exposures across all members. This results in one smaller exposure as opposed to several large exposures.²⁶ Post-novation, the CCP positions itself between the buy side and sell side of a trade. This gives room for the netting of gross exposures,²⁷ which reduces losses in the event of a default. Multilateral close out netting enables CCPs terminate a defaulting clearing members' positions and calculate any amounts owed by or due to the defaulting party. CCP multilateral netting also alleviates liquidity constraints placed on clearing members by contractual obligations. This is because whether payment obligations arise because of a single settlement date or over the life of a contract, the CCP calculates a single net amount to be paid by each member.²⁸

3.2.2. Default Management

Payments due to the CCP have to be matched. If a clearing member defaults, the CCP has to fulfil its obligations to its other clearing members. To this end, CCPs have rules, procedures, and resources to safeguard a well-ordered and coherent path to member default. For example, the CCP can hedge the defaulted positions or shop around for new counterparties to acquire the defaulting party's positions. This usually starts with an auction of the defaulting party's positions to other clearing members.²⁹ CCPs also usually have

²⁶ Gregory (n 22) 200; Rama Cont and Thomas Kokholm, 'Central Clearing of OTC Derivatives: Bilateral Vs Multilateral Netting' (2014) 31 *Statistics & Risk Modeling* 3; Viral Acharya and Alberto Bisin, 'Counterparty Risk Externality: Centralised Versus Over-the-Counter Markets' (2014) 149 *Journal of Economic Theory* 153; Craig Pirrong, 'A Bill of Goods: CCPs and Systemic Risk' (2014) 2 *Journal of Financial Market Infrastructure* 55; Darrell Duffie and Haoxiang Zhu, 'Does a Central Clearing Counterparty Reduce Counterparty Risk?' (2011) 1 *Review of Asset Pricing Studies* 74.

²⁷ Gross exposure is the value used to measure exposure to financial markets and equals the value of long positions and short positions.

²⁸ Rehlon and Nixon (n 16) 4.

²⁹ CCP rules will usually require non-defaulting clearing members to submit good faith bids on auctioned positions and will contain sanctions for non-compliance. Where an auction is unsuccessful, CCPs can forcibly allocate positions amongst clearing members. See David Murphy, *OTC Derivatives: Bilateral Trading and Central Clearing: An Introduction to Regulatory Policy, Market Impact and Systemic Risk* (Palgrave Macmillan 2013) 198; Jo Braithwaite and David Murphy, 'Got to be Certain:

financial resources provided by the defaulting parties, the CCP itself, and by non-defaulting members of the CCP in that order which can be used to offset the CCP's obligations.³⁰ These funds are called the CCP's default waterfall.³¹ These financial resources are discussed below.

a. Margin

CCPs are exposed to the counterparty risk of their members and consequently require said clearing members to post collateral.³² The initial line of defence utilised by CCPs in the event of a member's default, margin is the collateral provided³³ by the defaulting member that can be used to offset said defaulting member's exposures in a legally enforceable manner.³⁴ CCPs require two types of margin namely initial margin and variation margin. Initial margin is the collateral posted to the CCP at the beginning of a trade and can be used³⁵ to offset any losses or obligations that arise.³⁶ Typically, a CCP uses initial margin to offset any possible close out losses that may occur in the event of a default. Initial margin is usually calculated by reference to various scenarios of possible price movements over an assumed close out period,³⁷ utilising models³⁸ which are in return reliant on specific assumptions.³⁹ Acceptable forms of initial margin include cash, sovereign debt, equity indices, gold, and

The Legal Framework for CCP Default Management Processes' (2016) 37 Bank of England Financial Stability Paper 7.

³⁰ The order in which these drawdowns are arranged helps constrain the occurrence of perverse incentives.

³¹ Gregory (n 7) 134; Norman Feder, 'Deconstructing Over-the-Counter Derivatives' (2002) Columbia Business Law Review 733.

³² Manmohan Singh, 'Collateral, Netting and Systemic Risk in the OTC Derivatives Market' (2010) WP/10/99 IMF Working Paper 6.

³³ Usually via transfer or pledge. That is, the transfer of legal possession of the margin by a title transfer, or the transfer of an interest in the margin excluding possession. The former is a preferred method for the margin recipient as it shields them from legal risk; conversely, the latter method is more beneficial for the margin giver in light of possible problems that arise with the handling of margin by the recipient.

³⁴ Gregory (n 7) 75; Hasenpusch (n 5) 78.

³⁵ Or liquidated.

³⁶ Rehlon and Nixon (n 16); David Elliott, 'Central Counterparty Loss-Allocation Rules' (2013) 20 Bank of England Financial Stability Paper 5.

³⁷ Known as the Margin Period of Risk. See further Gregory (2014) 137.

³⁸ These models typically factor in the volatility and fungibility of the underlying, and the size of the position. Darrell Duffie and others (n 18).

³⁹ Pierce (n 10) 606.

government treasury bonds.⁴⁰ Variation margin helps limit exposures that result from changes to market price over the duration of the contract.⁴¹ To this end, the CCP calculates the gains and losses on each clearing member's portfolio; this can occur on a daily or more frequent basis.⁴²

The CCP's calculations of the underlying positions are usually based on third party sources, price submissions by members, and the CCP's own valuation models. Variation margin for fungible derivative instruments is calculated by marking to market.⁴³ Less liquid instruments on the other hand require that the CCP mark to model.⁴⁴ The freedom given to CCPs when valuing all underlying positions is particularly important in the OTC derivative context as OTC derivatives are typically illiquid instruments with long maturity periods.⁴⁵ Usually, cash is the only acceptable form of variation margin in contrast to other liquid securities⁴⁶ that may be admissible as initial margin. The contractual frequency of margin calls is an important aspect of margin usage. Frequent margin calls may maximise risk reduction but may lead to liquidity and operational challenges.⁴⁷ The period between the cessation of margin posting and the successful closing out and replacement of all underlying trades is known as the margin period of risk (MPR).⁴⁸ The MPR is a combination of two periods namely: first, pre-default, which is comprised of the contractual period for making margin calls, operational delays in requesting and receiving margin, disputes on the amount of margin, and provided grace periods. Second is post-default, which comprises closing out trades, hedging or replacing positions, and auctioning trades.⁴⁹

⁴⁰ Dietrich Domanski and others, 'Central Clearing: Trends and Current Issues' (2015) December BIS Quarterly Review 72-73; IMF, 'Making OTC Derivatives Safer: The Role of Central Counterparties,' Global Stability Report: Meeting New Challenges to Stability and Building a Safe System (IMF 2010) 17.

⁴¹ Gregory (n 22) 69–70.

⁴² Ibid 33; Durbin, *All about Derivatives* (McGraw-Hill 2011).

⁴³ Sean Griffith, 'Governing Systemic Risk: Towards a Governance Structure for Derivatives Clearinghouses' (2012) 61 *Emory Journal of Law* 1183.

⁴⁴ Ibid.

⁴⁵ Gregory (n 7) 136.

⁴⁶ Hasenpusch (n 5) 30.

⁴⁷ Discussed *infra* Section 4.3.

⁴⁸ Gregory (n 7) 77.

⁴⁹ Ibid 78.

To prevent the occurrence of issues at the pre-default stage, CCPs make daily or intra-daily cash only variation margin calls⁵⁰ exercising complete autonomy over the margin calculation process, and not guaranteeing a default grace period. CCP mechanisms for dealing with the post-default period include auctions, with CCPs assuming MPRs of over 5 days.⁵¹ CCPs may also apply haircuts to the value of the margin to compensate for the deterioration in value of the margin over a period.⁵² Margin rules ensure that CCPs are insulated from credit, liquidity, and market risks.

b. Central Counterparty Membership

Clearing members are entities authorised to involve the CCP in derivative trades, either directly acting as agents of the CCP when transacting with the counterparty, or indirectly by novating a discrete contract entered into with the counterparty.⁵³ CCPs have highly selective membership requirements due to the need to manage risks effectively. These requirements pertain to clearing members' creditworthiness, liquidity, and operational reliability. These requirements are crucial due to the important role played by clearing members in the mutualisation of risks.⁵⁴ Clearing is consequently often limited to financial entities with the requisite financial and technical resources.⁵⁵ The harshness of this regime is however remedied by the fact that firms can nevertheless access CCP services as clients of clearing members.⁵⁶

c. The Default Fund, CCP Equity, and Capital Contributions

The use of margin as a risk mitigation tool is dependent on a CCP's ability to resolve positions of a defaulting clearing member in a timely and orderly

⁵⁰ Eliminating settlement delay.

⁵¹ A more stringent assumption than that set out in the Basel III requirements.

⁵² CCPs usually take into consideration the liquidity of margin, default risk of the security, volatility of the underlying market, maturity of the security, any possible correlation between the default of the counterparty and the margin's value (wrong-way relationship). See further Gregory (n 7) 78.

⁵³ Griffith (n 43) 1177.

⁵⁴ Murphy (n 29) 147; Gregory (n 7) 33-34.

⁵⁵ Typically large banks and hedge funds. Jo Braithwaite, 'The Dilemma of Client Clearing in the OTC Derivatives Markets' (2016) 17 *European Business Organization Law Review* 355; Lieven Hermans and others, 'Central Counterparties and Systemic Risk' (2013) 6 *European Systemic Risk Board: Macro-prudential Commentaries* 6.

⁵⁶ Craig Pirrong, 'The Inefficiency of Clearing Mandates' (2010) *SSRN Electronic Journal* 8.

manner. Where this is not possible, for example, where a derivative instrument is not fungible, or where fire sale conditions lead to a decline in the price of a liquid instrument, CCPs will usually have to resort to a variety of resources they can draw on in the event of the insolvency of a clearing member.⁵⁷ CCPs mutualise risk by reallocating the risk of a member's default amongst all members and usually require that members contribute to the CCP's default fund before members can access the CCPs services. Consequently, where the collateral posted by a defaulting party cannot meet the amount owed, the CCP then draws on the defaulting members' contribution to the CCP default fund. The CCP can also draw on the default fund contributions of non-defaulting members but to ensure that the CCP curtails losses as much as possible, the CCP may first have to contribute some of its own resources.

Contributions to the CCP's default fund are usually calculated on the basis of the relevant clearing member's trading activity. When the defaulting member's contribution has been exhausted, the CCP then draws on the default fund contributions of non-defaulting members. If this amount is exhausted, the CCP may call for the contribution of other amounts from its clearing members. These contributions usually have a predetermined limit and are referred to as rights of settlement. In rare occasions; this amount may not be limited.⁵⁸ Once right of settlement funds are exhausted, the CCP's only resort is its remaining equity, and once this is exhausted, the CCP becomes insolvent.

3.3. An Overview of Current Regulation

The advantages offered by CCP clearing particularly the mitigation of counterparty credit risk and simplification of exposures makes it unsurprising that the G20 have mandated that 'All standardized OTC derivative contracts should be... cleared through central counterparties by end-2012 at the latest.'⁵⁹

⁵⁷ Griffith (n 43) 1184.

⁵⁸ Murphy (n 29) 148. Murphy further notes at 174 that unlimited liability as regards satisfying capital calls is problematic for clearing members as it creates potential unlimited liability which in turn triggers an unlimited capital requirement. He further notes that this is dealt with by the Basel Committee, which provides calculations for the capital requirements for unfunded commitments. See Bank of International Settlement 'Capital Requirements for Bank Exposures to Central Counterparties' (2014) <http://www.bis.org/publ/bcbs282.pdf>.

⁵⁹ G20, 'G20 Leaders Statement: The Pittsburgh Summit' (2009) <http://www.g20.utoronto.ca/2009/2009communique0925.html>

Having briefly examined the concepts underpinning clearing and settlement, this chapter now considers the implementation of the G20's CCP prescription in the EU and US. Chapter 2 of this thesis highlighted mainstream finance theory's contribution to the curtailment of regulatory oversight in OTC-DMs pre-GFC. Post-GFC, a significant amount of regulatory coordination has taken place with the International Organisation of Securities Regulators' Principles for Financial Market Infrastructures (PFMI)⁶⁰ playing a particularly important role in this regard. Pursuant to the G20 mandate, and the standards set out in the PFMI, the EU and US have undertaken substantial legislative reforms to reduce systemic risk and prevent OTC-DM manipulation.⁶¹ These reforms have taken the form of various rules mandating the clearing of OTC derivatives and authorising relevant regulatory authorities to oversee activities in OTC-DMs. A general analysis as well as a comparative and theoretical analysis of these regulatory reforms is undertaken below.

a. European Union

In response to the G20 mandate, EU legislators have created a tiered regulatory framework which emphasises the harmonisation of EU OTC derivatives regulation. This extremely detailed regulatory framework⁶² primarily consists of the EMIR of 4 July 2012. EMIR defines a derivative as including options, futures, swaps, forward agreements and other derivative contracts relating to securities, currencies, interest rates, financial indices, commodities, financial contracts for difference and credit default swaps.⁶³ An OTC derivative is one not executed on a regulated EU market or equivalent non-EU market.⁶⁴

⁶⁰ Committee on Payment and Settlement Systems and International Organization of Securities Commissions, 'Principles for financial market infrastructures,' (2012) <https://www.bis.org/cpmi/publ/d101a.pdf>.

⁶¹ Daria Latysheva, 'Taming the Hydra of Derivatives Regulation: Examining New Regulatory Approaches to OTC Derivatives in the United States and Europe' (2012) 20 *Cardozo Journal of International and Company Law* 487.

⁶² Paola Lucantoni, 'Central Counterparties and Trade Repositories in Post-Trading Infrastructure under EMIR Regulation on Derivatives' (2014) 29(11) *Journal of International Banking Law and Regulation* 682.

⁶³ Article 2(5) EMIR by reference to Points 4–10 of Section C of Annex I to the Markets in Financial Instruments Directive (MIFID).

⁶⁴ Article 2(7) EMIR.

EMIR requires the clearing of OTC derivatives via CCPs that have been authorised to carry out clearing activities by the relevant EU authorities.⁶⁵ The European Securities and Market Authority (ESMA) is empowered⁶⁶ in tandem with members of the European System of Central Banks⁶⁷ to oversee and regulate OTC-DMs and specifically, with the oversight of clearing and payment systems for derivatives. However, this grant of regulatory oversight does not affect the authority of the European Central Bank or national central banks as regards the supervision of clearing and payment systems.⁶⁸

b. United States

Post GFC, wide ranging reform was undertaken in the US via the Dodd-Frank Act. Most importantly for this thesis's purpose, Title VII mandates that standardised derivatives be subject to CCP clearing. Restrictions on the regulation of security based swaps were repealed⁶⁹ and the CFTC and SEC are given responsibility for the regulation of derivative instruments.⁷⁰ Whether or not swaps and security based swaps are cleared is to be determined by the CFTC and the SEC respectively. To obviate regulatory conflicts, between these agencies, the Dodd-Frank Act mandates that they consult with each other to resolve any conflicting regulatory prescriptions.⁷¹

Swaps that are deemed subject to the CCP prescription must be cleared through CCPs known as derivatives clearing organisations (DCOs).⁷² Security based swaps are to be cleared through security clearing agencies (SCA). The SEC has jurisdiction over security based swaps which the Dodd-Frank Act defines as an agreement, contract or transaction that is a swap and is based on: an index that is a narrow-based security index, a single security or loan, or the occurrence of, non-occurrence of an event relating to individual issuers of securities in a narrow-based security index, where said events affect the

⁶⁵ Article 14 EMIR.

⁶⁶ Recital 10 EMIR.

⁶⁷ Recital 11 EMIR.

⁶⁸ Recital 11 EMIR.

⁶⁹ Section 762 Dodd-Frank Act.

⁷⁰ Section 712 Dodd-Frank Act.

⁷¹ Section 712(a) Dodd-Frank Act.

⁷² The terms CCP and DCO will be used interchangeably throughout this thesis.

financial statements, financial condition, or financial obligations of the issuer.⁷³ The CFTC has jurisdiction over swaps, which are comprised of all other OTC derivatives.⁷⁴ Given the fact that the CFTC's regulations apply to approximately 90% of the US derivatives market,⁷⁵ this thesis only considers CFTC rules.

c. A Comparative Perspective

While there are substantial similarities in the EU and US approach to the CCP prescription - for instance, both regulatory endeavours require that a broad class of OTC derivatives be centrally cleared. The rule making powers granted to regulatory authorities are different in the EU and US. A crucial difference being the vast rulemaking powers granted US regulators to promulgate rules defining and implementing the dictates of the Dodd-Frank Act. Conversely, EMIR contains detailed rules directly addressing the implementation of the CCP prescription leaving EU regulatory bodies to play a less central role in the design of regulation. The reliance on regulatory agency rule formulation dominates the US regulatory scheme, and may be attributable to a preference for the coherence and continuity agency made rules provide – in contrast to judicial precedent.⁷⁶

EU regulatory agencies on the other hand merely enforce the detailed substantive rules contained in EMIR with ESMA's draft regulatory standards subject to the prior approval of the European Commission (EC) before becoming binding. Restraints on rule making powers in the EU can be attributed to the fact that unlike the US, the EU is a supranational body with

⁷³ Section 761(a)(6) Dodd-Frank Act.

⁷⁴ Section 721(a)(21) Dodd-Frank Act extensively defines swaps to include any agreement, contract or transaction that is or in the future comes to be known as a swap including 'that provides for any purchase, sale, payment or delivery (other than a dividend on an equity security) that is dependent on the occurrence, non-occurrence or extent of occurrence of an event or contingency associated with a potential financial, economic or commercial consequence' or 'that provides on an executory basis for the exchange, on a fixed or contingent bases, of 1 or more payments based on the value or level of 1 or more... quantitative measures, or other financial or economic interests or property of any kind... and that transfers... financial risk... without also conveying a current or future direct or indirect ownership interest in an asset... or liability.'

⁷⁵ Lubben (n 18) 144.

⁷⁶ Latysheva (n 61) 491; Garslian Levon, 'Towards a Universal Model Regulatory Framework for Derivatives: Post-Crisis Conclusions from the United States and the European Union' (2016) 37 *University of Pennsylvania Journal of International Law* 985.

Member States mostly controlling regulation within their borders and individually considering EU regulatory proposals before they become law. Additionally, EU Member States have their own regulatory authorities and consequently, to ensure harmonisation of the fundamental aspects of EU derivatives legislation, the EU developed a comprehensive regulatory network.⁷⁷

An advantage of the EU approach to regulatory supervision is the EU wide harmonisation it brings, leaving little room for regulatory arbitrage and capture. As opposed to the US regulatory approach which leaves a lot of discretionary rule making power in the hands of regulators. While this seemingly engenders regulatory flexibility in governing OTC-DMs, the CCP prescription places increased financial and operational pressure on regulatory agencies. This may lead to a reliance on private sector opinions and contributions to rule making, a reliance that may prove fatal as a lesson painfully learnt from the GFC is that private ordering can jeopardise the stability of OTC-DMs. Additionally, the fragmented jurisdiction of the CFTC and SEC engenders a fragmented regulatory environment. There is the possibility that regulation produced by the CFTC and SEC may not be aligned in terms of substance and implementation. This is in contrast to the EU regulatory approach that primarily utilises a central regulatory agency and prescribes detailed requirements for the regulation of OTC-DMs.

An examination of the Dodd-Frank Act and EMIR's definition of derivatives reveals substantial differences in EU and US approaches to the definition of OTC derivatives. While EMIR defines derivatives by reference to a broad range of derivative instruments, relating to specified underlyings, the Dodd-Frank Act defines OTC derivatives in terms of swaps and security-based swaps. The US definition justifies oversight by two regulatory bodies with the CFTC regulating commodities, and the SEC regulating securities. However, a problem with the US approach to defining derivatives is the possible fragmentation it may cause and the differential treatment that may be afforded nearly homogenous instruments by both regulators. While it can be counter-

⁷⁷ Levon (n 76) 986.

argued that the Dodd-Frank Act mandates that the CFTC and SEC consult together before rulemaking,⁷⁸ this mandate may not efficiently be implemented in reality. Conversely, it can be argued that while broad, the EU's definition of OTC derivatives is rather vague when compared with the detailed definitions of swaps and security based swaps provided by the Dodd-Frank Act. For instance, EMIR's definition of OTC derivatives merely lists the instruments included in the definition of OTC derivatives without defining them while the Dodd-Frank Act provides a very detailed definition of swaps and security based swaps. While this lack of specificity is disadvantageous in the sense that it can engender uncertainty over what instruments are covered, it also gives regulators a certain amount of flexibility in dealing with innovative and exotic financial instruments.

The above examination of the relative merits and demerits of the EU and US regimes lead to the tentative conclusion that the EU supervisory and definitional approach to the CCP prescription is superior due to its comprehensive and coordinated nature, which leaves little room for regulatory arbitrage. Additionally, the flexibility embodied in the CCP prescription leaves room for dynamic regulatory responses to new and innovative OTC derivative instruments in the future. Having comparatively analysed the general outline of reforms in OTC-DMs in the US and EU this section turns its attention to a theoretical analysis of said outline.

d. A Theoretical Perspective

The CCP prescription seems to present a wholesale departure from the economic ideology of unfettered markets advocated by MFT. However, *prima facie* the CCP prescription is particularly advantageous for OTC-DMs.⁷⁹ This claim is attributable to a number of factors. First, CCP clearing enables netting which promotes the orderly, coordinated replacement of defaulted positions, reduces the number of defaulted positions that have to be replaced, and promotes operational efficiency. Second, CCP clearing reduces price volatility and the associated large price swings that occur with the default of a major

⁷⁸ Section 712 Dodd-Frank Act.

⁷⁹ Pirrong (n 22).

OTC-DM participant. Fourth, CCPs increase transparency by providing centralised infrastructure for the monitoring of risk. Finally, CCP clearing is an essential tool in the containment of financial contagion due to CCP collection of accurately priced margin, allocation of default losses efficiently, and reduction of default loss concentration via netting.⁸⁰ These advantages lead to the belief that CCP clearing will result in greater efficiency and better calibrated asset-pricing models.

In addition, theoretically, CCPs can be said to complete markets in the sense that they improve the allocation of risk by shifting balance sheet risk from one set of market participants that is, hedgers who are risk averse by nature and trade derivatives to protect their wealth, to another group of market participants – dealers who are members of the CCP.⁸¹ Furthermore, CCP guaranteeing of derivative contracts increases the certainty of obtaining a payoff from said contract.⁸² Consequently, CCPs can be said to generate efficiencies, allowing more firms enter OTC-DMs. Additionally, CCPs broadcast information on aggregate exposures to certain instruments or parties to the market – including information on the net or gross exposures of relevant parties.⁸³ This information lets market participants and regulators price risk appropriately in the case of the former and enables the latter identify potentially systemically risky behaviour in financial markets.⁸⁴ Additionally, CCPs increase liquidity for clearing members by clearing complex trades in a timely and transparent manner.⁸⁵ This characteristic is particularly relevant in an environment of financial stress as a clearing member whose survival is ensured by quick CCP risk management can fulfil obligations to market participants in financial

⁸⁰ Yesha Yadav, 'The Problematic Case of Clearinghouses In Complex Markets' (2013) 101 *Georgetown Law Journal* 106; Darrell Duffie, 'Replumbing Our Financial System: Uneven Progress' (2013) 9 *International Journal of Central Banking* 267; Christopher Culp, 'OTC-Cleared Derivatives: Benefits, Costs, and Implications of The 'Dodd-Frank Wall Street Reform and Consumer Protection Act' (2010) 20 *Journal of Applied Finance* (2010) 17; Gregory (n 22) 200; Pirrong (n 22) 11; IMF (n 40) 7; Braithwaite and Murphy (n 29) 4.

⁸¹ Pirrong (n 56), 11.

⁸² Olga Lewandoska, 'OTC Clearing Arrangements for Bank Systemic Risk Regulation: A Simulation Approach' (2015) 47 *Journal of Money, Credit and Banking* 1178.

⁸³ Yadav (n 80) 410.

⁸⁴ *Ibid*; Mark Roe, 'Clearinghouse Overconfidence' (2013) 101 *California Law Review* 1658.

⁸⁵ When compared with bilateral trades. See generally Yee Loon and Zhaodong Zhong, 'The Impact of Central Clearing on Counterparty Risk, Liquidity, and Trading: Evidence from the Credit Default Swap Market' (2014) 112 *Journal of Financial Economics* 91.

markets as a whole.⁸⁶ Furthermore, prima facie, this transparency and CCP risk mitigation mechanisms theoretically reduces transaction costs,⁸⁷ facilitating the entry of new participants into the market.⁸⁸

However, in real world financial markets, the shift triggered by CCP clearing alters the payoffs of derivatives resulting in hedgers adopting positions in cleared markets that they would not in bilateral markets. This in turn affects equilibrium prices, volume, and dealer profits.⁸⁹ Pirrong notes that evidence from modelling the effects of clearing on equilibrium prices⁹⁰ indicates that CCP clearing results in the adoption of larger positions by hedgers and changes the terms of trade leading to prices falling when hedgers sell derivatives.⁹¹ This can be attributed to CCP clearing's reduction of the number of defaults.⁹² However, this expansion in trading activity can result in the sum of total defaults rising and raises the possibility of contagion larger than can be found in bilateral markets.⁹³ This lends credence to FIH's theorem namely that there are financing regimes under which markets are stable and instable.⁹⁴ Obviously, where CCPs engender hedge financing through the elimination of counterparty credit risk, competitive advantages are gained from the utilisation of Ponzi finance through innovation.

Furthermore, OTC derivative transactions are sometimes so complex that even their originators and sophisticated market participants grossly miscalculate their inherent risk and potential for financial destruction. A suitable example is the case of credit rating agencies who severely underestimated the risk profiles of CDOs. A failing that has been attributed to

⁸⁶ Roe (n 84) 1685; Duffie (n 26) 74-75; Michael Greenberger, 'Diversifying Clearinghouse Ownership in Order to Safeguard Free and Open Access to the Derivatives Clearing Market' (2013) 18 *Fordham Journal of Corporate and Financial Law* 248-249.

⁸⁷ Especially the costs of replacing positions. Lewandoska (n 82).

⁸⁸ Yadav (n 80) 387.

⁸⁹ Pirrong (n 56) 11.

⁹⁰ The analysis of these effects is difficult and complex due to the nonlinear nature of default risk.

⁹¹ Craig Pirrong, 'The Economics of Clearing in Derivatives Markets: Netting, Asymmetric Information, and the Sharing of Default Risks through a Central Counterparty' (2010) *SSRN Electronic Journal* 71-72.

⁹² Pirrong (n 56) 11.

⁹³ *Ibid* 12.

⁹⁴ *Supra* Section 2.5.2.

these instruments being 'too complex for anyone's good.'⁹⁵ Additionally, research has in fact found that responsibility for suboptimal pre-GFC credit ratings can probably be attributed to an overreliance on probability models that failed to account for tail risk.⁹⁶ A problem further compounded by the highly leveraged nature of the instruments being rated. Insights from this failure raise the question of why CCPs are any different. CCPs utilise complex models to evaluate the price risk of derivative instruments like credit rating agencies did. The flaws inherent in the theories that birthed these models are highlighted in earlier sections of this thesis⁹⁷ and further discussed in Chapter 4. Given the uniformity of the models used by CCPs, any flaws in said models could have systemic consequences.⁹⁸

As regards the multiplicity of regulatory authorities on both sides of the Atlantic, some of the matters they have been entrusted with for example ensuring that CCPs adequately fulfil their risk mitigation rule are clearly out of the usual ambit of their regulatory powers.⁹⁹ Furthermore, multiple sources of authority can be problematic if there is no regulatory coordination.¹⁰⁰ This fact in combination with the established bounded rationality and complexity all financial market participants including regulators are subject to begs the question 'who will guard the guards?' A suitable solution would be to ensure that regulators undergo an annual review of any regulations passed and general regulatory performance. This review could be undertaken by legislative committees. States should also ensure that regulators are equipped with the financial and operational resources to effectively carry out their assigned functions.

In conclusion, the above analysis indicates that the CCP prescription represents an ersatz departure from the ideology of unfettered markets

⁹⁵ Efraim Benmelech and Jennifer Dlugosz, 'The Credit Rating Crisis,' NBER Macroeconomics Annual (2009) 161.

⁹⁶ Ibid 162.

⁹⁷ Supra Chapter 2.

⁹⁸ Discussed Infra 4.3.

⁹⁹ Dan Awrey, 'Regulating Financial Innovation: A More Principles-Based Alternative?' (2011) No. 79/2010 Oxford Legal Studies Research Paper 39.

¹⁰⁰ Hadar Jabotinsky and Mathias Siems, 'How to Regulate the Regulators: Applying Principles of Good Corporate Governance to Financial Regulatory Institutions' (2017) 354/2017 ECGI Working Paper Series in Law 6.

espoused by MFT. A closer examination reveals that elements of MFT can still be found. Unencumbered, this ideology can be dangerous but where regulators are equipped with the tools to properly implement this mandate, it may successfully mitigate systemic risk. To this end, the above analysis suggests that regulators are subject to annual review by legislators.

3.4. Scope of the CCP Prescription

One of the most important aspects of the implementation of the CCP prescription in OTC-DMs is the scope of the derivative instruments to which these reforms apply as only instruments deemed within the scope of the CCP prescription will be mandatorily cleared, and supervised by regulatory authorities in this regard. As has been discussed above,¹⁰¹ an important CCP risk management tool is said CCP's ability to choose the classes of derivatives it clears. This is particularly relevant as not all derivative instruments are clearable. This fact calls into question the efficacy of the CCP prescription itself as the derivatives instrumental in the build-up and amplification of the GFC are typically illiquid, non-standardised, and complex instruments which may make them ineligible for clearing. For example, arguments that CCPs would have prevented the AIG's collapse¹⁰² are flawed. While central clearing could have prevented AIG's enormous exposures, and consequently obviated concentration risk, a substantial number of AIG's trades would have been ineligible for clearing due to their complexity.¹⁰³

Furthermore, the manner in which derivatives to be cleared are determined is crucial as it raises questions of whether private (CCPs) or public (regulators) actors are better suited to make this decision. Finally, end users including corporations and investors typically use OTC derivatives to hedge commercial risks like fluctuations in exchange rates, interest rates, and default risk among many others. These risk management needs may entail the use of derivatives that are not actively traded and consequently may not be satisfied by

¹⁰¹ Supra Section 3.2.

¹⁰² Ed Nosal, 'Clearing Over-The-Counter Derivatives' (2011) Vol xxxv, No. 4 Economic Perspectives 1.

¹⁰³ See Gregory (2014). 25; Darrell Duffie, How Should We Regulate Derivative Markets? (2009) 6 <https://pdfs.semanticscholar.org/d965/0666e85319b7eaa38fd525e67edde339e45f.pdf>.

exchange-traded derivatives. This inability to hedge creates significant costs as it can result in a deficiency in liquidity available for risky projects and increases the likelihood of insolvency.¹⁰⁴ In light of the above questions, it is necessary to understand the context of the CCP prescription's scope from an analytical, comparative and theoretical perspective – said examination is undertaken below.

a. European Union

The scope of EMIR's CCP prescription takes two forms specifically a subjective and objective scope. With the subjective scope of EMIR, OTC derivatives may be cleared according to the counterparties entering into the contract; with the objective scope of EMIR, OTC derivatives may be cleared according to their class. Article 4 EMIR provides that all OTC derivative contracts entered into or novated before the relevant CCP prescription start date,¹⁰⁵ after notification by a competent authority to ESMA are to be mandatorily cleared. Additionally, EMIR identifies two classes of covered parties to whom the CCP prescription applies namely financial counterparties (FC) and non-financial counterparties (NFC).¹⁰⁶ FCs are specified in Recital 25 and Article 2(8) EMIR as including credit institutions, insurance undertakings, assurance undertakings, reinsurance undertakings, alternative investment fund managers, and investment funds. Article 2(9) defines a NFC as one established in the EU and which is not categorised by EMIR as a CCP or financial counterparty. Therefore, unregulated non-EU entities are classified as non-financial counterparties.¹⁰⁷

FCs are generally subject to the provisions of EMIR while NFCs are subject to the CCP prescription only when they meet a clearing threshold.¹⁰⁸ To this end, NFCs have to assess their OTC derivative activity using a two-step procedure. These steps are: first, exclude from the calculation of the clearing

¹⁰⁴ Duffie (n 18) 10.

¹⁰⁵ This obligation took effect in the UK from 21 June 2016.

¹⁰⁶ Article 4 EMIR.

¹⁰⁷ For example, where a SPV is not a regulated alternative investment fund under AIFMID, it will be classified as a non-financial counterparty.

¹⁰⁸ See generally Article 4 EMIR.

threshold the notional value of OTC derivative positions which are objectively measurable as reducing the risks directly related to the commercial or treasury financing activity of the non-financial counterparty.¹⁰⁹ Article 10 of Commission Delegated Regulation (EU) 149/2013 specifies that three types of contract constitute hedges. First are contracts hedging risks directly associated with the normal course of business. Second are contracts indirectly hedging risks indirectly arising from the course of business; and third are contracts qualifying as hedging contracts pursuant to international financial reporting standards.

Second, NFCs must ensure that the gross notional value of their OTC derivative contracts excluding hedging derivatives do not exceed certain clearing thresholds. An NFC is subject to the CCP prescription where the rolling average of its notional positions in OTC derivative transactions¹¹⁰ for a period of 30 days of the NFC, or NFC in the NFC's group exceed certain threshold values. These values are €1 billion for credit and equity derivatives, and €3 billion for interest rate, FX, commodity and other derivatives.¹¹¹ The relevant notional value is the total notional value of OTC derivatives entered into by a group of NFCs and not the notional value of individual companies within the group.

Dealing with the classes of derivatives subject to the CCP prescription, under EMIR, the process of identifying derivative classes subject to CCP clearing involves a twofold approach. Under the first approach colloquially known as the bottom up approach, CCPs define which derivative classes possess the standardisation and market liquidity parameters necessary for clearing. This procedure is initiated by a CCP applying for authorisation to clear a specific class of derivatives with the relevant national competent authority (NCA). The NCA in turn notifies ESMA of their decision¹¹² and ESMA after conducting public consultations and consulting the European Systemic Risk Board (ESRB) has the power to confirm the decision and implement clearing of this particular class of derivatives across the EU thereby providing greater

¹⁰⁹ Article 10(3) EMIR.

¹¹⁰ With the exception of hedging derivatives.

¹¹¹ Article 11 Commission Delegated Regulation (EU) 149/2013.

¹¹² Article 5(1) EMIR.

harmonisation.¹¹³ With the second approach known as the top down approach, ESMA after conducting public consultations and consulting the ESRB notifies the commission of the classes of derivative to be subject to CCP clearing but which no CCPs have applied for authorisation to clear.¹¹⁴ ESMA has set out guidelines for determining the of OTC derivative contracts suitable for clearing. The foundational criteria are: the level of standardisation and the contractual availability of terms, the operational processes of the specific class of OTC derivatives; the volume and liquidity of the relevant class of OTC derivatives, and finally, the availability of reliable and generally accepted pricing information for the relevant class of derivatives.¹¹⁵ Crucially, ESMA must consider the ability of CCPs to manage the risks arising from the clearing of the relevant instruments.

There are currently three exceptions to EMIR's CCP prescription. These include intragroup transactions,¹¹⁶ pension funds, and transactions by NFCs. The intragroup exemption can be rationalised as EMIR's recognition that in certain instances, imposing the CCP prescription on intragroup derivatives may impede intragroup risk management procedures. However, this provision is counterbalanced by a notification requirement which enables regulators monitor possible sources of systemic risk. Pension funds were exempted from the CCP prescription until August 2015. This exemption was extendable by a further 2 to 3 years.¹¹⁷ The EC on 5 June 2015 extended the transitional pension fund exemption by two years. Upon the expiration of this exemption, ESMA has directed NCAs not to enforce the CCP prescription in relation to pension funds.¹¹⁸ This exemption was devised to grant CCPs more time to develop technical solutions to the fact that as a rule, CCPs only accept cash as variation margin while pension funds typically hold very little cash. This

¹¹³ Article 5(2) EMIR.

¹¹⁴ Article 5(3) EMIR.

¹¹⁵ Article 5 EMIR. Article 7 of Commission Delegated Regulation (EU) 149/2013 further specifies contributory elements to be used in the identification of the relevant standardisation requirements.

¹¹⁶ Intragroup transactions are defined in Article 3 EMIR and this definition is dependent on the FC/NFC status of the entity in question.

¹¹⁷ See generally Article 85(2) EMIR.

¹¹⁸ ESMA, 'Clearing Obligation for Pension Scheme Arrangements' (2018).

exemption furnishes CCPs with much needed time to develop models catering to derivatives utilised by pension schemes.¹¹⁹

b. United States

The Dodd-Frank Act creates new classes of financial market participants¹²⁰ introducing swap dealers (SD), major swap participants (MSP), and eligible contract participants (ECP). These new market participants are briefly considered below. Section 721(a)(21) Dodd-Frank Act provides that SD means a person who meets certain criteria. First, holds itself out as a dealer of swaps. Second, makes a market in swaps. Third, regularly enters into swaps with counterparties as an ordinary course of business for its own account; or fourth, engages in in any activity causing the person to be commonly known in the market as a dealer or market maker in swap.

Moving on to the definition of MSPs, Section 721(a)(16) Dodd-Frank Act prescribes that a person that satisfies one of three criteria is a MSP. First, maintains a substantial position in any of the major swap categories excluding positions held for hedging and mitigating commercial risk and positions maintained by any employee benefit plan for the primary purpose of hedging and mitigating any risk directly associated with the plan. Second, has outstanding swaps that create substantial counterparty exposure that could have serious adverse effects on the financial stability of the US's banking system or financial markets. Third is a financial entity that is highly leveraged relative to the amount of capital such entity holds and that is not subject to capital requirements established by an appropriate federal banking agency, and that maintains a substantial position in any of the major swap categories.¹²¹

Finally, the Dodd-Frank Act introduces the category of ECP and makes it unlawful for any person who is not an ECP to enter a swap trade unless said

¹¹⁹ Gregory (n 7) 49.

¹²⁰ Levon (n 76) 991.

¹²¹ However, businesses whose primary function is the provision of financing are excluded from this definition.

trade is made on a designated board of trade.¹²² The Dodd-Frank Act defines an eligible contract participant as a financial institution, insurance, or investment company.¹²³ Additionally, an ECP can be a corporation with total assets exceeding \$10 million or \$1 million if the derivatives hedge risk. Individuals are eligible contract participants where they have assets exceeding \$10 million or only \$5 million where the purpose of the derivative is to hedge against risk.

Section 731 Dodd-Frank Act provides that it shall be unlawful to act as a SD or MSP without registering with the CFTC. The CFTC can impose minimum capital requirements for non-bank SDs and MSPs. As banks already have to comply with minimum capital requirements, the CFTC must consult with the relevant bank regulator when making regulations affecting banks' minimum capital requirements. In addition, the CFTC has issued business conduct standards for SDs and MSPs dealing with counterparties. The business conduct rules direct that SDs and MSPs treat customers fairly, disclose substantial risks conflicts of interest and material incentives before transacting a swap. SDs must also supply their counterparties with mid-market marks of outstanding bilateral swaps on a daily basis to ensure transparency

Turning to the manner in which derivative instruments subject to the CCP prescription are determined. CCPs must tender swaps that they wish to clear to the CFTC for review. The CFTC will then determine whether or not the swaps should be subject to the CCP prescription;¹²⁴ taking into account factors like liquidity, pricing data notional exposures, credit support infrastructure, and the possible effects of clearing on the mitigation of systemic risk.¹²⁵ Swap transactions submitted to CCPs must be disclosed to the public, with time provided for comments.¹²⁶ Additionally, it is presumed that CCPs are eligible to clear swaps that they already cleared at the time of the Dodd-Frank

¹²² Section 723 Dodd-Frank Act.

¹²³ Subject to regulation under the Investment Company Act 1940 15 U.S.C. or foreign person performing a similar function subject as such to foreign regulation.

¹²⁴ Section 723(a)(2)(B)(i) Dodd-Frank Act.

¹²⁵ Section 723 Dodd-Frank Act.

¹²⁶ Section 723(a)(2)(B)(iii) Dodd-Frank Act.

Act's enactment but must obtain permission to clear new swaps.¹²⁷ From the above it can be seen that liquidity and pricing data are important drivers in evaluating the eligibility of derivative instruments for clearing.¹²⁸

Furthermore, the Dodd Frank Act requires that the CFTC conduct investigations of OTC derivatives not submitted by CCPs to decide whether they should be mandatorily cleared.¹²⁹ When conducting its review, the CFTC must assess the risk profiles of these swaps – taking into consideration factors including the liquidity and notional exposures of the swap in question as well as any effects the mandatory clearing of the swap may have on systemic risk.¹³⁰ Upon the completion of its review, the CFTC must ascertain what actions need to be carried out to ensure that trading in the swaps not accepted for clearing does not result in the build-up and amplification of systemic risk. However, the CFTC cannot force a CCP to clear an instrument if doing so would threaten the financial integrity of the CCP.

The Dodd-Frank Act also exempts certain transactions and counterparties from the CCP prescription. These include commercial end users, captive finance companies, eligible treasury affiliates, and commercial end user affiliates. Pursuant to this provision, the CFTC has issued rules exempting non-financial end users and certain affiliated entities.¹³¹ The commercial end-user exemption applies to counterparties who are non-financial entities using derivatives to hedge commercial risk, and who have shown that they generally meet their financial obligations in relation to the uncleared swap.¹³² However, end users may still decide to clear the swap.¹³³ Section 2(h)(7)(c)(iii) CEA permits captive finance companies to use the end-user exemption as they are excluded from the definition of financial entities. Eligible treasury affiliates also have swaps they enter into exempted in some circumstances. Finally, while the Dodd-Frank Act does not expressly exempt inter-affiliate transactions, the

¹²⁷ Section 723(a)(2)(B)(ii) Dodd-Frank Act.

¹²⁸ Griffith attributes this to the fact that these instruments are used to determine appropriate clearinghouse reserves via margin and default fund contributions. Griffith (n 43)1187.

¹²⁹ Section 723(a)(2)(A)(i) Dodd-Frank Act.

¹³⁰ Section 723(a)(2)(h)(2) Dodd-Frank Act.

¹³¹ Griffith (n 43) 1207.

¹³² Section 723(a)(3) Dodd-Frank Act.

¹³³ Section 723(a)(3) Dodd-Frank Act.

CFTC finalised rules exempting transactions between certain affiliated parties on 1 April 2013 pursuant to its powers under Section 4(c)(1) CEA.¹³⁴ This exemption generally allows eligible affiliates of entities that qualify for the commercial end user exemption utilise the commercial end user exemption if certain criteria are met.

c. A Comparative Perspective

The Dodd-Frank Act and EMIR delineate covered parties very differently with the Dodd-Frank Act creating specific classes of market participants and specifying thresholds the triggering of which initiate the application of statutory rules and regulatory oversight. Conversely, EMIR categorises market participants into two. This difference suggests that the Dodd-Frank Act's scope is less comprehensive than EMIR's as the Dodd-Frank Act only appears to apply to covered parties carrying out qualifying transactions while EMIR applies to all market participants – though EMIR's application is differential depending on the nature of the market participant. Furthermore, the Dodd-Frank Act's approach can be characterised as complicated when compared with EMIR's, a possible consequence of which is the proliferation of regulatory fragmentation and arbitrage as parties who do not regularly deal in swaps are excluded from the Dodd-Frank Act's regulatory ambit. The US regulatory approach can be attributed to a focus on the regulation of the major financial market participants as opposed to all financial market participants. The Dodd-Frank Act was a direct response to the GFC and consequently, is a tool via which US regulators can monitor and manage the risks of large OTC-DM participants.¹³⁵

An examination of the criteria utilised in determining the eligibility of derivative transactions for CCP clearing reveals a high degree of commonality in the US and the EU approaches. Both legislations provide for CCP and regulator determination of what products are to be cleared and grant wide discretion to CCPs and regulators when determining what classes are to be cleared. This approach is unsurprising as while regulators in both jurisdictions can

¹³⁴ 78 F.R. 21750.

¹³⁵ Levon (n 76) 995.

recommend the clearing of certain derivative classes, caveats exist to ensure that CCPs aren't forced to clear instruments that threaten their integrity. Consequently, the likelihood of this power being utilised liberally is extremely low as forcing the clearing of illiquid instruments can negate a CCP's risk management mechanisms in environments of severe financial stress and consequently engenders systemic risk.¹³⁶ Additionally, both legislative mandates require that regulators consider a variety of similar attributes when determining the merits and demerits of clearing certain OTC derivative instruments and consequently, their suitability for clearing. The Dodd-Frank Act and EMIR both mandate that in determining what classes of OTC derivatives are to be cleared, regulators consider the impact of said clearing decision on the reduction of systemic risk. This is obviously in line with the G20's rationale for the imposition of the CCP prescription. Additional central themes in both regulatory criteria include standardisation, liquidity, and pricing. All of which are important as they form an important part of a CCP's risk management framework.

Unsurprisingly, both EU and US regulatory initiatives exclude non-financial users of derivatives from the CCP prescription. This exclusion illustrates regulators' cognition of entities that pose a risk to the resilience of financial markets and entities that do not pose said risk. Consequently, regulators have reduced the onerous regulatory burden non-financial counterparties have to bear when attempting to hedge and mitigate risk. It should however be noted that while the Dodd-Frank Act explicitly provides for an end user exemption, EMIR simply exempts certain NFC. The divergence in EU and US treatment of non-financial counterparties highlight the different regulatory priorities on both sides of the Atlantic. From the US perspective, the aim of post-GFC regulatory reforms seems to be the regulation of major financial counterparties. Conversely, EMIR seems to place an emphasis on the volume of transactions that could pose systemic risks as exemplified by the thresholds it provides which once passed trigger the CCP prescription. Alternatively, it could be argued that through the creation and further definition of various

¹³⁶ Griffith (n 43) 1188.

financial market participants who are not eligible for the end user exemption, the Dodd-Frank Act itself creates a regime similar to the EU NFC regime.

Another point of convergence in the EU and US regimes as regards exemptions is the intragroup exemption. The similarities in both regimes can be understood from an anti-arbitrage perspective. Additionally, ensuring common ownership ensures that the pertinent counterparty risk inherent in uncleared OTC derivative transactions is internalised by the corporate group in question. Further comparison of the exemptions under the EU and US regimes reveals that there is no pension fund exemption under the US regime. In the US, pension schemes subject to the Employee Retirement Income Security Act 1974 are subject to the CCP prescription. Clearing poses idiosyncratic problems for pension funds due to the fact that their business models dictate that they may not have the cash on hand needed to satisfy variation margin calls, and may have to divest themselves of assets as CCPs generally require that variation margin in cash.¹³⁷ The absence of a pension fund exemption in the US is however unsurprising as the Dodd-Frank Act came into force 21 July 2010 as opposed to EMIR which came into force 16 August 2012. Additionally, clearing commenced on 11 March 2013 in the US as opposed to the EU's 21 July 2016; which leads to the assumption that the US is merely ahead of the EU when it comes to the full implementation of the CCP prescription. The fact that the pension fund exemption is merely temporary further reinforces this argument. Furthermore, special carve outs for pension funds are questionable given the fact that other entities¹³⁸ also face this problem.

Another divergence in the EU and US regimes is the absence of the US captive finance company exemption in the EU regime. Captive finance companies are set up by a non-financing parent company to finance credit

¹³⁷ Jan Luettringhaus, 'Regulating Over-The-Counter Derivatives in the European Union – Transatlantic (Dis)Harmony after EMIR and Dodd-Frank: The Impact on (Re)Insurance Companies and Occupational Pension Funds' (2012) 18 *The Columbia Journal of European Law Online* 24.

¹³⁸ Life insurers for example.

sales to the ultimate consumers of the parent company's products.¹³⁹ Consequently, it is safe to assume that captive finance companies provide much needed liquidity in the real economy. Captive finance companies typically use derivative to hedge the foreign exchange and interest risks inherent in their financing activities. The imposition of mandatory clearing on captive finance companies increases their transaction costs and could discourage their prudent management of risk through derivatives.

Additionally, margin requirements inherent in clearing potentially disrupts asset backed securitisation models that utilise derivatives impacting the structure of this market by introducing additional complexity to securitisation transactions which oftentimes enable captive finance companies provide competitive financing prices to consumers. US regulators recognising this fact exempt captive finance companies from the definition of major swap participants and by extension, financial counterparties – recognising that the activities of captive finance companies in OTC-DMs are not speculative. This exemption is however rightly subject to stringent criteria demanding that captive finance companies must use derivatives for the sole purpose of hedging commercial risks arising from their financing activities. The above analysis raises questions on why captive finance companies who perform such financially and economically vital functions are not explicitly exempted from the CCP prescription under EMIR or ESMA rulemaking. However, captive finance companies across several EU jurisdictions have different corporate structures which explains why there are no special provisions for captive finance companies in the EU.

Having established and critically comparatively examined the scope of the CCP prescription in the EU and US, this section now turns its attention to an analysis of the scope of the CCP prescription through the lens of theories of finance.

¹³⁹ Ronald Copeland and Sharon McKinnon 'Financial Distortion' and Consolidation of Captive Finance Subsidiaries in the General Merchandising Industry, (1987) *Journal of Business Finance & Accounting* 78.

d. A Theoretical Perspective

From a MFT perspective, a cursory appraisal of the creation of special classes of regulated persons in OTC-DMs by post-GFC reforms fetters market discretion and contradicts the markets know best ideology espoused by US and EU regulators prior to the GFC which left OTC-DMs virtually unregulated. US regulators have intervened through the creation of special classes of entities subject to the CCP prescription, risk mitigation rules, and conduct of business rules. This is unsurprising as the GFC has revealed that private actors are seldom incentivised to reduce information asymmetries in OTC-DMs; and have in fact often utilised their superior information in the creation and structuring of suboptimal and inefficient financing structures.¹⁴⁰

Mandatory clearing applied to financial counterparties who are generally large OTC derivative traders ameliorates adverse selection problems previously inherent in OTC derivative markets. When major OTC derivative traders are subject to mandatory clearing, this theoretically leads to deep and liquid markets via increases in trading volume. Additionally, as highlighted above in Section 3.3, mandating that financial counterparties clear their trades through CCPs significantly promotes price discovery and narrower bid – ask spreads.¹⁴¹ Furthermore, forcing major OTC derivative dealers to clear their trades simplifies the complex contractual networks characteristic of bilateral OTC derivative markets,¹⁴² and consequently results in increased transparency and liquidity in OTC-DMs implementing the tenets of MFT. In addition, the standardisation necessary for the clearing of a derivative, resolves most of the legal and economic heterogeneities inherent in OTC derivative transactions and consequently promotes OTC-DM efficiency.¹⁴³ The above arguments consequently support MFT's prescription of regulatory intervention to promote market efficiency.

¹⁴⁰ Dan Awrey, 'The Mechanisms of Derivative Market Efficiency' (2016) 91 *New York University Law Review* 1173.

¹⁴¹ *Ibid.*

¹⁴² Major OTC dealer balance sheets are linked via mark to marketing which can result in destructive financial feedback loops.

¹⁴³ Awrey (n 140) 1175.

In relation to the scope of instruments to be cleared, clearing is essentially a private-ordering mechanism¹⁴⁴ for the mitigation of credit risk and this is recognisable in the discretion granted to CCPs by regulators in determining the products to undergo mandatory clearing. This decision supports MFT's thesis that responsibility for the design of financial adequacy mechanisms be devolved to private actors as CCPs are given a significant amount of discretion in determining what products to clear, **and regulatory ability to mandate CCP clearing is dependent on the ability of CCPs to handle the relevant risk.**

The effectiveness of this prescription is dependent on regulatory authorities' intense and thorough supervision of CCPs.¹⁴⁵ However, due to stark information asymmetries between regulators and CCPs – attributable to reduced regulatory incentives and resources to invest in information and expertise,¹⁴⁶ the utility of this useful tool is doubtful if CCPs prove uncooperative or obfuscatory in sharing information and expertise with regulators. Furthermore, CCPs are not incentivised by the threat of mandatory clearing decisions by regulators **due to legislative caveats requiring regulators to consider CCP ability to mitigate the risks posed by specific instruments.** This problem is compounded by regulators' stark dearth of expertise. However, despite the highlighted flaws, the above regulatory techniques seem to borrow from the precept of regulatory intervention inherent in this thesis's highlighted alternative theories of finance.¹⁴⁷ Consequently, regulatory approaches towards the determination of classes of derivatives eligible for clearing seem to mix regulatory insights from MFT and alternative theories of finance.

The above conclusion is supported by the fact that regulatory standards for the determination of OTC derivatives promote standardisation, liquidity, and the availability of pricing information; all factors that promote clearing in a manner that promotes hedge finance and simultaneously promote market efficiency. Legal and economic standardisation are essential for central clearing as they facilitate multilateral netting which is touted as a significant

¹⁴⁴ Yesha Yadav and Dermot Turing, 'The Extraterritorial Regulation of Clearinghouses' (2016) 2 *Journal of Financial Regulation* 21.

¹⁴⁵ Awrey (n 99) 24.

¹⁴⁶ Ibid.

¹⁴⁷ Supra Section 2.5.

advantage of central clearing, and contributes to the development of deep and liquid markets for OTC derivatives through the concentration of trading in a minimised number of instruments. In addition, the fungibility provided by standardisation facilitates CCP procedures in the event of a members' default. In fact, it has been noted that managing and substituting illiquid derivative positions can result in greater bid-ask spreads and can result in wild price swings.¹⁴⁸ Additionally, complex derivative instruments are hard to value and consequently, CCPs run the risk of over or under collateralisation. However, derivative instruments can simultaneously possess standardised contractual terms and exhibit economic complexity. In addition, standardisation is not without its demerits. First, as OTC derivatives are generally customised to fit the particular user's bespoke risk management and investment appetites, this leads to a conundrum on whether the more complex or illiquid derivatives can be standardised or cleared.

Liquidity is an especially important factor when considering the relative merits of clearing due to its effect on pricing and risk. Pricing information obtained from liquid and deep markets is likely to be more precise and consequently avoids the under collateralisation or over collateralisation of derivative trades. The availability of this pricing information ensures that market participants have access to relatively reliable time series of data which contributes to the development and calibration of relatively accurate pricing models.¹⁴⁹ An important aspect of liquidity is the fungibility of an OTC derivative in environments of financial stress. This is because in environments of financial stress, risk appetites are low resulting in a flight of capital towards financial instruments that are perceived to be of high quality, which may lead to a decrease in the liquidity of certain OTC derivatives. The above similarities in criteria used in determining the suitability of classes of derivatives for clearing indicates regulators' realistic recognition of the fact that CCPs are private bodies performing public functions, as well as of the limited ability of CCPs to provide liquidity and adequate risk management for complex and illiquid instruments. **Legislative** reluctance to mandate the clearing of products ill

¹⁴⁸ Pirrong (n 22).

¹⁴⁹ Ibid.

adapted to the requirements of clearing recognise the detrimental effects ill-advised mandated clearing could have on CCPs. However, from an endogenous risk perspective, market participants may exhibit bounded rationality in environments of financial strain. This can lead to derivative instruments which were deemed liquid in times of safety becoming illiquid in times of crisis. Furthermore, lessons from behavioural finance indicate that noise trading can lead to the mispricing of risk in financial markets¹⁵⁰ - a problem worsened by fundamental uncertainty. Consequently, while in an ideal world, standardisation, liquidity, and the availability of pricing information are givens, in environments of financial stress, liquid instruments may prove difficult to auction, and pricing information used may prove unreliable.

Further elements of pure MFT abound. Derivatives perform several financially efficient functions. Recognising that the key to derivative market efficiency is the number of participants, and that derivative markets enhance company balance sheets through the use of efficient hedging strategies which provide additional liquidity for activities in the real economy, regulators have exempted end users utilising OTC derivatives to hedge commercial risk in the US, and non-financial entities in the EU. While these exemptions are understandable, they cut against the mitigation of systemic risk flow the CCP prescription supposedly engenders. Arguments have been made for the exemption of various entities due to their commercial or finance providing nature and the additional transaction costs clearing would impose. These arguments seem to be justified by MFT as they echo sentiments that leverage in some forms can be dismissed. It has also been noted that end users due to the risk mitigation nature of their derivative trades do not maintain matched books and resultantly possess positively correlated derivative positions. Where these end users fail, this can result in a CCP receiving a large liquidity shock.¹⁵¹ Consequently, from a MFT perspective, the end user exemption is justified.

However, from an alternative finance perspective, end user exemptions especially as implemented under US regimes can result in regulatory arbitrage by parties seeking to evade the CCP prescription. This can result in financial

¹⁵⁰ Supra 2.5.1.

¹⁵¹ Richard Squire, 'Clearinghouses as Liquidity Partitioning' (2014) 99 Cornell Law Review 921.

innovation utilising Ponzi financing techniques, which can obscure regulatory perception and mitigation of systemic risk.¹⁵² Furthermore, financial market participants considered small in relation to others can still have significant effects on systemic risk. Financial market participants are all connected by their balance sheets and mark to market valuation. This interconnectedness may be worsened by suboptimal innovation which could flourish outside CCP surveillance. Consequently, it can be said that the wholesale exemption of commercial end users as practiced in the US, incentivises moral hazard and suboptimal contracting by Ponzi finance firms seeking rents. This leads to a recommendation of the EU approach to exemptions over the US's as the EU approach instead of generally exempting OTC derivative end-users mandates that when they cross certain transaction thresholds, said end users become subject to the CCP prescription. This ensures that no stone is left unturned in implementing the CCP prescription.

In conclusion, from a theoretical perspective, regulatory prescriptions on the scope of the CCP prescription seem to combine modern and alternative theories of finance in their attempt to balance the mitigation of systemic risk with their lack of technical knowledge. On the surface, mandating that financial counterparties clear their derivative trades goes against the central tenets of MFT, that is, unfettered markets. However, it has been revealed that forcing large dealers to clear their trades promotes market efficiency. Furthermore, due to a lack of technical expertise, regulators have adopted a balanced approach towards the determination of classes of derivatives eligible for clearing. However, regulatory grants of exemption especially in the US echo MFT's mistrust of regulation as certain parties are exempt from the CCP prescription and may engender endogenous risk. Resultantly, this section has advocated the use of the EU's approach by US regulators.

This section has highlighted the important roles CCPs play in OTC-DMs and consequently, this chapter in its next section examines the extraterritorial scope of EMIR and the Dodd-Frank Act.

¹⁵² Katharina Pistor, 'On the Theoretical Foundations for Regulating Financial Markets' (2012) 12-304 Columbia Public Law Research Paper 55.

3.5. Extra-Territoriality

The GFC underscored the interconnected nature of global financial markets generally and OTC-DMs specifically. Following the crisis, a plethora of regulation has been introduced into OTC-DMs pursuant to the G20 commitment.¹⁵³ However, despite the similarity of objectives in the implementation of the G20 mandate, globalised financial markets have not led to simplified regulatory regimes. Instead, differences in regional implementation of the CCP prescription have proliferated as has been highlighted in this chapter's preceding analysis. Differences in EU and US regulatory responses are attributable to regulators attempting to balance harmonisation with regional policy considerations. Unfortunately, discordant global regulation can result in regulatory arbitrage and dissuade efficient regulation as exemplified by the FSB's focus on maintaining an open and integrated global financial system; especially in light of the fact that the GFC seems to have slowed down the integration of global financial markets.¹⁵⁴ EU and US regulators recognising this problem have crafted provisions allowing for substituted compliance. Understanding these rules is fundamental to understanding the manner in which post-crisis OTC-DMs will function. Consequently, this section critically analyses regulatory prescriptions on extraterritoriality in the EU and US.

a. European Union

EMIR applies to derivative contracts between non-EU entities where said derivative contracts would have a direct, substantial, and predictable effect in the EU, or where the application of EMIR is necessary to prevent the evasion of EMIR's provisions.¹⁵⁵ ESMA has developed regulatory standards specifying which contracts it deems to have a direct, substantial and foreseeable effect within the EU, or in which case extraterritorial application is necessary or appropriate to prevent the evasion of any provisions of the EMIR. First, is where at least one party is a third country entity covered by a

¹⁵³ Supra Section 3.1.

¹⁵⁴ Financial Stability Board, 'Implementation and Effects of the G20 Financial Regulatory Reforms' (2017) 34 <http://www.fsb.org/wp-content/uploads/P030717-2.pdf>.

¹⁵⁵ Article 4(1)(a)(iv) EMIR.

guarantee provided by an EU FC. Second, where two FCs established outside the EU enter into OTC derivative contracts through their EU branches. Third, where the primary purpose of an OTC derivative contract is to evade or misuse the application of EMIR. Finally, where transactions between a FC or an NFC above the clearing threshold become subject to the CCP prescription as if said counterparty was an EU organisation.¹⁵⁶

To ameliorate the onerous burden of financial market participants complying with duplicative regulatory requirements, the EU has provisions for equivalence. The EC may 'adopt implementing acts declaring that the legal, supervisory and enforcement regime of a third country are equivalent to the EU regime.'¹⁵⁷ This particular wording was a reaction to Section 722(d) Dodd-Frank Act which contained similar provisions. Upon the issuance of an equivalence decision, market participants are considered to comply with the EU regime by complying with the regime in their own non-EU jurisdiction when one of the counterparties to the derivative transaction is established in the relevant third country. EMIR further mandates that the EC monitor and ensure that the requirements set out in EMIR are implemented in a similar manner by international partners. This naturally involves the EC cooperating and coordinating with third country authorities to ensure consistency. Furthermore, CCPs established in third countries can only provide clearing services to clearing members established in the EU where said CCP has been recognised by EMIR.¹⁵⁸ Where an equivalence decision has been reached in respect of a third country, ESMA may formally recognise said third country CCP and authorise their operation in the EU. However, it should be noted that ESMA can withdraw or review this recognition decision at any time.¹⁵⁹ Marjoosola also notes that the European Court of Justice also has the power to review the

¹⁵⁶ ESMA, 'Draft Technical Standards under EMIR on Contracts with a Direct, Substantial and Foreseeable Effect within the Union and Non-evasion' (2013).

¹⁵⁷ Article 13 EMIR.

¹⁵⁸ Article 25(1) EMIR.

¹⁵⁹ Article 25 (5) EMIR.

validity of the EC's equivalence decisions¹⁶⁰ as exemplified by Maximilian Schrems v Data Protection Commission.¹⁶¹

The above discussion is particularly relevant in the context of Brexit. On 23 June 2016, the UK voted to leave the EU. This vote will have substantial effects on the regulation of financial market infrastructure and participants. Examining the position of UK financial market participants, there should be no changes if the UK joins the European Economic Area or develops a bilateral relationship with the EU. However, if the UK is characterised as a third country, the EU will have to issue an equivalence decision if UK counterparties are to be considered compliant with EMIR's CCP prescription where said counterparties are deemed to fall under EMIR's scope.¹⁶² In relation to CCPs, ESMA may decide to recognise UK CCPs if the UK's regime is deemed equivalent to the EU's. However, the grant of recognition is not a given and can become a political issue. The political nature of recognition is highlighted by calls from within the EU to have CCPs handling euro denominated products situated within the Eurozone.¹⁶³ However, it is still too early to predict what form post-Brexit regulation will take.

b. United States

The CFTC has authority over OTC derivative transactions outside the US in two circumstances. The first being where the derivative in question has a direct and significant connection with activities in, or effect on the commerce of the US. The second is where activities involving derivatives contravene rules or regulations that the CFTC may prescribe or promulgate as are necessary or appropriate to avoid the evasion of any provisions of the Dodd-Frank Act.¹⁶⁴ In fulfilment of this mandate, the CFTC issued the Interpretive Guidance and

¹⁶⁰ Heikki Marjosola, 'Regulate Thy Neighbour: Competition and Conflict in the Cross-Border Regulatory Space for OTC Derivatives' (2016) 2016 EUI Working Paper 12.

¹⁶¹ Case C-362/14.

¹⁶² Article 13 EMIR.

¹⁶³ European Parliament, 'Report on the Proposal for a Regulation of the European Parliament and of the Council Amending Regulation (EU) No 1095/2010 Establishing a European Supervisory Authority (European Securities and Markets Authority) and Amending Regulation (EU) No 648/2012 as Regards the Procedures and Authorities Involved for the Authorisation of Ccps and Requirements for the Recognition of Third-Country CCPs' (2018).

¹⁶⁴ Section 722 Dodd-Frank Act.

Policy Statement Regarding Compliance with Certain Swap Regulations.¹⁶⁵ In light of the above statutory provisions, it is obvious that the first step in determining the extra territorial reach of the Dodd-Frank Act is ascertaining whether an entity is a US entity. This is because swaps between non-US persons are not within the jurisdictional reach of the CFTC and swaps between such parties do not trigger a requirement to register as a swap dealer. However, whether US regulation applies to transactions between a US person and non-US person is not clear and has been the source of debate as well as releases by the CFTC.¹⁶⁶

The extraterritorial effects of the Dodd-Frank Act can be disapplied by the framework of substituted compliance which was originally a tool created to provide the opportunity for foreign entities wishing to do business in the US without complying with US rules where regulation in the foreign entities' home jurisdiction achieves the same outcomes as the US regime.¹⁶⁷ More recently, a subsequent, substituted compliance framework has been designed to curtail the extra-territorial reach of the Dodd-Frank Act. As regards CCPs, the US position is that any entity clearing swaps for US persons must register as a CCP. While foreign CCPs can apply for exemptions, the situation is complicated as only Futures Commission Merchants (FCMs)¹⁶⁸ can act as intermediaries in swap transactions. As FCMs are a US specific class of persons and subject to segregation and portability rules amongst others, foreign CCPs will have to comply with US rules in effect. This led to a standoff between the EC and the CFTC with the EC refusing to recognise US CCPs due to the CFTC's refusal to recognise EU CCPs. This situation has however

¹⁶⁵ 78 F.R. 45299.

¹⁶⁶ Ibid.

¹⁶⁷ John Coffee, 'Extraterritorial Financial Regulation: Why ET Can't Come Home' (2014) Cornell Law Review 1259; Alexey Artamonov, 'Cross-Border Application of OTC Derivatives Rules: Revisiting the Substituted Compliance Approach' (2015) Journal of Financial Regulation 213; ISDA, 'Cross-Border Fragmentation of Global OTC Derivatives: An Empirical Analysis' <https://www.isda.org/a/cSiDE/cross-border-fragmentation-an-empirical-analysis.pdf>.

¹⁶⁸ Discussed Infra Section 4.4.

be remedied¹⁶⁹ following the agreement to a common approach for the treatment of transatlantic CCPs.¹⁷⁰

c. A Comparative Perspective

Both EU and US extraterritorial provisions are vastly similar. The reasons for which will become clear upon this subsection's theoretical analysis. The major difference between both regimes is that the EU regime requires similar third country rules for equivalence while the US approach requires the attainment of similar outcomes. The broad scope of both regulations indicates a need to export what these countries consider best practices to less powerful jurisdictions to ensure that systemic risk is not transmitted from those jurisdictions to the relevant home jurisdictions. However, both jurisdictions also provide for substituted compliance albeit under different names. It has however been noted that the grant of recognition of substituted compliance has become a tool in the political machinations of regulators on both sides of the Atlantic. This is especially the case as a regulatory standoff between the two largest OTC-DM jurisdictions does not bode well for global markets. While the exertion of political influence is not entirely unjustified, EU and US regulators must work in tandem as extraterritoriality tactics are likely to be unsuccessful. These regulators must further ensure that this political wrangling does not engender systemic risk.

d. A Theoretical Perspective

Due to the global nature of OTC-DMs, the efficacy of the CCP prescription is dependent on its uniform application. This is because in the event of divergent regulatory approaches, transacting parties can shift derivative trades from highly regulated jurisdictions to less regulated jurisdictions to extract rents, which can result in market fragmentation and liquidity partitioning.¹⁷¹

¹⁶⁹ European Commission, 'European Commission Adopts Equivalence Decision for CCPs In USA' (2016) http://europa.eu/rapid/press-release_IP-16-807_en.htm.

¹⁷⁰ European Commission, 'European Commission and The United States Commodity Futures Commission: Common Approach for Transatlantic CCPs' (2017) http://europa.eu/rapid/press-release_IP-16-281_en.htm.

¹⁷¹ Sean Griffith, 'Substituted Compliance and Systemic Risk: How to Make a Global Market in Derivatives Regulation' (2014) 98 Minnesota Law Review 1324; Alexey Artamonov, 'Cross-Border

Regulatory arbitrage dilutes the efficacy of national regulatory measures¹⁷² and creates opacity in OTC-DMs as regulators and financial market participants are unable to accurately assess derivative exposures. This in turn engenders imperfect information constraints which results in an abundance of uncertainty in financial markets and may engender the proliferation of instable finance structures.

From an endogenous risk perspective, divergence in regulatory implementation of mandatory clearing can be ascribed to a factor that this thesis argues is inherent in financial markets – fundamental uncertainty. This fundamental uncertainty is attributable to regulators cognisance of the sometimes irrational nature of financial market participants which leads to differing national solutions to the global problem of systemic risk. Lehmann succinctly states that this uncertainty manifests in three forms. First, uncertainty about the adequacy of national financial regulation. Second, uncertainty about the motives of other states, and third is uncertainty about national regulatory capability.¹⁷³ This uncertainty is manifest in the extraterritorial provisions of both the Dodd-Frank Act and EMIR. Due to uncertainty about the effects of regulatory arbitrage or just plain contracting in less regulated jurisdictions on financial stability within a state, these legislations have instituted wide ranging extraterritorial measures. Regulatory divergence however creates duplicative or contradictory legislative requirements. The global nature of financial markets dictate that large market participants will be active in more than one jurisdiction. This results in legal fragmentation which creates additional transaction and/or compliance costs for market participants and can pose barriers to market entry. Fragmentation resultantly inhibits liquidity in financial markets and their efficient frictionless functioning.

Application of OTC Derivatives Rules: Revisiting the Substituted Compliance Approach' (2015) 1 Journal of Financial Regulation 206.

¹⁷² Marjosola (n 160) 18.

¹⁷³ Matthias Lehmann, 'Legal Fragmentation, Extraterritoriality and Uncertainty in Global Financial Regulation' (2017) 37 Oxford Journal of Legal Studies 415-417.

From a MFT perspective, extraterritoriality also poses liquidity problems in OTC-DMs. Multilateral netting helps CCPs reduce the amount of collateral needed to back derivative trades. Regulatory divergence and its resultant legal fragmentation inhibits CCP netting of cross border transactions. This results in increased collateral demands from CCPs, consequently reducing the amount of liquidity available to OTC-DM participants and resultantly affects the amount of financing these entities can provide for the development of the real economy. Furthermore, regulatory fragmentation reduces the number of trades that can be netted in the event of a clearing member's default as only said clearing member's trades with the particular CCP can be netted. This results in the CCP having to absorb more losses through its loss mutualisation mechanisms. In response to this possibility, CCPs demand larger amounts of contributions to the default fund further increasing transaction costs and curtailing the use of derivatives as a risk mitigation tool.¹⁷⁴

This analysis once again reveals that extraterritoriality does not necessarily follow the tenets of MFT that is, unfettered deeply liquid markets as extraterritoriality inhibits cross-border netting. In the long term, extraterritoriality may however pay off. Utilising the market power their liquid, well developed, and world leading financial markets offer them, the EU and US can export their rules to weaker states. For this to occur, the EU¹⁷⁵ and US will have to coordinate to ensure that other jurisdictions adopt their rules promoting convergence. While in light of current events, this seems like a tall order, the EU and US will no doubt be incentivised by the fact that in the event of large financial shocks, they will suffer the most damage.¹⁷⁶ This uniform application of high-quality rules results in more liquid and efficient OTC-DMs and addresses the problem of suboptimal regulatory arbitrage.

Attuned to the extraterritoriality defect in the implementation of post-GFC regulatory reform, regulators in the EU and US have implemented substituted compliance and equivalence regimes discussed above. From a MFT

¹⁷⁴ Griffith (n 171) 1352-1353.

¹⁷⁵ On the ability to export regulatory standards, see Anu Bradford, 'The Brussels Effect' (2012) 107 *Northwestern University Law Review* 1.

¹⁷⁶ Marjosola (n 160) 20.

perspective, this is indeed the correct approach and ensures the efficient and frictionless operation of financial markets. However, MFT also dictates that to ensure true efficiency, it is imperative that regulatory efforts do not prevent regulatory competition. Adapting Romano's thesis, market oriented competition amongst states facilitates the adoption of financial regulation aligned with financial market participant's preferences.¹⁷⁷ Any suboptimal regulatory arbitrage financial market participants may undertake is priced into their creditworthiness and they are consequently disciplined by market forces. Furthermore, regulatory competition incentivises regulators to innovate efficient regulation encouraging trading volume and consequently increased liquidity. Additionally, regulation that is more efficient may result in lower compliance costs or achieve better results at the same price consequently freeing up capital.¹⁷⁸ Furthermore, regulatory competition provides information on the existence and viability of other jurisdictions regulations.¹⁷⁹ However, given market participants' drive to extract rents and the consequent possibility of a proliferation of Ponzi finance structures, this approach could engender endogenous risk.

Interestingly, from a fundamental uncertainty perspective, uniformity in regulatory approaches may also be problematic. Uncertainty dictates that regulators still do not totally understand the consequences of embryonic post-GFC reforms. Regulatory processes should be flexible and innovative. This necessarily involves some diversity in national regulatory initiatives with states

¹⁷⁷ See Roberta Romano, 'Empowering Investors: A Market Approach to Securities Regulation' (1998) 107 *The Yale Law Journal* 2359; Roberta Romano, 'The Need for Competition in International Securities Regulation' (2001) Paper 258 John M. Olin Centre for Studies in Law, Economics, and Public Policy Working Papers; Roberta Romano, 'For Diversity in the International Regulation of Financial Institutions: Redesigning the Basel Architecture' (2014) 31 *Yale Journal on Regulation* 1. The effects of regulatory competition are controversial. See for example Lucian Bebchuk, 'Federalism and the Corporation: The Desirable Limits on State Competition in Corporate Law' (1992) 105 *Harvard Law Review* 1435; Lucian Bebchuk and others, 'Does the Evidence Favor State Competition in Corporate Law?' (2002) 90 *California Law Review* 1775; John Coffee, 'Competition Versus Consolidation: The Significance of Organizational Structure in Financial and Securities Regulation' (1995) 50 *The Business Lawyer* 447; Stephen Choi and Andrew Guzman, 'National Laws, International Money: Regulation in a Global Capital Market' (1997) 65 *Fordham Law Review* 1856; John Coffee, 'Racing towards the Top?: The Impact of Cross-Listings and Stock Market Competition on International Corporate Governance' (2002) 102 *Columbia Law Review* 1757.

¹⁷⁸ Griffith (n 171) 1328.

¹⁷⁹ Romano (n 177) 7.

learning from each other's successes and failures.¹⁸⁰ Unfortunately, regulatory prescriptions as regards systemic risk in OTC-DMs have converged on CCPs as the optimal solution. This results in the calcification of solutions to the vexing problem of systemic risk and inhibits the search for superior solutions. Financial markets are fraught with irrational market participants and complexity which means that they are highly dynamic and that the effects of regulation or regulatory ideology may be counter performative. This calcification results in the significant correlation in financial market participant strategies. These strategies may involve Ponzi finance structures which can be debilitating in the event of black swan events.¹⁸¹

The above problem is worsened by the fact that global regulatory harmonisation increases interconnectedness in global OTC-DMs. Errors in judgment by regulators who are only human and consequently subject to bounded rationality can have disastrous consequences. Expanding on this point, as has been shown above, the CCP prescription constrains market discipline. In the absence of other constraints on systemic risk, failure in OTC-DMs in a particular jurisdiction can have globally disastrous consequences as there will be no liquidity partitioning or regulatory firewalls to prevent the spread of contagion.¹⁸² Conversely, it could be argued that global liquid non-concentrated markets are better adapted to absorb financial shocks insofar as regulators are able to curtail the majority of systemic risk.¹⁸³ It can however be counter-argued that due to the fundamental uncertainty inherent in OTC-DMs, regulators will never master systemic risk and consequently, it is better to err on the side of caution.

The above discussion poses vexing questions on how in the face of bounded rationality, fundamental uncertainty and imperfect information regulators can design substituted compliance regimes that prevent suboptimal regulatory

¹⁸⁰ Griffith (n 171) 1346.

¹⁸¹ See Nassim Taleb, *Anti-Fragile* (Allen Lane 2012) for a general discussion on the relationship between the fragility of financial markets and regulation.

¹⁸² Joseph Stiglitz, 'Risk and Global Economic Architecture: Why Full Financial Integration May Be Undesirable' (2010) 100 *American Economic Review* 388; Roberta Romano, 'Against Financial Regulation Harmonization: A Comment' (2010) No. 414 *Yale Law & Economics Research Paper* 16

¹⁸³ Marjosola (n 160) 19.

arbitrage while preserving the objective of ensuring financial stability. Building on Romano's proposal for the implementation of Basel III,¹⁸⁴ one solution to this regulatory conundrum could be national regulators acceding to discretionary recognition of regulation from other jurisdictions as having similar outcomes as regulation as home state regulation. In this case, the end goal would be ensuring the stability of OTC-DMs. This approach creates an environment that encourages regulatory diversity amongst national regulatory regimes. This approach obviates the current complicated and overly burdensome comparable rules system currently used by the EU to determine equivalence. It also ensures that regulators are focused on the overarching goal of safeguarding financial stability in OTC-DMs. This approach also encourages the production of innovative regulatory strategies for the mitigation of systemic risk. Of course, it can be argued that regulators themselves suffer from bounded rationality and that the resultant regulatory competition can lead to the development of suboptimal national regulation especially where this proposal reduces accountability by promoting rubberstamping.¹⁸⁵ However, the alternative which is globally uniform regulatory reform can prove disastrous if regulators have miscalculated.

In conclusion, this sections' theoretical examination highlights several salient points. First, extraterritorial regulation indicates regulators' awareness of imperfect knowledge, bounded rationality, and the fundamental uncertainty immanent in OTC-DMs. However, extraterritorial regulation does not promote market efficiency. Consequently, regulators have instituted deference regimes to promote market efficiency though this approach inhibits regulatory competition. EU equivalence and global regulatory convergence may however calcify regulatory prescriptions and do not promote the flexibility needed to deal with financial markets fraught with endogenous risk. To this end, this section has advocated the adoption of a more relaxed outcomes based system of substituted compliance.

¹⁸⁴ Romano (n 177) 10–11.

¹⁸⁵ Lehmann (n 173) 424.

3.6. Conclusion

The GFC has triggered wholesale reform in OTC-DMs. These reforms have included the CCP prescription. This chapter has provided an overview of the nature of clearing and settlement, the nature of CCP's and the risk management mechanisms utilised by these financial market infrastructures. In addition, this chapter has examined the efficacy of the CCP prescription. To this end, drawing on both comparative and interdisciplinary methodologies, this chapter has provided an outline of the framework for clearing and settlement, particularly CCP clearing, and examined central elements of the CCP prescription including the general outline and scope of this mandate as well as the extraterritorial reach of said prescription.

The comparative analysis reveals that in terms of ensuring financial stability, the EU approach is best if financial stability is to be guaranteed. An example of the virtues of the EU's reform is the absence of wholesale exemptions to the CCP prescription. Analysis from a theoretical perspective reveals that regulatory approaches to the CCP prescription seem to mix insights from modern and alternative theories of finance. The recognition of imperfect information, uncertainty, and irrationality are however stronger in the EU reforms which overall advocates stricter market oversight than reforms in the US. To illustrate, the scope of the US's CCP prescription excludes certain parties giving rise to a presumption in favour of a 'markets still know best ideology.' The EU on the other hand has imposed a qualified exemption which only allows uncleared trades below a certain threshold which can be viewed as an excess dampening method and consequently evidences EU regulators acknowledgment of uncertainty about the future due to the imperfect knowledge and complexity inherent in OTC-DMs. These advantages are however undercut by the fact that complex derivatives are likely to be excluded from the ambit of CCP clearing a fact attributable to the legal and economic heterogeneity of these instruments, as well as the hybridised public-private nature of CCPs. Reforms are further undercut by US wholesale exclusion of end users, and divergent EU and US regimes which may result in regulatory arbitrage. This leads to a tentative conclusion that the CCP prescription is a placebo not panacea when trying to ensure financial stability in the long run.

However, it is still useful to have this financial market infrastructure present and consequently, this chapter has made the following normative suggestions for reforms: (i) the annual auditing of regulators as they themselves are subject to bouts of irrationality and the imperfect knowledge constraint (ii) US adoption of the EU's approach towards non-financial counterparties, and; (iii) while substituted compliance helps encourage cross border derivative transactions, regulatory diversity should be encouraged so that optimal solutions guaranteeing financial stability can be developed and to ensure that fire breaks are in place in the event of crisis.

Chapter 4: The Rules on Central Counterparty Operation: A Law and Finance Analysis

4.1. Introduction

This thesis has examined the G20's CCP prescription¹ from a generalised perspective in Chapter 3. This analysis indicates that this prescription may be a placebo and not a panacea to the endogenous risk endemic in OTC-DMs. However, this conclusion comes with a caveat - the design of CCP clearing mechanisms and access arrangements may have positive effects on the utility of CCP clearing. Mandated CCP clearing has dramatically altered the geography of OTC-DMs, transforming CCPs into potential nodes of systemic risk.² This raises questions on the sufficiency of CCP financial resources, as well as on the appropriateness of CCP governance mechanisms which will undoubtedly have an effect on CCP risk management. In addition, given the fact that CCP clearing is mandatory in certain circumstances, but CCP membership remains highly selective, client clearing is a necessary corollary of the G20's CCP prescription. Consequently, an assessment of the viability of regulatory prescriptions on CCP governance, risk management mechanisms, client clearing, and the segregation and portability of collateral is imperative.

It is in this context that this chapter explores certain substantive aspects of the CCP prescription from an analytical, comparative and theoretical perspective. This chapter seeks to further ascertain whether these regulatory prescriptions add credence to the CCP prescription, or may contribute to the exacerbation of systemic risk in environments of financial stress. To this end, Section 4.2 explores CCP authorisation, organisation and governance. Section 4.3 interrogates CCP financial resources. Section 4.4 explores client clearing, and Section 4.5 analyses the segregation and portability of client collateral. This

¹ Supra Section 3.1.

² Adam Levitin, 'The Tenuous Case for Derivative Clearinghouses' (2013) 101 Georgetown Law Journal 447.

analysis yields a number of conclusions which indicate that CCPs may transmit systemic risk in environments of financial stress, and that CCP access arrangements engender unnecessary complexity. To mitigate these problems, this chapter makes a number of recommendations, which are further bolstered by recommendations made in Chapter 7 of this thesis. It is pertinent to note at this juncture that due to the absence of a precise legal framework, this chapter does not examine CCP recovery and resolution.

4.2. CCP Authorisation, Organisation, and Corporate Governance

The failure of a CCP will have significantly deleterious effects on financial markets catalysing the spread of contagion.³ An implication of the CCP prescription is that CCPs serve a public-private function – that is, CCPs while privately established and controlled entities designed to achieve commercial ends now also perform the public functions of mitigating systemic risk.⁴ Basic corporation law and economics dictates that the manner in which CCPs are governed will have profound effects on the manner in which they are authorised and consequently governed.

The first issue to then be considered is how CCPs are authorised as the resilience of said CCPs, and by extension, the resilience of OTC-DMs is largely dependent on the resilience of structures that ensure that strict prudential requirements are put in place. This ensures that only CCPs which can deal with the substantially large number of OTC derivatives to be cleared are authorised.⁵ A second issue is CCP corporate governance. CCPs are typically closely held or publicly traded companies.⁶ Investing in CCPs enables dealers participate in CCP corporate governance.⁷ There is also the risk that there will be insufficient alignment of control and risk.⁸ Both of these facts raise

³ Craig Pirrong, 'The Economics of Central Clearing: Theory and Practice' (2011) 1 ISDA Discussion Papers Series 35; Jo Braithwaite and David Murphy, 'Got to be Certain: The Legal Framework for CCP Default Management Processes' (2016) 37 Bank of England Financial Stability Paper 4.

⁴ Sean Griffith, 'Governing Systemic Risk: Towards a Governance Structure for Derivatives Clearinghouses' (2012) 61 Emory Journal of Law 1155; Kristin Johnson, 'Clearinghouse Governance: Moving Beyond Cosmetic Reform' (2012) 77 Brooklyn Law Review 705.

⁵ Niamh Moloney, *EU Securities and Financial Markets Regulation* (Oxford University Press 2014) 604.

⁶ Johnson (n 4) 696.

⁷ Ibid 697–698.

⁸ Pirrong (n 3) 26.

agency issues.⁹ Exceedingly aware of these dangers, regulators have designed authorisation, corporate governance and conduct of business rules. A detailed outline, and a comparative and theoretical analysis of these rules is undertaken in the subsections below.

a. European Union

In the EU, the authorisation of CCPs is a national power as where a CCP risks insolvency, fiscal responsibility lies with the Member State in which it is established.¹⁰ However, given the risk the failure of a CCP could have on pan-European clearing members and the potentially detrimental effects of discriminatory access to central clearing,¹¹ EMIR provides for the college of supervisors¹² to check the powers of NCAs.¹³ Article 14 (1) EMIR provides that any legal person intending to provide CCP clearing services must apply for authorisation from the NCA¹⁴ of the Member State in which it is established. Within 30 days of the submission of an application for authorisation, the CCP's NCA must establish, manage, and lead a college of supervisors.

The CCP's NCA must then conduct a risk assessment of the CCP and submit said report to the college within four months.¹⁵ Subsequent to which the college must reach a joint opinion on whether the applicant CCP complies with EMIR's requirements. Where the college does not veto the CCP's application for authorisation and the NCA is fully satisfied that the CCP meets EMIR's

⁹ For this thesis's purposes, agency costs are costs resulting from conflicts of interest. See Michael Jensen and William Meckling, 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure' (1976) 3 *Journal of Financial Economics* 305.

¹⁰ Recital 52 EMIR.

¹¹ *Ibid.*

¹² Article 18(1) EMIR. This college consists of ESMA, the CCP's NCA, the NCAs responsible for the supervision of the relevant CCPs clearing members, the supervisor of trading venues supervised by the CCP, the supervisors of CCPs with which the CCP in question has interoperability arrangements, the supervisor of central securities depositories, and the relevant member of the ESCB responsible for the oversight of the CCP, the relevant member of the ESCB responsible for the oversight of CCPs with which interoperability arrangements have been established, and the central banks of issue of the most relevant EU currencies of the financial instruments cleared. The operations of this college are to be determined by written agreement.

¹³ Moloney (n 5) 605.

¹⁴ Article 22 EMIR mandates that each Member State designates a competent authority responsible for the authorization and supervision of CCPs established in its territory. In the UK, the designated CCP regulator is the Bank of England.

¹⁵ Article 19 EMIR.

requirements, the NCA may grant authorisation;¹⁶ subsequent to its consideration of the college's risk assessment.¹⁷ Where the college unanimously¹⁸ reaches the opinion that a CCP not be authorised, this opinion is binding.¹⁹ The CCP's NCA may however refer the issue to ESMA.²⁰

Where authorisation is granted, it is effective throughout the EU, and is usually granted for the performance of specific services and classes of financial instruments. While authorisation conditions are not specified or mandated under EMIR, Member States can impose additional requirements on CCPs established in their jurisdictions.²¹ Some EU states pursuant to this authority have dictated additional criteria. For example, Germany mandates that CCPs obtain bank licenses before commencing their operations.²² Conversely, in the UK, CCPs do not have to register as banks. They merely need to register as financial services businesses.²³ This difference in criteria may explain why the UK has a high number of CCPs authorised to operate in its jurisdiction.²⁴ These differences in intra-EU regulatory regimes impede cross border trade within the EU and competitiveness in the international arena.²⁵

Once authorised, CCPs must continuously comply with the conditions of their authorisation and notify NCAs of any changes influencing their authorisation conditions.²⁶ It should also be noted that authorisation can be withdrawn where the CCP's NCA believes that there are grounds for the full or partial withdrawal of authorisation, it must notify ESMA and consult the college. Despite not specifying detailed conditions for authorisation, EMIR does require that CCPs upon initial authorisation hold €7.5 million in permanent and

¹⁶ Article 17(4) EMIR.

¹⁷ Article 19 EMIR.

¹⁸ Excluding the applicant CCP's NCA.

¹⁹ Article 17(4) EMIR.

²⁰ Ibid.

²¹ Article 14(5) EMIR.

²² Banking Act (Kreditwesengesetz, KWG).

²³ Part XVIII Financial Services and Markets Act 2000.

²⁴ The United Kingdom has three CCPs established in its jurisdiction. A list of all EU CCPs can be found at: https://www.esma.europa.eu/system/files/force/library/ccps_authorised_under_emir.pdf

²⁵ Kern Alexander and Rahul Dhumale, *Research Handbook on International Financial Regulation* (Edward Elgar 2012) 247.

²⁶ Article 14(4) EMIR.

available capital.²⁷ This regulatory capital can cushion payment, treasury, operational, and business risks.²⁸ Additionally, CCP capital²⁹ must be proportionate to risk arising from its activities, and be sufficient to ensure the orderly winding down or restructuring of its activities over an appropriate period.³⁰

EMIR imposes a number of detailed administrative rules regulating CCP corporate governance.³¹ These rules aim to promote transparency, accountability, and avoid conflicts of interests.³² For instance, CCP ownership structure must be transparent, and ESMA must be notified of changes in ownership structure.³³ Additionally, CCPs must comply with strict conflict of interest provisions.³⁴ Furthermore, CCPs must establish sound risk management policies and internal control mechanisms including the establishment of a risk committee³⁵ consisting of independent directors, clearing members, and client representatives tasked with the responsibility of advising the board on any arrangements that may affect the risk management of the CCP.³⁶ NCAs may ask to attend meetings of the risk management committee in a non-voting capacity. Additionally, where a committee member has an actual or potential conflict of interest, the chairman must ensure that said member is not allowed to vote on the relevant matter.³⁷ CCPs must inform the NCA of any decisions of the risk management committee they decide to ignore.³⁸

²⁷ Article 16 EMIR.

²⁸ Alexander and Dhumale (n 25) 244.

²⁹ Including earnings and reserves.

³⁰ Article 16(2) EMIR.

³¹ Title IV, EMIR.

³² Guido Ferrarini and Paolo Saguato, 'Post-Trading Infrastructures: A New International Framework' in Niamh Moloney and others (ed), *The Oxford Handbook of Financial Regulation* (Oxford University Press 2015) 585.

³³ Articles 30 and 31 EMIR.

³⁴ Article 33 EMIR.

³⁵ Comprised of representatives of the CCPs clearing members, independent members of the CCPs board, and client representatives.

³⁶ Article 28 EMIR.

³⁷ Article 29(4) EMIR.

³⁸ Article 28(5) EMIR.

Senior CCP management must be of good character and experienced enough to ensure the appropriate prudential management of a CCP.³⁹ Furthermore, CCPs must establish a board, a third or at the very minimum two of whom must be independent.⁴⁰ Board members are subject to the same expertise and integrity requirements as senior management and the board's compensation must not be linked to the performance of the CCP. Finally, EMIR imposes record keeping requirements on CCPs as regards services and activity provided, and information on contracts.⁴¹

b. United States

Organisations intending to carry on business as a CCP must register with the CFTC.⁴² Furthermore, to maintain this registration, CCPs must comply with core principles set out in the Act and any rules that may be devised by the CFTC. The Dodd-Frank Act mandates that CCPs establish and enforce rules that fulfil public interest requirements,⁴³ minimise conflicts of interests,⁴⁴ and ensure that the composition of the governing board of the CCP includes market participants.⁴⁵ The Dodd-Frank Act then leaves the minutiae of transforming these mandates into regulation to the CFTC.⁴⁶ Furthermore, the Dodd-Frank Act explicitly authorises the CFTC⁴⁷ to draft rules⁴⁸ addressing conflicts of interest in CCP governance where necessary and appropriate. In pursuance of these aims, the CFTC has issued proposed rules addressing conflicts of interests within CCPs. These rules propose two governance mechanisms namely restrictions on voting power and prescribed rules on governance.⁴⁹

³⁹ Article 27 EMIR.

⁴⁰ Article 27(2) EMIR.

⁴¹ For at the minimum, a period of 10 years.

⁴² 17 CFR 39.3.

⁴³ Section 725(c)(O) Dodd-Frank Act.

⁴⁴ Section 725(c)(P) Dodd-Frank Act.

⁴⁵ Section 725(c)(Q) Dodd-Frank Act.

⁴⁶ Section 725(d) Dodd-Frank Act.

⁴⁷ Section 726 Dodd-Frank Act.

⁴⁸ These rules should aim to promote efficiency.

⁴⁹ Requirements for Derivatives Clearing Organisations, Designated Contract Markets, and Swap Execution Facilities Regarding the Mitigation of Conflicts of Interests, 75 FR 63 (proposed Oct. 18 2010) (to be codified at 17 C.F.R. 39).

The CFTC has proposed alternative voting structures with different trade-offs.⁵⁰ Individual voting caps of either 5% per member with no aggregate cap or 20% per member with aggregate caps of 40%.⁵¹ It should however be noted that the CFTC's proposed rules target specific entities including bank holding companies with over \$50 billion in total consolidated assets, a nonbank financial company supervised by the Federal Reserve, SDs and their affiliates, and MSPs and their associated persons.⁵² The CFTC proposes a single approach to governance rules mandating that 35% of CCP board members be independent directors with the minimum number of said directors being two.⁵³ Additionally, any committee with powers equal to or superseding the boards' must satisfy the independence requirements the board has to meet.⁵⁴ CCPs must also have nominating committees and risk management committees.⁵⁵ The nominating committee, which nominates directors to the CCPs board, must have a majority of independent directors and must be chaired by an independent director.⁵⁶ The risk management committee, which advises on risk modelling, default procedures, membership eligibility and applications, and clearing eligibility, must have at least 35% independent directors and additionally, 10% of its constituents must represent customer interests.⁵⁷ CCPs must notify the CFTC where the board of the CCP rejects the recommendation of, or supersedes the action of the risk management committee.⁵⁸

c. A Comparative Perspective

The substance of authorisation requirements under both the US and EU regimes are similar with both regimes requiring that CCPs register with the relevant regulatory authorities before commencing business. Furthermore, both regimes provide that registration and continuous authorisation is

⁵⁰ Griffith (n 4) 1212

⁵¹ 75 F.R. 63, 733-734.

⁵² 75 F.R. 63, 750.

⁵³ 75 F.R. 63, 738.

⁵⁴ 75 F.R. 63, 738.

⁵⁵ 75 F.R. 63, 733.

⁵⁶ 75 F.R. 63, 740.

⁵⁷ 75 F.R. 63, 740.

⁵⁸ 75 F.R. 63, 741.

dependent on compliance with certain provisions. The procedures for CCP authorisation under the EU and US regimes are however radically different. This difference is due to the peculiar supranational nature of the EU, which has led to an attempt to balance the sovereignty of EU Member States and the mitigation of systemic risk in the EU through the college of supervisors' mechanism. While the EU approach to CCP authorisation is understandable when considering the effects of a CCP's failure on clearing members who may be spread throughout the EU, it makes the authorisation process cumbersome when contrasted with the US approach.

Another noticeable difference between the EU and US regulatory regimes is that while EMIR provides detailed corporate governance requirements and conduct of business standards for CCPs, the Dodd-Frank Act charges regulators with the task of developing corporate governance and conduct of business standards for CCPs. This difference can once again be attributed to the different political considerations on both sides of the Atlantic. A definite advantage to the US approach once again is the flexibility that it affords regulators especially as regards any attempts to avoid compliance with the prescriptions of the Dodd-Frank Act. Both regimes provision for corporate governance mechanisms highlight the importance risk governance plays in the reduction of systemic risk. CCPs are companies despite the public function they play. The organic theory of corporate life, which has dominated Anglo-American debates on corporate decision-making states that control of the company or rather decision making lies with the company's board of directors.⁵⁹ Consequently, accountability and the institution of safeguards on the part of a CCPs board are important factors in ensuring the proper monitoring and mitigation of risk by boards.⁶⁰

The manner in which the EU and US regimes govern CCP corporate governance measures are however radically different. The US regime, aims to ensure that large clearing members cannot institute unfairly discriminatory and anticompetitive policies.⁶¹ These alternatives also have decision making

⁵⁹ J. Parkinson *Corporate Power and Responsibility* (Clarendon Press 2002) 23.

⁶⁰ Johnson (n 4) 689.

⁶¹ Ibid 704.

implications for the board. By instituting board composition requirements which vary depending on the alternative adopted, regulators counterbalance the voting power of clearing members or shareholders with the number of independent directors on the board. Under the EU regime, no numerical limits on shareholding have been instituted as EMIR only mandates transparency of CCP ownership structures, and that ESMA be informed of any changes in CCP ownership structure.

A superficial comparison of the EU and US regime suggests that the US regime is superior as it specifically provides for ownership and control limits. However, it can be argued that these rigid criteria preclude flexibility and responsiveness especially as there are no reporting requirements in relation to changes in ownership structures within the provided parameters. The EU approach on the other hand is relatively simple and ensures that regulators are kept abreast of and capable of responding to changes in CCP ownership capable of impacting CCP risk governance. The EU and US regimes both mandate the appointment of independent directors onto the board though the number of directors required by both regimes vary. However, the use of the word independence is quite vague as no criteria is provided for determining what true independence means. While reference will no doubt be made to jurisdictional corporate governance codes for the definition of independence, this omission leaves room for avoidance on the part of CCP boards. In addition, both jurisdictions require the use of risk committees. However, the EU regime lets regulators attend risk committee meetings.

Overall, from a comparative perspective, despite its cumbersome authorisation policy, the EU corporate governance regime for CCPs seems superior to the US regime due to the fact that it thrusts regulatory participation in corporate governance into the centre stage unlike the US regime which lays down prescriptive percentage based corporate governance rules. However, the US corporate governance regime is still in its embryonic state so final judgments cannot be made at this stage. This analysis however raises interesting questions on the effects theories of finance may have on board decision-making and corporate governance in general. Consequently, the

subsequent subsection explores the general insights from EU and US corporate governance gleaned in this section through the lens of mainstream finance theory and alternative theories of finance.

d. A Theoretical Perspective

From a MFT perspective, it is crucial that ownership and control rights, and risk are aligned in a CCP.⁶² Reinforcing this sentiment, Griffith argues that there is a clear incentive for financial market participants with an interest in the CCP to undertake substantial governance roles within the CCP. MFT further dictates that governance by these parties who have the most interest in the CCP will lead to self-discipline, which promotes efficient CCP functioning. However, as alternative theories of finance have shown, OTC-DMs are not always efficient. Furthermore, actions which are individually rational can be collectively irrational. This then leads to the questioning of these parties incentives, and furthermore, whether these incentives align with the mitigation of systemic risk.

First, OTC derivative dealer profits are derived from spreads that are charged on their trades. The more trade volume a dealer has, the higher its profits.⁶³ Second, dealers innovate new products that are customised solutions to particular client problems. This innovation involves significant expenditure and technical expertise. Consequently, dealers expect returns in the form of higher spreads even where trading volume is not large.⁶⁴ The enhanced transparency engendered by CCP clearing promotes competition for dealers' trades narrowing their spreads and consequently provides a possible incentive for dealers to obstruct the central clearing of trades.⁶⁵ Furthermore, CCPs' margin requirements are significantly more taxing than margin requirements applicable in bilateral OTC derivative markets.⁶⁶ Finally, CCP clearing's mitigation of counterparty credit risk negates the need for a concentrated

⁶² Pirrong (n 3) 26; Paolo Saguato, 'The Ownership of Clearinghouses: When 'Skin in the Game' Is not Enough, the Remutualization of Clearinghouses' (2019) 34 *Yale Journal on Regulation* 636.

⁶³ Darrell Duffie and others, 'Policy Perspectives on OTC Derivatives Market Infrastructure' (2010) 424 *Federal Reserve Bank of New York Staff Reports* 10.

⁶⁴ *Ibid.*

⁶⁵ *Ibid.*; Discussed *Supra* Section 3.3.

⁶⁶ Griffith (n 4) 1195.

group of interconnected creditworthy dealers.⁶⁷ Conversely, it could be argued that with reduced regulatory capital requirements, for example in the form of zero-risk weights banks can attribute to cleared OTC derivative transactions and the exclusion of OTC derivatives requiring the payment of variation margin from the Basel III's risk based capital requirement are advantageous to dealers.⁶⁸ CCP clearing also facilitates trade compression, which reduces the number of dealers' outstanding contracts by allowing market participants tear up offsetting trades with each other consequently allowing CCPs aggregate clearing members' positions for determining collateral requirements.⁶⁹

These advantages do not outweigh the costs to OTC derivative dealers as the regulatory capital advantages offered by CCP clearing may be outweighed by the costs of margining and default fund contribution – especially as collateral requirements in bilateral OTC derivative markets were not strictly enforced.⁷⁰ From the above, it is possible that dealers will be incentivised to keep the bulk of clearing of OTC derivative transactions off CCPs through the faux customisation of bilateral contracts; and the exertion of governance influence over the CCP to ensure that the CCP deems these instruments non-standardised. The deference that the regulatory reforms leave to CCPs when determining what products are eligible for clearing and legislative reluctance to force ostensibly non-standardised contracts into CCP clearing therefore leave room for arbitrage on the part of dealers. While these dealers' actions may seem individually rational, they can be collectively irrational and engender the creation of instable finance structures.

Dealers may also exert their corporate governance influence over CCPs for monopolistic reasons that is, by excluding their competitors with capital requirements and sophistication standards.⁷¹ Incentives for this monopolistic behaviour stem from the fact that large dealers earn fees for acting as

⁶⁷ Ibid.

⁶⁸ Ibid.

⁶⁹ Trade compression reduces the number of contracts in a portfolio while retaining the same economic exposure. See further David Murphy, *OTC derivatives: Bilateral Trading and Central Clearing: An Introduction to Regulatory Policy, Market Impact and Systemic Risk* (Palgrave Macmillan 2013) 54.

⁷⁰ Griffith (n 4) 1196.

⁷¹ Johnson (n 4) 698.

intermediaries to small non-member dealers.⁷² Clearing members can misuse the CCP's ability to restrict membership for risk reasons. For instance, sophistication is one of the factors considered when denying membership.⁷³ Where CCPs adopt discriminatory eligibility criteria, a large volume of OTC derivatives may be transacted on the bilateral market, which negates the purpose of the CCP prescription.⁷⁴

Small dealers are also subject to the same constraints as large dealers, that is, smaller spreads, CCP clearing offers the means through which they can build their books of business. However, CCP clearing imposes significant costs on small dealers, as they cannot exert influence over CCPs to extract concessions. Consequently, small dealers may be incentivised to reduce these costs by seeking a reduction of the CCP's collateral requirements via margin and default fund contributions. This engenders moral hazard; as small dealers may then transact riskier derivative transactions as large dealers will make the bulk of default fund contributions. Clearing clients are not exempt from conflicts of interest. While admittedly one of the constituencies affected by CCP policy they possess no incentive to monitor risk, as they do not have to contribute to CCP default resources. Additionally, Griffith notes that end users may be incentivised to collude with dealers in exchange for lower bid-ask spreads.⁷⁵

Of course, these issues may be ameliorated by the use of voting caps. However, the use of voting caps is highly controversial as dealers can collude to exert majority voting influence over CCPs.⁷⁶ Additionally, dealers exert enormous influence over CCP trade volume which is closely tied to profitability with the end result that dealers may still be able to exert informal governance influence over CCPs. In addition, the use of voting caps results in a misalignment of economic ownership and voting control. This can result in agency costs and consequently, in moral hazard on the part of minority

⁷² Ibid.

⁷³ Ibid.

⁷⁴ Johnson (n 4) 699.

⁷⁵ Griffith (n 4) 1218

⁷⁶ Ibid.

constituents of the CCP and engender systemic risk as exposure to CCP risk should be equivalent to the amount of control granted.⁷⁷ A potential solution to this agency issue is the use of independent directors. However, the assumption that modifications to board composition will resolve conflicts of interests and achieve regulatory goals can be faulted.

An examination of the foundations of board independence calls into question the efficacy of notions of independence. Independence has primarily been promoted as a tool to prevent conflicts of interest that could obstruct the attainment of the corporate objective. The concept of shareholder primacy has long held sway in corporate governance debates with shareholder's being the constituency whose interests directors are primarily to protect.⁷⁸ However, directors often act in a manner that is not in the best interests of shareholders and generate agency costs.⁷⁹ The concept of independent directors however supposedly ensures that there are impartial outsiders to constrain executive management's self-dealing. This position is reinforced by Gilson and Kraakman who promote independent directors as a means of ensuring that companies are managed in the best interests of their shareholders;⁸⁰ an argument that has subsequently been promoted in academic literature.⁸¹

This reveals a conflict of interest for directors themselves in the CCP context as directors will owe a duty to maximise value whether short or long term for shareholders while simultaneously implementing adequate risk oversight measures – especially as both of these goals may not necessarily align.⁸² This conflict of interest is particularly crucial in light of the fact that CCPs are typically closely held to publicly traded companies attempting to meet the

⁷⁷ Ibid 1219.

⁷⁸ Andrew Keay, 'Enlightened Shareholder Value, the Reform of the Duties of Company Directors and the Corporate Objective' (2006) *Lloyds Maritime and Commercial Law Quarterly* 335; Henry Hansmann and Reinier Kraakman, 'The End of History for Corporate Law' (2001) 89 *Georgetown Law Journal* 439; Lucian Bebchuk, 'The Myth of the Shareholder Franchise' (2007) 93 *Virginia Law Review* 675.

⁷⁹ Adolf Berle and Gardiner Means, *The Modern Corporation and Private Property* (WS Hein 2000).

⁸⁰ Ronald Gilson and Reiner Kraakman, 'Reinventing the Outside Director: An Agenda for Institutional Investors', 43 *Stanford Law Review* (1991) 873.

⁸¹ See Luca Enriques and others, 'The Basic Governance Structure: The Interests of Shareholders as a Class', in R. Kraakman, and others (ed) *The Anatomy of Corporate Law*, (2nd edn Oxford, OUP 2009) 64

⁸² Saguato (n 62) 670.

needs of a large number of stakeholders. Additionally, clearing members or shareholders are likely to appoint directors to the CCP's board.⁸³ These directors may vote in line with the relevant appointing entity's interest. Additionally, empirical evidence does not clearly support independence as a corporate governance tool.⁸⁴ Anecdotal evidence in fact reveals that independent directors were rife on the boards of several systemically important banks pre-GFC. However, their presence did not prevent said banks from failing to institute appropriate risk oversight procedures.⁸⁵ This failure has been attributed to deficiencies in independent directors' knowledge of the complexities of businesses they were nominated to manage.⁸⁶ To remedy this defect, the US and EU regime both mandate that directors have sufficient expertise to enable them implement proper risk governance strategies. While this approach is valid, it fails to take into consideration the fact that there is a limited pool of candidates with the appropriate expertise to act on CCP boards. This results in CCPs recruiting from a small pool of industry experts; thus, these experts will usually have ties to large financial institutions or may aim to develop said ties following their appointments,⁸⁷ further narrowing the field of candidates from which CCPs can obtain qualified applicants. From the above analysis, it can be concluded that the use of independent directors on CCP boards and committees does not clarify whose interests the directors are to protect.

Furthermore, a close examination of the regulatory mandates as regards the appointment of directors and committee members indicates a strong correlation with one of the fundamental tenets of MFT: namely that these individuals are always rational. However, insights from behavioural finance indicate that financial market participants contrary to this assumption exhibit bounded rationality at times, making decisions based on heuristics, which

⁸³ Johnson (n 4) 706.

⁸⁴ Wolf-Georg Ringe, 'Independent Directors: After the Crisis' (2013) 14 *European Business Organization Law Review* 415.

⁸⁵ Ibid 402. AIG had a supermajority of independent directors, see Griffith (n 4) 1226.

⁸⁶ Donald Nordberg, 'Corporate Governance and the Board', *Theory and Practice of Corporate Social Responsibility* (Springer 2011) 51. See also Lawrence Cunningham, 'Rediscovering Board Expertise: Legal Implications of the Empirical Literature' (2008) 77 *Cincinnati Law Review* 465.

⁸⁷ Johnson (n 4) 75.

affect their judgment and result in systematic errors.⁸⁸ Three of these heuristics namely: representativeness, availability, and the competence and reliance effects will be discussed in relation to the CCP prescription and the resultant CCP risk management and corporate governance arrangements. With the availability heuristic, research from behavioural finance proves that judgments of an event's probability are made by reference to the number of incidences of that event.⁸⁹ However, the availability of these instances may be affected by the passage of time since the occurrence of the event itself and the saliency of the event.⁹⁰ This heuristic can result in bias as not all memories or events are easily available. This can result in more recent and important events being accorded greater weight, which can heavily distort estimates.⁹¹ Extrapolating insights from this heuristic, it is entirely possible that CCP risk management when estimating the likelihood of a CCP insolvency may ask the question: 'how likely is it that the CCP will collapse soon' as opposed to the more relevant 'how likely is it that the CCP will collapse given current market conditions.' The first question draws the individual's mind to past incidences of CCP failure while the latter draws the individuals mind to current market conditions.

The availability heuristic is closely related to the competence and reliance effects which state that willingness to bet on uncertain events depends not only on the probability of the event but also on the decision makers' knowledge of, or understanding of the relevant context.⁹² Thus, individuals place a large amount of emphasis on their fields of speciality.⁹³ Supplementing the expert

⁸⁸ Supra Section 2.5.1; Hersh Shefrin, *A Behavioral Approach to Asset Pricing* (Elsevier Academic Press 2005) 16.

⁸⁹ Paul Slovic, 'Psychological Study of Human Judgment: Implications for Investment Decision Making' (1972) 27 *The Journal of Finance* 790.

⁹⁰ Ibid.

⁹¹ Amos Tversky and Daniel Kahneman, 'Availability: A Heuristic for Judging Frequency and Probability' (1973) 5 *Cognitive Psychology* 207; Nicholas Barberis and Richard Thaler, 'A Survey of Behavioral Finance' in G Constantinides and Rene Stulz (ed), *Handbook of the Economics Of Finance: Financial Markets And Asset Pricing* (Elsevier 2003) 1066; Colin Camerer and Robin Hogarth, 'The Effects of Financial Incentives in Experiments: A Review and Capital-Labor-Production Framework' (1999) 19 *Journal of Risk and Uncertainty* 7.

⁹² Chip Heath and Amos Tversky, 'Preference and Belief: Ambiguity and Competence in Choice under Uncertainty' (1991) 4 *Journal of Risk and Uncertainty* 7.

⁹³ Richard Zeckhauser and others, 'Nonrational Actors and Financial Market Behavior' (1991) 31 *Theory and Decision* 266.

effect is the reliance effect – individuals in financial markets regularly rely on the advice of experts even where there is no proof that the use of an expert will result in better outcomes.⁹⁴ The expert effect can be linked to CCP overreliance on sophisticated models and the quants who develop them. Furthermore, as CCPs may consider themselves experts in the valuation of OTC derivatives and rely on their expert model's valuation of OTC derivatives, there is the possibility that they disregard correlated risk outside OTC-DMs. Additionally, the competence and reliance effects can be linked to the emphasis on specialised risk management committees in CCP corporate governance structure. Furthermore, the representativeness heuristic may be used when making decisions about the probability of an event. This heuristic involves assessing 'the degree to which an event is similar in essential characteristics to its parent population, and reflects the salient features of the process by which it is generated.'⁹⁵ This heuristic can result in CCP boards misjudging the likelihood of an event occurring as the fact that a situation is representative does not make it more probable. This is particularly relevant in dynamically innovative and complex OTC-DMs, where CCPs will be operating under fundamental uncertainty.

Finally, the imposition of voting caps under the US regime does not take into cognisance the fact that OTC-DMs are complex and rapidly evolving and that regulation can oftentimes be counter-performative. This counter-performativity may manifest itself as clearing members colluding amongst themselves to exert governance influence, innovating new shareholding structures, or bribing clearing clients. The EU regime once again seems to be most suited to the prescriptions of alternative theories of finance as it creates direct regulatory intervention through mandatory approvals of changes in ownership structures and regulatory involvement in the proceedings of the risk management committee. Though of course, regulators too may be subject to bounded rationality.

In conclusion, while regulatory prescriptions on both sides of the Atlantic are well intentioned, this section's analysis shows that elements of MFT abound

⁹⁴ Ibid.

⁹⁵ Kahneman and Tversky (n 91).

in corporate governance. Regulators assume that market participants are collectively rational and will exercise self-discipline. While in perfect markets, this would be true, the GFC has revealed that market participants only exercise discipline to the extent of their interests. Furthermore, the US regime's total dependence on voting caps and independent board members ignores the fact that these individuals are themselves subject to moments of irrationality especially in environments where uncertainty is rife. The intrusive regulatory prescriptions in the EU while mixing models of MFT and alternative theories of finance seems to be adopt the superior approach with the only drawback of the EU regime being the lack of flexibility afforded regulators.

4.3. Financial Resources

A crucial aspect of CCP risk management is said CCP's financial resources, which constitute a fundamental line of defence in the event of a members' default and in environments of financial stress. CCPs require members to post two types of margin namely initial margin and variation margin. Additionally, clearing members must contribute to the CCP's default fund and heed capital calls. The importance of these risk management mechanisms particularly margin is highlighted by the manner in which LCH.Clearnet's SwapClear service handled the default of Lehman Brothers which is considered the biggest clearing member default in CCP history.⁹⁶ Lehman Brothers Special Financing (LBSF) had outstanding OTC derivative trades of over \$9 trillion. Upon the non-payment of margin, Lehman Brothers was quickly declared⁹⁷ in default. LCH.Clearnet was able to successfully close out LBSF's positions, hedge risks, transfer LBSF's client positions, and auction LBSF's positions.⁹⁸ All of this was possible with only a third of LBSF's initial margin. Unsurprisingly, regulatory reforms in OTC-DMs have prescribed guidelines for CCP financial resources. This section outlines regulatory prescriptions on CCP financial

⁹⁶ Jon Gregory, *Central Counterparties: Mandatory Central Clearing and Initial Margin Requirements* (John Wiley & Sons 2014) 42.

⁹⁷ Ibid 43.

⁹⁸ Julia Lees Allen, 'Derivatives Clearinghouses and Systemic Risk: A Bankruptcy and Dodd Frank Analysis' (2012) 64 *Stanford Law Review* 1082.

resources and critically evaluates these prescriptions from a comparative and theoretical perspective.

a. European Union

CCPs are subject to capital requirements.⁹⁹ Additionally, clearing members must contribute to a CCP's default fund. Furthermore, CCPs must set an amount below which the level of default funds must not fall.¹⁰⁰ Contributions to this fund are calculated based on the specific clearing member's exposures and different default funds for different classes of product are permitted. Furthermore, the default fund must enable the CCP, under extreme but plausible market conditions,¹⁰¹ withstand the default of the member to which it has the largest exposures, or its second and third largest members. CCPs are to take the most volatile periods experienced by markets which the CCP provides services for into consideration when modelling this scenario.¹⁰² Additionally, the total amount of financial resources available to the CCP must be capable of covering the default of the two clearing members to which it has the largest exposures. This amount excludes CCP capital.¹⁰³ CCPs can make capital calls from clearing members.¹⁰⁴

Margin is the primary defence of the CCP¹⁰⁵ and consequently, EU law requires that CCPs call and collect margin from clearing members and other CCPs with which they have interoperable arrangements and further specifies that said margin should cover 99.5%¹⁰⁶ of the risk of exposure movements over an appropriate timeframe.¹⁰⁷ EMIR however, mandates margining with one caveat: CCPs are to regularly monitor and appropriately revise the level

⁹⁹ Article 16 EMIR.

¹⁰⁰ Article 42 EMIR.

¹⁰¹ CCPs are to implement internal policy frameworks for defining types of extreme but plausible market conditions to be discussed by the risk committee, approved by the board, and subject to annual review. See Article 29 Commission Delegated Regulation (EU) 153/2013. Furthermore, the framework must reflect the CCP's risk profile, taking into consideration cross border and cross currency exposure amongst many others. See further Article 30 Commission Delegated Regulation (EU) 153/2013.

¹⁰² Article 42 EMIR.

¹⁰³ Article 43 EMIR.

¹⁰⁴ Article 43(3) EMIR.

¹⁰⁵ Recital 70 EMIR.

¹⁰⁶ Article 41 EMIR. See further Article 24(1)(a) Commission Delegated Regulation (EU) 153/2013.

¹⁰⁷ Otherwise known as the margin period of risk. *Supra* Section 3.2.2.

of margin collected to reflect current market conditions factoring in any potentially procyclical effects of said revisions.¹⁰⁸ Consequently, CCPs are to adopt models and parameters in setting their margin thresholds¹⁰⁹ that capture the risk characteristics of the cleared derivatives, and conduct stress tests in which margin can be collected and called on a daily basis to ascertain value at risk with the probability of a certain loss.¹¹⁰ These models are to be evaluated by the risk management committee and an independent party.¹¹¹ In addition, margin must be highly liquid¹¹² and may include where appropriate, the underlying of the derivative being cleared.¹¹³

b. United States

CCPs must maintain their financial resources at a minimum that exceeds the total amount that would allow the CCP meet its obligations notwithstanding the default of its largest member or two largest members.¹¹⁴ In the case of systemically important CCPs¹¹⁵ in extreme but plausible conditions¹¹⁶ and enable the CCP cover its operating costs for a period of one year.¹¹⁷ Furthermore, the Dodd-Frank Act specifies the resources that can be utilised by a CCP in the event of a clearing member's default namely: margin,¹¹⁸ the CCPs capital, guaranty fund deposits, default insurance, capital contributions from clearing members,¹¹⁹ and any other financial resource deemed acceptable by the CFTC.¹²⁰ Additionally, financial resources to be used by the

¹⁰⁸ Article 41(1) EMIR.

¹⁰⁹ Article 41(2) EMIR.

¹¹⁰ Alexander and Dhumale (n 25) 245.

¹¹¹ Article 49 Commission Delegated Regulation (EU) No 153/2013.

¹¹² Conditions to be met to be considered highly liquid are contained in Annex I, Commission Delegated Regulation (EU) 153/2013.

¹¹³ Article 36 EMIR.

¹¹⁴ 17 CFR 39.33(a).

¹¹⁵ A systemically important CCP is a financial market utility that is a registered derivatives clearing organization currently designated by the Financial Stability Oversight Council to be systemically important and which the CFTC supervises and any CCP that elects to be treated as a systemically important CCP. See 17 CFR 39.2, 39.30, and 39.31.

¹¹⁶ 17 CFR 39.11(a)(1).

¹¹⁷ 17 CFR 39.11(a)(2).

¹¹⁸ To the extent permitted by parts 1, 22, and 190 of this chapter and under the DCO's rules.

¹¹⁹ If permitted by the DCOs rules.

¹²⁰ 17 CFR 39.11(B)(1).

CCP to cover its operating costs for at least one year include the CCP's capital, and any other financial resource deemed acceptable by the CFTC.¹²¹

The assessment of financial resources must take place at least monthly. Where permitted these assessments can include non-prefunded guaranty fund contributions after a 20% haircut has been applied.¹²² However, non-prefunded guarantee fund contributions cannot be included in financial resources available to meet a CCP's obligation to clearing members in the case of systemically important CCPs.¹²³ CCPs must also possess liquidity resources enabling them perform daily settlements,¹²⁴ and in the case of systemically important CCPs, intraday, same-day, and multi-day obligations to perform settlements with a high degree of confidence under a range of stress scenarios to include but not limited to default by the clearing member with the most significant liquidity obligation for the CCP.¹²⁵ Finally, CCPs especially systemically important CCPs are allowed to access lines of credit from the Federal Reserve.¹²⁶

It is also provided that CCPs must protect themselves from the risk of clearing member default through the collection of margin¹²⁷ which must be sufficient to cover potential exposures in normal market conditions.¹²⁸ Additionally, the models used in the calculation of margin must be risk based and reviewed on a regular basis.¹²⁹ The Dodd-Frank Act does not mandate the use of a particular margin modelling methodology.¹³⁰ However, the CFTC requires CCPs to implement risk based modelling in determining appropriate margin while leaving the nature of these models to CCPs discretion.¹³¹

¹²¹ 17 CFR 39.11(B)(2).

¹²² 17 CFR 39.11(d).

¹²³ 17 CFR 39.33(b).

¹²⁴ 17 CFR 39.11(e).

¹²⁵ 17 CFR 39.33(c)(i).

¹²⁶ Section 844 Dodd-Frank Act. See Yesha Yadav and Dermot Turing, 'The Extraterritorial Regulation of Clearinghouses' (2016) 2 *Journal of Financial Regulation* 39.

¹²⁷ Section 725 Dodd-Frank Act.

¹²⁸ *Ibid.*

¹²⁹ *Ibid.*

¹³⁰ Section 731 Dodd-Frank Act requires that SDs and MSPs comply with initial and variation margin rules but only grants the CFTC rulemaking power over margin for uncleared swaps.

¹³¹ 17 CFR 39.13.

The CFTC requires that CCPs establish margin requirements in line with the characteristics of a derivative instrument.¹³² Initial margin must cover potential future exposures to price movements for periods between the last collection of variation margin and the estimated time for the liquidation of a defaulting clearing member's positions.¹³³ Furthermore, initial margin calculated by models and the projected measures of said models' performance must meet a confidence level of at least 99% using data from an appropriate historic time period. Finally, the CFTC requires that systems for generating initial margin must undergo independent evaluation that must not be carried out by the person responsible for developing said models but can be carried out by the CCP's employees.¹³⁴

c. A Comparative Perspective

Due to the global nature of OTC-DMs, regulatory prescriptions regarding CCP financial resources under EU and US regimes are vastly similar. Generally, CCPs in both jurisdictions must possess financial resources enabling them survive the default of members. Additionally, both regimes specify the financial resources CCPs can utilise in meeting their obligations. However, while these default waterfall specifications are vastly similar, under the EU regime, CCPs must possess financial resources sufficient to withstand the default of their two largest members. The US only requires that CCPs normally hold financial resources sufficient to withstand the default of their largest member with the exception of systemically important CCPs. The EU regime's stricter prudential requirements however seem to be preferable from a systemic risk perspective as following the CCP prescription, CCPs have become nodes of systemic risk and need to be supervised strictly. The stricter prudential regime in the EU is further highlighted by the fact that unlike the US position, CCP capital is excluded from the calculation of financial resources and insurance is not included in the list of financial resources CCPs can resort to. There are however no provisions for access to institutional backstops under the EU regime. This can be attributed to the supranational nature of the EU. It also

¹³² 17 CFR 39.13(g)(2)(i).

¹³³ 17 CFR 39.13(g)(2)(ii).

¹³⁴ 17 CFR 39.13(g)(3).

implies that the reaction of national authorities to CCP distress is flexible under the EU regime.¹³⁵

A point of convergence in financial resource requirements under the EU and US regimes is the requirement that financial resources be able to cover member defaults in extreme but plausible conditions. This similarity is attributable to the fact that a CCP's largest clearing member(s) will probably be a large bank, which is only likely to default in environments of extreme financial stress. However, when considering the structure of the default waterfall, the EU approach seems stricter as it specifies the exact manner in which the default waterfall is to be structured. Further evidence of the EU's comparatively stricter margin regime is evidenced by its requirement that margin cover 99.5% of exposures as opposed to the US requirement of 99%. In addition, under the EU regime, margin is calculated to reflect current market conditions while in the US, margin is calculated to reflect normal market conditions. The US prudential regime reveals the traditional American faith in markets and suspicion of regulation. Both margin calculation methodologies however have their respective demerits. Under the US regime, there is the possibility that derivative transactions become under collateralised in abnormal market conditions. Conversely, under the EU approach, updating margin to reflect current market conditions where these conditions indicate significant stress in financial markets can result in procyclical effects and consequently, amplify systemic risk. While EMIR does urge that CCPs consider the procyclical effects of margin revisions, it is hard to balance this admonition with the preservation of CCP integrity in environments of financial stress.

In conclusion, there are broad similarities between financial resource demands under the EU and US regimes. While confidence levels of models and exposures for margin differ under the EU and US regimes, both regulatory initiatives demand risk based models but leave the selection of specific models

¹³⁵ Yadav and Turing (n 126) 45.

to CCPs themselves. This approach is sensible as forcing models incompatible with CCP procedures can have disastrous consequences

d. A Theoretical Perspective

A critical analysis of the above discussion leads to the conclusion that the CCP prescription implicitly endorses MFT that is, the view that rational OTC-DM participants would have acted differently and made optimal decisions in the run up to the financial crisis given the presence of risk mutualising market infrastructure. CCPs can be viewed as a form of regulator sanctioned private ordering designed to mutualise risk and withstand financial shocks.¹³⁶ However, this view is one dimensional, especially as from the perspective of alternative theories of finance, it is possible that in the event of a chain of severe defaults which typically occur in environments of financial stress, CCPs can become insolvent – after all, a CCP is not much more than the sum of its clearing members.¹³⁷ CCP resources are vast; however, they are not infinite. With the central role played by CCPs in OTC-DMs post-G20 reforms, the insolvency of a CCP could have severely deleterious effects on the financial system, which could spread to the real economy.¹³⁸

For instance, given fundamental uncertainty and the attendant inability to definitively account for future events quantitatively, where a CCPs clears single derivative instruments, swings in asset prices attributable to a financially distressed member attempting to source required variation margin can trigger CCP wide asset price slumps. This can lead to further variation margin calls possibly leading to asset prices spiralling downwards due to fire sales, which can spread contagion in financial markets.¹³⁹ Furthermore, despite their financial resources, CCPs are particularly vulnerable to slumps in asset

¹³⁶ Yesha Yadav, 'The Problematic Case of Clearinghouses in Complex Markets' (2013) 101 Georgetown Law Journal 406.

¹³⁷ Allen (n 98) 1093.

¹³⁸ Jeremy Kress, 'Credit Default Swap Clearinghouses and Systemic Risk: Why Centralised Counterparties Must Have Access to Central Bank Liquidity' (2011) 48 Harvard Journal on Legislation 51.

¹³⁹ Mark Roe, 'Clearinghouse Overconfidence' (2013) 101 California Law Review 1678; Dietrich Domanski and others, 'Central Clearing: Trends and Current Issues' (2015) December BIS Quarterly Review 69.

prices.¹⁴⁰ For instance, in the event of a clearing member's default, CCPs have to sell their collateral; this may drive prices down – a result that will be exacerbated in periods of substantial financial stress.¹⁴¹

In addition, regulatory prescriptions requiring that CCPs possess the financial resources to withstand the default of one or two of their largest counterparties can prove fatal. In environments of significant financial stress, especially where a large market participant has defaulted; uncertainty about CCP capitalisation can result in runs on CCPs; straining their liquidity and engendering wild price swings, which can result in the insolvency of said CCP.¹⁴² From a MFT perspective rational market participants cognizant of CCP risk mutualisation abilities will readjust their investment strategies utilising sophisticated quantitative methods.¹⁴³ However, insights from behavioural finance and the GFC also give rise to the possibility that market participants may herd.¹⁴⁴ Even a whiff of uncertainty about a major clearing member can trigger panic outside the CCP, which may lead to questioning of the ability of the CCP, and other clearing members on which the CCP will have to make capital calls and resort to for liquidity resources.¹⁴⁵ This is even more likely as CCPs are prone to 'jump to default.'¹⁴⁶ Resulting in market participants overreacting,¹⁴⁷ herding, and consequently triggering precipitous declines in asset prices.¹⁴⁸ This overreaction and consequent herding are closely related to the availability heuristic¹⁴⁹ This heuristic can result in bias as

¹⁴⁰ Roe (n 139) 1688.

¹⁴¹ Ibid; Manmohan Singh, 'New Regulations and Collateral Requirements Implications for the OTC Derivatives Market' (2013) 2012-004 SWIFT Institute Working Paper 12.

¹⁴² Pirrong (n 3) 23.

¹⁴³ For instance, through the appropriate use of Credit Valuation Risk Adjustments.

¹⁴⁴ See further Andrea Devenow and Ivo Welch, 'Rational Herding in Financial Economics' (1996) 40 *European Economic Review* 604.

¹⁴⁵ Roe (n 139) 1678.

¹⁴⁶ This is a phenomenon that is common with CDS where the protection seller's liability occurs suddenly as opposed to incrementally, consequently imposing volatile liquidity demands on CDS sellers. See Levitin (n 1) 455.

¹⁴⁷ Behavioural finance has shown that market participants tend to overreact towards new information consequently creating distortionary effects in financial markets. See Werner De Bondt and Richard Thaler, 'Does the Stock Market Overreact?' (1985) 40 *the Journal of Finance* 793; 'Overreaction Evidence from Large-Cap Stocks' (2014) 13 *Review of Accounting and Finance* 310.

¹⁴⁸ Emiliios Avgouleas, 'The Global Financial Crisis, Behavioural Finance and Financial Regulation: In Search of a New Orthodoxy' (2009) 9 *Journal of Corporate Law Studies* 33.

¹⁴⁹ *Supra* Section 4.2. See generally Slovic (n 89) 790; Tversky and Kahneman (n 91) 207; Thomas Gilovich and others, *Heuristics and Biases* (Cambridge University Press 2013).

not all memories or events are easily available. This can result in more recent and important events being accorded more weight, which can heavily distort estimates.¹⁵⁰ In the context of environments of financial stress, it is possible that market participants will assess their decisions in light of recent events resulting in skewed results and potential overreaction.

The above issues are reinforced by the fact that a degree of maturity transformation takes place during the margin provision process. To satisfy variation margin calls, clearing members typically rely on lines of credit extended by banks. Clearing members are also responsible for the provision of variation margin for customer accounts.¹⁵¹ Large variation margin calls can exceed amounts provided for by lines of credit and can result in the provision of insufficient credit or the severing of the relevant line of credit in environments of financial stress leading to disastrous results. To prevent this scenario, this thesis recommends the use of a recapitalisation mechanism activated on the default of a member, and upon every subsequent default. The efficacy of this mechanism will however be dependent on the apparent liquidity of market participants who have committed to the provision of supplementary capital. Another possible solution would be forcing CCPs to clear multiple classes of derivative instruments as this would ensure that they aren't vulnerable to bubbles and crashes in asset prices.

CCP mutualisation of risk also engenders moral hazard. Moral hazard is an asymmetric-information phenomenon, with its defining characteristic being hidden action.¹⁵² Moral hazard can result from agency costs and usually occurs when an individual is insulated from risk and possesses more information than the actor that bears the adverse consequences of the individual's actions.¹⁵³ With mandated CCP clearing, clearing members are free to increase the volume of risky trades or increase their balance sheet risk

¹⁵⁰ Amos Tversky and Daniel Kahneman, 'On the Psychology of Prediction' (1973) 80 *Psychological Review*; Barberis and Thaler (n 91) 1066.

¹⁵¹ Craig Pirrong, 'Clearing and Collateral Mandates: A New Liquidity Trap?' (2012) 24 *Journal of Applied Corporate Finance* 71.

¹⁵² Richard Amott and Joseph Stiglitz, 'Moral Hazard and Nonmarket Institutions: Dysfunctional Crowding Out of Peer Monitoring?' (1991) 81 *the American Economic Review* 181.

¹⁵³ *Ibid.*

– consequently increasing the predominance of instable finance structures, and the likelihood of their default. Resultant losses are absorbed by risk pooling meaning that dealers do not internalise the cost of their default.¹⁵⁴ Consequently, as risk is widely dispersed, there is the possibility that it becomes so marginalised that market participants have no incentives to monitor or constrain it.¹⁵⁵ Pirrong notes that this makes clearing member capital a public good which creates a tragedy of commons – a form of market failure in which the rational actions of individual market participants leads to a situation that is not pareto-efficient.¹⁵⁶ This observation reinforces one of FIH’s central theorems, that is, financial systems and for this thesis’s purposes, OTC-DMs swing from states of stability to states of instability where there is a proliferation of stable finance structures. The mutualisation of risk can also engender herding due to the obfuscatory effects it has on market participants’ cognition of any deleterious consequences of risk itself, and risk mutualisation.¹⁵⁷

The efficacy of quantitative models used in the calculation of CCP financial resources can also be questioned. From a MFT perspective, the use of margin determined by sophisticated models protects against the risk of default – especially as initial margin is calculated to ensure that the probability of price movements inducing losses unsatisfied by margin is statistically very low. Various methodologies can be employed in the calculation of margin with these methodologies either taking into account the possibility of fat tails, that is, the possibility that margin will be used up between variation margin deliveries, and other valuation methodologies that do not account for tail risk and merely estimate changes in value under several scenarios. Illustrating the former margin calculation methodology is LCH Clearnet’s Portfolio Approach to Interest Rate Scenarios (PAIRS)¹⁵⁸ which is a conditional form of the Value

¹⁵⁴ Christian Chamorro-Courtland, ‘The Trillion Dollar Question: Can a Central Bank Bailout a Central Counterparty Clearing House Which is ‘Too Big to Fail’?’ (2012) 6 Brooklyn Journal of Corporate, Financial and Commercial Law 438.

¹⁵⁵ Steven Schwarcz, ‘Regulating Financial Change: A Functional Approach’ (2014) 100 Minnesota Law Review 1456.

¹⁵⁶ Craig Pirrong, ‘The Inefficiency of Clearing Mandates’ (2010) SSRN Electronic Journal 13.

¹⁵⁷ Steven Schwarcz, ‘Marginalising Risk’ (2012) 89 Washington University Law Review 505.

¹⁵⁸ Used for the calculation of margin for OTC interest rate derivatives, foreign exchange derivatives and listed rate derivatives cleared at LCH.Clearnet. See further ‘PAIRS - LCH Group’

at Risk (VaR) modelling methodology.¹⁵⁹ VaR is the loss level which cannot be exceeded given a certain confidence level for a period of time.¹⁶⁰ However, VaR models are not effective during periods of market stress as they do not account for tail risk.¹⁶¹ This is due to the fact that VaR assumes that asset returns follow a normal distribution - the normal (Gaussian) distribution is the foundation of EMH and consequently, modern portfolio theory of which VaR is a product. Consequently, VaR disregards extreme losses beyond its specifications, which results in VaR disregarding important information about the fat tails¹⁶² of underlying distributions.¹⁶³

Expected Shortfall or Conditional VaR attempts to alleviate the problems associated with VaR.¹⁶⁴ Expected shortfall analyses the possibility of loss beyond VaR levels and consequently is more suitable for accounting for tail risk as unlike VaR, it does not cut-off the loss-distribution at 99%. The advanced nature of these quantitative models make the calculation of margin easy under simplified assumptions. It should however be noted that a major failing of VaR and Expected Shortfall is their dependence on the amount of quantitative data of relevant synchronised data for all risk factors which are likely to be scarce when it comes to tail risk. A further problem with expected shortfall is that while clearly theoretically superior, it requires a significantly larger amount of data than VaR.¹⁶⁵ Additionally, the valuation of legally and economically complex instruments like credit derivatives, even for sophisticated market participants is uncertain and the modelling of margin for

<https://www.lch.com/risk-collateral-management/group-risk-management/risk-management-ltd/ltd-margin-methodology/pairs>.

¹⁵⁹ VaR was developed by Riskmetrics at J. P Morgan and became particularly important when the 1995 Basel Accord encouraged the use of VaR in the calculation of regulatory capital. See Chia-lin Chang and others, 'Risk Management of Risk under the Basel Accord: Forecasting Value-At-Risk of VIX Futures' (2011) 37 *Managerial Finance* 1088.

¹⁶⁰ VaR at the 99% confidence level is the upper 1% percentile of the loss distribution.

¹⁶¹ VaR has problems measuring extreme price swings.

¹⁶² Schwarcz (n 157) 498.

¹⁶³ Yasuhiro Yamai and Toshinao Yoshiba, 'Comparative Analysis of Expected Shortfall and Value-At-Risk under Market Stress' (2001) 2002-E-2 IMES Discussion Paper Series.

¹⁶⁴ See generally Philippe Artzner and others, 'Thinking Coherently' (1997) 10(11) *Risk* 68; Philippe Artzner and others, 'Coherent Measures of Risk' (1999) 9(3) *Mathematical Finance* 203.

¹⁶⁵ Jón Daniélsson, 'The Emperor Has No Clothes: Limits to Risk Modelling' (2002) 26 *Journal of Banking & Finance* 1290.

derivatives that were previously traded over the counter is also complicated due to absence of historical benchmarks.¹⁶⁶

Moreover, real world financial markets are complex and unpredictable, a phenomenon attributable to fundamental uncertainty and irrational behaviour, consequently increasing the complexity of these processes and calling the efficacy of these models into question.¹⁶⁷ Danielsson notes that a predominantly fundamental assumption in statistical risk modelling is that the properties of data during times of stability will remain constant during periods of severe financial stress. He further notes that this is not true as in times of stability, market participants act individually while in times of crisis their actions become similar and amplificatory.¹⁶⁸ When the risk process itself becomes a target for risk control, the dynamics of risk models change.¹⁶⁹

This reinforces Keynes' 'Beauty Market Metaphor' to the effect that market participants pricing is not based on conceptions of fundamental value but instead on what they think other market participants think asset prices are.¹⁷⁰ A cautionary tale against total reliance on these quantitative models is the fact that VaR and Expected Shortfall do not properly evaluate the costs of liquidation. This is exemplified by an inability to account for bid–ask spreads, liquidity differentials, and market depth.¹⁷¹ It has led to losses suffered by J. P. Morgan subsequent to the liquidation of a large portfolio which were several times higher than losses estimated by VaR.¹⁷² Thus demonstrating the underestimation of risk by J. P. Morgan which had enjoyed a strong reputation during the GFC for risk management,¹⁷³ a mistake that CCPs could easily replicate, and exemplifies the supremacy of fundamental uncertainty in financial markets.

¹⁶⁶ Yadav (n 136) 419.

¹⁶⁷ Pirrong (n 151) 22; Domanski and others (n 139) 69.

¹⁶⁸ Danielsson (n 165) 1275.

¹⁶⁹ *ibid* 1293.

¹⁷⁰ John Maynard Keynes, *The General Theory of Employment, Interest, and Money* (Palmgrave Macmillan 1936) 156.

¹⁷¹ Rama Cont, 'Central Clearing and Risk Transformation' (2017) SSRN Electronic Journal 10.

¹⁷² Rama Cont and Lakshitha Wagalath, 'Risk Management for Whales' (2015) SSRN Electronic Journal 1.

¹⁷³ Yadav (n 136) 413.

In addition, from a behavioural perspective, the excessive reliance on quantitative models is to be treated with caution, especially as some heuristics have been found to permeate decision making in the context of low-probability and high risk hazards.¹⁷⁴ These include the availability heuristic,¹⁷⁵ the competence effect, and the overconfidence effect.¹⁷⁶ The competence effect can be linked to CCP overreliance on sophisticated models and the quants who develop them. Furthermore, as CCPs may consider themselves experts in the valuation of OTC derivatives and rely on their expert model's valuation of OTC derivatives, there is the possibility that they disregard correlated risk outside OTC-DMs. The competence and reliance effects both feed into the overconfidence effect, which indicates that market participants subjective estimation of their private information, that is, their ability to quantitatively interpret market signals is grossly overestimated.¹⁷⁷

These behavioural factors may also result in noise trading.¹⁷⁸ This gives rise to the possibility of the mispricing of risk by market participants worsening in the short term because of pessimistic or optimistic traders becoming even more optimistic or pessimistic about the future despite rational indicators to the contrary.¹⁷⁹ This mispricing of risk can be persistent. Crucially, changes in market conditions for example volatility and liquidity, which are a result of irrational market participants herding or noise trading are difficult to model. In fact, the actions of individual market participants while seemingly rational can be collectively irrational with disastrous consequences. Furthermore, any resultant demand for margin can also have profound impacts on liquidity. CCPs typically demand liquid assets as margin and a large search for liquid assets in environments of significant financial stress can lead to significant negative changes in financial markets. For example, this could result in increased interest rates and bullish credit allocation. Increased demands for

¹⁷⁴ Jack Guttentag and Richard Herring, 'Credit Rationing and Financial Disorder' (1984) 39 *The Journal of Finance* 1363; Hersh Shefrin, *A Behavioral Approach to Asset Pricing* (Elsevier Academic Press 2005) 16.

¹⁷⁵ *Supra* Section 4.1.

¹⁷⁶ *Supra* Section 4.2.

¹⁷⁷ Barberis and Thaler (n 91) 12.

¹⁷⁸ *Supra* Section 2.5.1.

¹⁷⁹ Robert Waldmann and others, 'Noise Trader Risk in Financial Markets' (1990) 98 *Journal of Political Economy* 703.

liquidity can also result in the inefficient pricing of normally accessible sources of liquidity – even for firms not subject to any collateral demands.¹⁸⁰

In addition, the deployment of CCP resources in times of financial stress including the timely and orderly replacement of trades at their correct prices is dependent on market liquidity. Pirrong notes that modelling market liquidity is difficult due to an inability to predict the relationship between market liquidity and the context of a large default. Especially as in times of financial stress triggered by large defaults, liquidity will be scarce therefore proving the pre-eminence of fundamental uncertainty in financial markets. The precarity of regulatory and CCP reliance on modelling is further highlighted by the fact that the calculation of the conditional exposures required for ascertaining clearing member contributions to the default fund is complex and even less reliable as tail events do not happen regularly resulting in a scarcity of information to be used in models. Even where a model is available, determining the parameters necessary for the distribution of these exposures or back testing the model itself will be exceedingly difficult.

From the preceding analysis, it can safely be concluded that an essential element of the CCP risk mitigation process from a MFT perspective is the pricing of counterparty risk. In a MFT world, information and the ability to properly utilise it play crucial roles in ensuring that risk is correctly priced into the margin required. CCPs rely on current market price information to mark to market. As CCPs mutualise risk, risks are not necessarily directly priced against a specific member's creditworthiness but instead spread out among all clearing members.¹⁸¹ To quantify risk, CCPs utilise information about the risk-return characteristics of a derivative instrument. This quantification of risk is dependent on the availability of information of the historical behaviour of the derivative instrument's price. That is, given a derivatives' current value and keeping the capital value of the relevant clearing member constant, said member's default risk is the probability distribution of the derivative and size of the position taken.¹⁸² CCPs also use market prices to calculate variation

¹⁸⁰ Pirrong (n 3) 12.

¹⁸¹ Pirrong (n 156) 8.

¹⁸² *ibid* 14.

margin¹⁸³ which can result in defective market prices leading to sub-optimal estimations of risk.¹⁸⁴

Current and historical CCP information¹⁸⁵ on homogenous liquid instruments is likely to be as good as information in possession of clearing members. However, with highly complex, illiquid and significantly heterogeneous derivative instruments, price information is difficult to come by and due to the low or sometimes non-existent volume of transactions, CCPs are unable to mark to market. This necessitates the deployment of sophisticated models to determine how much collateral is required. Connecting this situation with the FIH,¹⁸⁶ clearing members and dealers on the other hand specialise in the development of models for risk management. Better models enhance the rents they can extract from trades and assist with good risk management.¹⁸⁷ Conversely, CCPs do not possess these incentives as they are only exposed to default risk not price risk. This leads to the conclusion that dealers with better information and models than CCPs may engage in adverse selection by determining which risks have been under-priced by the CCP and vice versa and then trading instruments whose risks are under-collateralised. While these actions may be justified from the perspective of arbitrage, they may also contribute to the transformation of CCPs from stable to instable financial market infrastructure in environments of financial stress where CCP misconception of the risk inherent in the relevant instrument is revealed. Unfortunately, CCPs may not realise these risks due to the overconfidence bias and competence effect.

Furthermore, the design of complex derivatives is in the hands of the largest financial market participants. These instruments are typically traded OTC which allows these dealers to present nuanced information on their balance sheet risks to CCPs as information in OTC-DMs usually reference complex trades and consequently, the CCP may not have a fully clear picture of the risk

¹⁸³ Richard Squire, 'Clearinghouses as Liquidity Partitioning' (2014) 99 Cornell Law Review 870.

¹⁸⁴ Pirrong (n 156) 15.

¹⁸⁵ Both current and historical.

¹⁸⁶ Supra Section 2.5.2.

¹⁸⁷ Pirrong (n 156) 15.

the clearing member is taking on.¹⁸⁸ Dealers could also engage in financial innovation via the splitting of transactions and the trading of only some of the risk through CCPs while leaving the rest of the risk obscured in OTC markets.¹⁸⁹

These problems could be prevented through customised margin requirements. This would however require access to information CCPs are not privy to. This solution is also costly from a governance perspective as it incentivises market participants to try to influence the CCP to grant them favourable risk profiles. In practice, CCPs do not tailor margin to clearing member's balance sheet risks but instead gear margin to address the risk profile of the relevant derivative instrument.¹⁹⁰ This results in the inefficient allocation of trading volume, increases the likelihood of default, and raises margin levels. However, proactive CCP monitoring of trade and real time reporting of transactions, combined with firm level restraint, which is a consequence of mutualised risk, may curtail excessive risk taking.¹⁹¹ Furthermore, following the precepts of the FIH, this excessive risk taking can be curtailed by capping clearing members' capital contributions – consequently pre-empting any source of financial instability. This however reduces the amount of risk mutualisation a CCP can perform.

Finally, reducing the amount of credit in OTC-DMs has an uncertain but most likely negligible effect on the amount of credit in the financial system. This can be attributed to the Modigliani and Miller Theorem.¹⁹² OTC-DM participants can employ debt capacity left unaffected by CCP margin requirements to obtain collateral that can be used to satisfy CCP collateral demands.¹⁹³ Furthermore, given fundamental uncertainty and the consequently rapid pace of innovation in OTC-DMs, the nature of the leverage that debt capacity freed

¹⁸⁸ See for example Spamann describing the ability of a hedge fund to obfuscate its trades from the view of market makers: Holger Spamann, 'Derivatives Trading and Negative Voting' (2012) SSRN Electronic Journal 5.

¹⁸⁹ Yadav (n 136) 425.

¹⁹⁰ Craig Pirrong, 'The Economics of Clearing in Derivatives Markets: Netting, Asymmetric Information, and the Sharing of Default Risks Through a Central Counterparty' (2010) SSRN Electronic Journal 18.

¹⁹¹ Yadav (n 136) 411

¹⁹² Discussed Infra Section 2.1.

¹⁹³ Pirrong (n 180) 8-9.

up by margining could take is unknown and it is not clear that the substituted forms of leverage will be optimal and not just redistribute the risk of crisis outside OTC-DMs. This point is especially crucial in light of the fact that the CCP prescription will result in an increase in demand for highly liquid collateral¹⁹⁴ as CCPs require that clearing members post highly liquid collateral as margin.¹⁹⁵ This results in investors holding low yield instruments to satisfy CCP collateral requirements.¹⁹⁶

Market participants have responded to these demands by innovating ways to mitigate the adverse effects of increased collateral demands in OTC-DMs and elsewhere.¹⁹⁷ One such technique is collateral management that is, techniques used by market participants to reduce the costs of collateral. Some techniques focus on expanding the class of acceptable collateral, for instance, through the application of a haircut to inferior collateral. However, where the collateral receiver is unwilling to make this concession, firms may pursue alternative strategies known as collateral transformation. The major forms of collateral transformation are security lending, asset swaps, and repurchase agreements (repos).¹⁹⁸

Repos involve the sale of a security to a lender, while simultaneously agreeing to repurchase said security at a later time.¹⁹⁹ In the collateral transformation context, the obtained funds are subsequently used as cash collateral or to purchase acceptable collateral. The use of repos as a collateral transformation tool may however be suboptimal as repos typically provide short term funding while derivatives tend to have long maturities; this can lead to rollover risk.²⁰⁰ Additionally, the market participant may lose some of its investment benefits as the repo counterparty may insist on the right to use the asset.

¹⁹⁴ Jorge Cruz Lopez and others, 'The Market for Collateral: The Potential Impact of Financial Regulation' (2013) Bank of Canada Financial System Review 47; D Bauer and others, 'Optimal Collateralization with Bilateral Default Risk' (2013) SSRN Electronic Journal.

¹⁹⁵ Singh (n 141) 4; 'The Changing Collateral Space' (2013) 13 IMF Working Papers 8.

¹⁹⁶ Ronald Anderson and Karin Joeveer, 'The Economics of Collateral' (2014) SSRN Electronic Journal, 4; Rama Cont, 'Central Clearing and Risk Transformation' (2017) SSRN Electronic Journal 5.

¹⁹⁷ Pirrong (n 145) 69.

¹⁹⁸ Anderson and Joeveer (n 196) 15-16.

¹⁹⁹ André Ruchin, 'Can Securities Lending Transactions Substitute For Repurchase Agreement Transactions?' (2011) 128 Banking Law Journal 481.

²⁰⁰ This is the risk associated with the rollover of debt.

Despite the highlighted flaws in the repo form of collateral transformation, repos are the most widely utilised collateral transformation tool due to their active and deep markets.²⁰¹ To mitigate rollover risk, market participants may attempt to ensure that as much as possible, the maturity of the repo transaction matches their funding needs.²⁰² Market participants may also attempt to mitigate collateral loss by focusing on the size of the loss the collateral is supposed to cover.²⁰³ This involves reducing the confidence levels of the models used in setting margin.²⁰⁴ This is obviously not possible with cleared derivatives, as regulators require that models used in determining margin for cleared OTC derivatives have confidence levels of at least 99%. Consequently, market participants could pursue an alternative solution by utilising portfolio margining. Portfolio margining determines margin levels by holistically evaluating the market risk of a portfolio of positions.²⁰⁵ For collateral transformation purposes, portfolio margining amends the loss distribution of a portfolio by reducing the amount of risk that has to be covered by margin.²⁰⁶ To be effective, the collateral receiver has to join the two transactions. For initial margin, the transactions will have to be combined in the event of default. With variation margin, portfolio margining can be implemented by the market participant for all instruments processed by the system.²⁰⁷

Incidentally, banks who are usually clearing members are the best positioned to offer portfolio margining services.²⁰⁸ This can be attributed to a number of reasons the first of which is that the assessment of customer credit risk is at the core of these banks' specialisation. Second, banks are optimally positioned to be their client's counterparty on several derivative transactions which can be pooled together for collateral management purposes through the use of credit support annexes in addition to the ISDA master agreement as

²⁰¹ Anderson and Joeveer (n 196) 16.

²⁰² This is not without its problems which are beyond the scope of this thesis.

²⁰³ Anderson and Joeveer (n 196) 17.

²⁰⁴ For example, reducing the confidence threshold from 99% PAIRS to 95%.

²⁰⁵ Kenneth Rosenzweig, 'An Introduction to Portfolio Margining' (2018) 26 *Journal on the Law of Investment & Risk Management Products* 2.

²⁰⁶ Anderson and Joeveer (n 196) 17.

²⁰⁷ *Ibid* 18.

²⁰⁸ See generally Lukasz Prorokowski, 'Banks' Perspective On Regulatory-Driven Changes to Collateral Management' (2014) 22 *Journal of Financial Regulation and Compliance* 128.

credit support annexe's can be tailored to the client's liquidity needs. Third, global banks usually enjoy economies of scope.²⁰⁹

Collateral transformation exemplifies the transition from hedge financing structures to fragile Ponzi finance structures. Facing liquidity constraints, and bolstered by the overconfidence bias and the competence effect, market participants can create myriad assets via financial engineering involving complex and opaque intermediation chains.²¹⁰ The shadow banking system in which market participants are sure to engineer new sources of liquidity is particularly vulnerable to runs - given fundamental uncertainty especially as these new financing structures may be particularly vulnerable to loss of confidence.²¹¹ Consequently, increasing the amount of collateral required by CCPs does not necessarily reduce the amount of risk in the financial system and could even be said to exacerbate it. However, reforms in securities lending markets as for example implemented by the EU's Secured Financing Transactions Regulation²¹² may ameliorate this position.²¹³

In conclusion, this analysis has shown that the predominant theoretical basis for regulatory prescriptions both in the US and EU is MFT. This is obvious from the requirements that models used to calculate margins be risk based, margin be modelled in extreme but plausible conditions and that financial resources cover the default of the largest clearing members. This reliance is understandable and to an extent can be justified as a wholesale rejection of MFT is impossible and its tools still prove useful. However, when analysed from an endogenous risk perspective, these regulatory prescriptions are of limited utility in ensuring the stability of CCPs, and the financial system at large. Reforms suggested by this section include recapitalisation mechanisms, diversity in cleared derivative instrument classes, margin tailored to fit balance sheet risks, and capping capital contributions.

²⁰⁹ Anderson and Joeveer (n 196) 18.

²¹⁰ Harry McVea, 'Central Counterparties and Sale and Repurchase Agreements: Regulating Financial Markets in the Light of yet another False Dawn' (2016) 17 *Journal of Corporate Law Studies* 127.

²¹¹ Pirrong (n 145) 69.

²¹² Regulation (EU) 2015/2365.

²¹³ An analysis of the potential impact of this regulation is beyond this thesis's scope.

4.4. Client Clearing

A diverse set of entities will need access to central clearing as OTC-DM participants trading derivatives that are subject to mandatory clearing will either have to become clearing members of CCPs or clients of said clearing members.²¹⁴ Access to central clearing also has implications for the efficacy of the CCP prescription.²¹⁵ Consequently, it is unsurprising that this issue has attracted considerable regulatory interest.²¹⁶ Some OTC derivatives dealers cannot meet CCP membership requirements or simply choose not to become clearing members due to the heavy financial and operational burdens inherent in this membership.²¹⁷ To remedy this conflict, client clearing models have been developed. There is currently no single widely utilised indirect clearing model in OTC-DMs, and it should be noted that client clearing is a recently introduced regulatory initiative. Two client clearing models are briefly considered below.

The principal-to-principal model is normally used in Europe and involves the client contracting with the clearing member as principal and the clearing member in turn contracting with the CCP as principal.²¹⁸ There is no direct contractual relationship between the CCP and the client as the clearing member enters into separate bilateral contracts with the client and the CCP. Documentation between the client and the clearing member will attempt to replicate the clearing member's relationship with the CCP especially in relation to the provision of margin. Consequently, despite the lack of a direct legal relationship between the CCP and the client, CCP margin requirements will have an indirect effect on clients.²¹⁹ The agency model is traditionally used in

²¹⁴ Hester Pierce, 'Derivatives Clearinghouses: Clearing the Way to Failure' (2016) 64 *Cleveland State Law Review* 605.

²¹⁵ Joshua Silve and others, 'Access to Central Clearing Services for Over-The-Counter Derivatives' (2011) *Bank of Canada Financial System Review* 39. Noting that access to CCP clearing has important implications for 'market innovation, concentration, competition and the resilience of local financial markets.'

²¹⁶ See for example Financial Stability Board and others, 'Incentives to Centrally Clear Over-the-Counter (OTC) Derivatives' [2018] <https://www.fsb.org/2018/11/incentives-to-centrally-clear-over-the-counter-otc-derivatives-2/>.

²¹⁷ Murphy (n 69) 156; Jo Braithwaite, 'The dilemma of client clearing in the OTC derivatives markets' (2016) 17(3) *European Business Organization Law Review* 363.

²¹⁸ Murphy (n 69) 157; Gregory (n 96) 128.

²¹⁹ Braithwaite (n 217) 365.

the US. Here the clearing member acts as an agent to the client, introducing them to the CCP, and acting as guarantor for the client's performance to the CCP. Consequently, the clearing member is exposed to the credit risk of the client just as is the case in the principal-to-principal model.²²⁰ Having established the relevant methods for access to CCP clearing, this section considers regulatory prescriptions related to this issue.

a. European Union

A clearing member is an undertaking that participates in a CCP and which is responsible for discharging the financial obligations arising from that participation.²²¹ These membership requirements are in line with the mandate contained in Article 37 EMIR to the effect that CCPs in designing their membership requirements must ensure that clearing members possess the financial resources²²² and operational abilities to meet the commitments inherent in CCP membership.²²³ Members must also comply with these entry criteria on a continuing basis during the pendency of their membership.²²⁴ In addition, CCPs can impose supplementary requirements on members. These criteria result in great operational and financial demands²²⁵ on clearing members at the time of application and for the duration of their membership. Furthermore, EMIR explicitly deals with client clearing. EMIR defines clients as entities who are able to clear their derivative transactions through a CCP due to their contractual relationship with a clearing member.²²⁶ Clearing members may only clear for clients where they have the necessary financial and operational capabilities.²²⁷ Finally, the EU regime provides for indirect clearing which occurs where the client in question is the client of a client of a clearing member.²²⁸

²²⁰ Murphy (n 69) 157.

²²¹ Article 29(14) EMIR.

²²² Slive and others (n 215) 173.

²²³ Article 37(1) EMIR.

²²⁴ Article 37(2) EMIR.

²²⁵ See for example LCH.Clearnet's membership requirements available at <http://www.lch.com/members-clients/members>.

²²⁶ Article 2(14) EMIR.

²²⁷ Article 37(3) EMIR.

²²⁸ Article 1(a) Commission Delegated Regulation (EU) 149/2013.

b. United States

CCPs must establish appropriate admission and continuing eligibility standards which include sufficient financial resources and operational capacity to meet obligations arising from participation in the CCPs.²²⁹ Clients who are US persons must clear derivatives subject to the CCP prescription through Futures Commission Merchants (FCMs). FCMs are defined as individuals or entities engaged in soliciting or accepting orders for the purchase or sale of a commodity for future delivery, security futures products, swaps, commodity options, and who in connection with the aforementioned activities accepts money or collateral to margin, guarantee or secure any trades or contracts that result or may result therefrom.²³⁰ FCMs must register with the CFTC before carrying out these activities.²³¹

c. A Comparative Perspective

Both the US and EU regimes provide for client clearing. This displays a recognition of the fact that CCP membership requirements can be quite onerous. The avenues through which this initiative is implemented are different under EU and US regimes because FCMs are subject to registration and conduct of business requirements, while clearing members are not subject to these requirements under EMIR. This fact is attributable to the federal nature of the EU as the regulation of asset managers and banks are covered in other regulation beyond the scope of this thesis. Additionally, indirect clearing is not explicitly provided for under the US regime. It should however be noted that in the EU, indirect clearing was not specified in EMIR but was subsequently introduced in delegated legislation.²³² Indirect clearing is a relatively new market mechanism²³³ which explains the Dodd-Frank Act's deficiency. The lack of indirect clearing provisions under the US regime can also be rationalised on the grounds that the US does not distinguish between clearing

²²⁹ Section 725 Dodd-Frank Act.

²³⁰ Section 721 Dodd-Frank Act. Markham notes that FCMs are the derivative industry's equivalent of broker dealers in securities markets. See Jerry Markham, 'Custodial Requirements for Customer Funds' (2013) 8 Brooklyn Journal of Corporate, Financial & Commercial Law 93.

²³¹ Section 724 Dodd-Frank Act.

²³² Commission Delegated Regulation (EU) 149/2013.

²³³ Braithwaite (n 217) 365.

members and clients when providing for client clearing. The US regime instead broadly mandates that all client clearing arrangements will have to be carried out through a FCM. Consequently, even where clients offer indirect clearing services, they will have to register as FCMs like clearing members.

While the motives behind client clearing are laudable as they try to ensure that all entities have access to clearing, they can be criticised on a number of grounds. First, there is no obligation on the part of clearing members to clear derivatives for particular clients. This can deny mid-sized entities which are active in OTC-DMs access to clearing. Second, it should be noted that client clearing arrangements merely mitigate the access to clearing problem and are not a solution to said problem.²³⁴ Third, clearing providers may be subject to higher regulatory capital charges in certain circumstances. For example, recent research has shown that the manner in which initial margin is treated in by the leverage ratio disincentivizes client clearing as given the non-risk based nature of the leverage ratio, initial margin has no effect on the leverage ratio's exposure measure for derivatives. Where a clearing member holds client margin on its accounting balance sheet, this may increase its leverage ratio exposure measure resulting in higher costs of clearing, and reduced incentives to offer client clearing services.²³⁵ Fourth, clients are subject to the whims and caprices of their clearing members as they may face higher demands for margin, which while understandable from a risk mitigation perspective, are also costly, and these clients have to expose information on their business to the clearing member which may be a competitor.²³⁶ A situation worsened by the fact that not all clearing members offer client clearing.²³⁷ Finally, a major concern with client and indirect clearing is the treatment of client collateral, an issue discussed in Section 4.5. In light of the above analysis, it is unsurprising that in a report published in November 2018, over two thirds of the clients surveyed indicated that they had experienced problems accessing clearing

²³⁴ Ibid 365.

²³⁵ Financial Stability Board and others (n 216) 5.

²³⁶ Silve and others (n 215) 41.

²³⁷ Arshadur Rahman, 'Over-The-Counter (OTC) Derivatives, Central Clearing and Financial Stability' (2015) 55 Bank of England Quarterly Bulletin 290. Pirrong further notes the potentially competitive effects of client clearing. See Pirrong (n 3) 28.

including: experiencing difficulties establishing an account, being declined an account, and being offboarded, which had impaired or restricted their trading activity.²³⁸

d. A Theoretical Perspective

Post-G20 regulatory reforms emphasise access to CCP clearing – a mandate to be applauded from a MFT perspective. Increased access to clearing increases the number of derivative trades cleared via CCPs and resultantly fosters deeper standardisation, liquidity, and availability of accurate pricing data in OTC-DMs. Furthermore, client clearing arguably reduces demand for collateral across the system where rehypothecation is allowed. This can be attributed to the opportunities for cross-counterparty netting.²³⁹ In addition, client clearing can also be said to ensure that client's obtain the benefits of CCP risk mitigation mechanisms.²⁴⁰ However, state reinforced client clearing is riddled with defects. For instance, the exclusion of non-members from a CCP's auction protocols call the efficiency of CCP risk mitigation into question. When a clearing member defaults on its obligations, the CCP auctions its position among its members. Auctions facilitate price discovery and provide liquidity. The restriction of participation does not support the efficient distribution of important information and promotion of liquid markets. Further illustrating the inefficiency of CCP membership restrictions is the fact that this may lead to sub-optimal pricing of products. Furthermore, while prima facie, increased use of CCPs results in the availability of accurate pricing information. Derivative product prices are dictated by clearing members, consequently, these prices will be determined by a small number of market participants who may have perverse incentives or may be noise trading. This problem is worsened by the fact that clearing members are free to decline client clearing, which can reduce market discipline or result in suboptimal competition. This results in the mispricing of derivative products and can inhibit these contracts' liquidity. There is also the possibility that a rational analysis of

²³⁸ Financial Stability Board and others (n 216) 49.

²³⁹ Darrell Duffie and others, 'Central Clearing and Collateral Demand' (2015) 116 *Journal of Financial Economics* 238. Further noting that these benefits are dependent on the size of each investor's portfolio.

²⁴⁰ Discussed supra Chapter 3.

the costs of clearing regardless of any reductions from netting, and the costs of retaining risk result in clients retaining risk, which may have deleterious consequences.²⁴¹

In addition, from the perspective of alternative theories of finance,²⁴² structural formalisation of client clearing can be criticised. First, client clearing can be used to arbitrage around the financial stability goal of the CCP prescription as it can lead to the underestimation of balance sheet risk by CCPs. CCPs require information from clearing members on their balance sheets and rely on members' judgment of balance sheet risk. Typically, CCPs gather this information from clearing member financial statements and clearing member audits. Market participants can also utilise information they have obtained in their private interactions with counterparties. Factoring in superior dealer information on default risk gleaned from models combined with private dealer balance sheet risk information, clearing members may have a superior understanding of the relevant instruments default risk. This can lead to adverse selection when facing these dealers.

Selective CCP membership requirements, and the attendant concentration of CCP membership by large financial institutions also make CCPs more susceptible to shocks from the failure of these institutions as the failure of a clearing member may have profound effects on market liquidity, impairing market resilience, and engendering systemic risk.²⁴³ Corroboratively, recent research demonstrates that the provision of client clearing is concentrated in a small number of market participants,²⁴⁴ a scenario that poses systemic risk issues. Furthermore, client clearing reduces market discipline as clients are not directly exposed to a CCP's loss mutualisation mechanism, for example, the guarantee fund and are consequently not incentivised to contract with creditworthy counterparties. Furthermore, undisciplined firms are not

²⁴¹ David Murphy, 'The Systemic Risks of OTC Derivatives Central Clearing' (2012) 5 *Journal of risk management in financial institutions* 330.

²⁴² *Supra* Section 2.5.

²⁴³ Silve and others (n 215) 42.

²⁴⁴ For instance, five bank affiliated firms are responsible for more than 80% of client margin for cleared interest rate swaps in UK, US, and Japan. See further Financial Stability Board and others (n 216) 3.

discouraged from investing in risky assets. While it will be up to clearing members to impose this discipline, complex contracts requiring the use of esoteric models can be profitable as clearing members can obtain rents through wider bid-ask spreads. Furthermore, clearing clients upon a rational examination of their options may decide to strategically default. Defaults among clients may be correlated in conditions of significant financial stress where they face the same market conditions. This can result in price volatility and weakened clearing member balance sheets regardless of clearing fees or the contractual mirroring of the clearing member's obligation to the CCP. If a clearing member suffers debilitating losses, it may default on its obligations to the CCP – especially as in environments of financial stress liquidity may be scarce.²⁴⁵ To mitigate this problem, clearing members with a substantial number of clients could be made to contribute larger amounts to the default waterfall.²⁴⁶

A supposed advantage of CCP clearing from a MFT vantage is the simplification of the interconnectedness endemic in OTC-DMs. However, client clearing goes contrary to this aim. A significant amount of intermediation and documentation take place,²⁴⁷ engendering interconnectedness and complexity, and providing opportunities for regulatory arbitrage through the use of Ponzi financing techniques and sub-optimal contracting. The dense thicket of documentation utilised in client clearing can also result in opacity. To ensure the efficient administration of mandatory clearing, it is suggested that CCPs directly supervise clearing clients. To reduce the chances of perverse incentives, clearing clients should also be subject to CCP loss mutualisation mechanisms. This ensures that clients are incentivised to actively monitor counterparty risk and further's the CCP prescription's financial stability mandate. This could be achieved through regulatory fiat mandating the direct novation of clearing client contracts transferring the clearing member's liabilities and rights directly to the client in respect of said client's contracts.

²⁴⁵ Ed Nosal, 'Clearing Over-the-Counter Derivatives' (2011) 35(4) *Economic Perspectives* 145.

²⁴⁶ Angela Armakolla and Jean-Paul Laurent, 'CCP Resilience and Clearing Membership' (2015) 14 *SSRN Electronic Journal*.

²⁴⁷ Braithwaite (n 217) 364.

In conclusion, it has been argued that while encouraging access to clearing even where indirect coheres with the tenets of MFT as it theoretically ensures liquid markets and the availability of accurate pricing data, in conditions of uncertainty and with the perverse incentives current regulation engenders, it is highly likely that derivative instruments will be mispriced. Additionally, it has also been argued that market participants namely clearing clients can imperil clearing members and consequently CCPs in environments of severe financial stress.

4.5. Segregation and Portability

Segregation involves the legal separation of margin and additionally implies the imposition of restrictions on the use of client margin.²⁴⁸ Commingling margins leaves clients exposed to the default of other parties. Furthermore, when clearing members hold customer margin in their customer account, operational errors or investment risks may result in said customer suffering losses in the event of a clearing member or fellow client bankruptcy. This risk is evidenced by the failure of Lehman Brothers. Initial margin posted by its buy side clients was comingled or rehypothecated by Lehman in its role as the prime broker. Consequently, these clients became general unsecured creditors for margin they had posted - as their bilaterally negotiated trades did not enjoy any segregation protection.²⁴⁹

Closely connected to segregation is portability. Portability is a process observed in the event of a clearing member's default. It allows for the transfer²⁵⁰ or 'porting' of assets and positions held on a segregated client account with a clearing member or client that defaults to the account of a solvent clearing member or client, consequently avoiding replacement costs.²⁵¹ Portability is particularly important as when a clearing member

²⁴⁸ Christian Chamorro-Courtland, 'On the Margin of Success: The Legal and Regulatory Protections for Customer Margin in the Canadian Derivatives Markets' (2016) 32 *Banking & Finance Law Review* 11.

²⁴⁹ Gregory (n 96) 216; Markham (n 230) 93.

²⁵⁰ In other words, 'porting.'

²⁵¹ Christian Chamorro-Courtland, 'Collateral Damage: The Legal and Regulatory Protections for Customer Margin in the U.S. Derivatives Markets' (2016) 7 *William and Mary Business Law Review* 628.

defaults, all of its positions revert to the relevant CCP which will either transfer or liquidate them, consequently jeopardising the client's positions and assets.²⁵² For this thesis's purposes, porting refers to post-default porting.²⁵³ The legal enforceability of segregation and portability requirements is crucial as their inefficacy in environments of financial stress could be disastrous.²⁵⁴ In light of the important role segregation and portability play in ensuring the timely and orderly transfer of positions in OTC-DMs, this section examines regulatory prescriptions regarding the segregation of customer collateral in the EU and US below.

a. European Union

Under EMIR, a major component of any CCP's application for authorisation is the manner in which the CCP plans to segregate client-margining accounts.²⁵⁵ To safeguard margin and its use, CCPs must keep records and accounts that allow them at any time to immediately distinguish a clearing member's assets and positions from other those of other clearing members. In addition, a clearing member's assets and positions must be distinguishable from the CCP's own positions.²⁵⁶ These requirements also apply to assets provided by a title transfer collateral agreement.²⁵⁷ To this end, CCPs must offer clearing members the ability to establish at least one account to record the positions and collateral relating to the clearing member's own proprietary transactions and client accounts to record the positions and collateral relating to transactions cleared by the clearing member on its client's behalf namely omnibus segregation²⁵⁸ and individual segregation.²⁵⁹ With omnibus

²⁵² Bas Zebregs, 'Guaranteed Portability under EMIR' (2011) 26 *Butterworth's Journal of International Banking and Financial Law* 276.

²⁵³ See further Mark Ho, 'Client Clearing: Portability between Clearing Members' (2014) 7 *Journal of Securities Operations & Custody* 43.

²⁵⁴ Pirrong (n 3) 34.

²⁵⁵ Claude Brown and Dasha Sobornova, 'Segregation under EMIR' (2014) 5 *Journal of International Banking and Financial Law* 333

²⁵⁶ Article 39(1) EMIR.

²⁵⁷ Andrew Henderson, 'When Clearing Members go Bust: OTC Clearing and the Protection of Initial Margin under EMIR' (2011) 2 *Journal of International Banking and Financial Law* 79.

²⁵⁸ Article 39(2) EMIR.

²⁵⁹ *Ibid.* Braithwaite notes that despite prescribing the basic features of these accounts, EMIR fails to go into specific details on the operation of these accounts. Braithwaite gives as an example the lack of guidelines on whether or not the positions of clients utilising omnibus client accounts should be margined on a net or gross basis, Braithwaite (n 217) 370.

segregation, the CCP must keep separate records and accounts to enable the clearing member distinguish the assets and positions of the clearing member held on behalf of relevant clients from its own assets and positions.²⁶⁰ Individual segregation, distinguishes the assets and positions held for the account of a clearing member's client from those held for the account of other clients in accounts with the CCP.²⁶¹ Client collateral held on individual client or omnibus client accounts must only be used to cover positions held for the account of the pertinent client or clients.

Dealing with portability, the EU regime requires that CCPs and clearing members must provide implementable and realistic mechanisms for transferring the assets and positions of defaulting clearing members and clients to another clearing member or client dependent on any prior agreement.²⁶² Clearing members must also discern, observe and control any risks arising from the facilitation of client clearing services.²⁶³ There is no need for the consent of the defaulting clearing member to port accounts. In the case of omnibus client accounts, the consent of all relevant clients must be obtained which may prove challenging in practice.²⁶⁴ Clearing members are only obliged to accept ported client accounts where there is a pre-existing contractual obligation to do so. Consequently, where a client wishes to exercise this right, it is advisable that they agree on documentation in advance with one or more clearing members who are willing to act as transferee where the porting process is needed.

b. United States

Section 724(a) Dodd Frank Act amended Section 4d CEA to provide protection for collateral deposited by cleared swaps customers of FCMs and CCPs. Implementing this directive, the CFTC on 7 February 2012 finalised a new

²⁶⁰ Article 39(9) EMIR specifies that the segregation requirement is satisfied when assets and positions are recorded in separate accounts, the netting between different accounts is prevented, and assets in one account cannot be used to cover losses in another account.

²⁶¹ Article 39(3) EMIR.

²⁶² Articles 48(5)-(6) EMIR for CCPs, and Article 4(4) Commission Delegated Regulation (EU) 149/2013 for clearing members.

²⁶³ Article 4(6) EMIR.

²⁶⁴ Geoffrey Yeowart and Robin Parsons, 'Segregation and Portability of Client Accounts held with a Clearing House' (2012) 6 *Journal of International Banking and Financial Law* 329.

margin segregation model for cleared swaps called the legal segregation with operational commingling model (LSOC).²⁶⁵ The LSOC model allows the margin of a FCM's clients to be held in an omnibus account, which permits the commingling of customer margin²⁶⁶ and is maintained separately from any account holding clearing member or CCP property,²⁶⁷ or property belonging to non-cleared swaps customers. FCMs and CCPs must ensure that the value of margin attached to each customers' positions is legally treated as separate from that of the FCM or CCP and other customers; that is, as if said client accounts are individually segregated. Furthermore, FCMs must verify that CCPs do not use the collateral of one customer to satisfy the obligations of another customer.²⁶⁸ This ensures that in the event of a double default, non-defaulting client's collateral cannot be used for the satisfaction of the defaulting client or FCM, essentially ring-fencing the client's margin from the CCP's default waterfall.²⁶⁹ FCMs may not grant a lien to persons other than CCPs on customer collateral or on its remaining interest in its customers account.²⁷⁰ However, FCMs do not have to physically store customer collateral in the cleared swaps collateral account and are allowed to invest said collateral as permitted by Regulation 1.25.²⁷¹

Furthermore, FCMs must also collate information sufficient to identify the portfolio of rights and obligations arising from cleared swaps intermediated by the clearing member on a client's behalf and relay this information to CCPs on a daily basis.²⁷² While there are no specific provisions for portability under the US regime, Section 724(b) of the Dodd-Frank Act states that cleared swaps are commodity contracts. The implication of this clarification is that in the event of an FCM or CCP bankruptcy case commenced under the Bankruptcy Code, clearing clients are entitled to close out or/and transfer cleared swaps and

²⁶⁵ 17 CFR Parts 22 and 190.

²⁶⁶ 17 CFR 22.2(C)(1).

²⁶⁷ 17 CFR 22.2(b)(2)(i).

²⁶⁸ 17 CFR 22.2(d)(1).

²⁶⁹ Chamorro-Courtland (n 247) 617.

²⁷⁰ 17 CFR 22.2(d)(2).

²⁷¹ 17 CFR 22.2(e)(I).

²⁷² 17 CFR 22.11(A)(2).

collateral. This will be further aided by the detailed record keeping required for LSOC accounts.

c. A Comparative Perspective

Most segregation methods are not without their drawbacks. Omnibus segregation puts client margin at the risk of the default of fellow clients. That is, the risk that in the event of the default of other clients of the clearing member, a non-defaulting client's margin will be used to satisfy other customer's obligations.²⁷³ The manner in which margin is collected also impacts the efficacy of omnibus segregation. Where margin is calculated on a net basis, clients are exposed to fellow customer risk. Where margin is calculated on a gross basis, clients are exposed to fellow customer risk and potentially to the risk of the clearing member's default.²⁷⁴ Individual segregation offers the best protection as it protects clients from fellow customer risk and clearing member default risk. However, margin for an individually segregated account will have to be collected on a gross basis. This can result in additional operating costs. In addition, individual segregation is typically more expensive as CCPs must increase the loss absorbency that has been made unavailable. Furthermore, individually segregated accounts are vulnerable to CCP loss allocation, and the risk of the clearing member's failure as this will necessarily involve porting costs. Porting may also be difficult where there are operational risks. That is, the risk that due to improper segregation of client property, there is a shortfall in client collateral attributable to theft, negligence, fraud, force majeure, and other non-investment related events.²⁷⁵

An advantage of omnibus client segregation is that clearing members may post net variation margin and initial margin on its net client portfolio. Certain client accounts may cancel each other out which leads to the clearing member being left with more client margin than is required by the CCP.²⁷⁶ Where there is no agreement to the contrary, the clearing member will be able to keep this

²⁷³ Clearing clients are only exposed to the default of other clients in the event of the clearing member's default.

²⁷⁴ Gregory (n 96) 222.

²⁷⁵ Ibid 216.

²⁷⁶ Braithwaite (n 217) 370.

extra margin and in certain circumstances, use said margin. With individual segregation on the other hand, the CCP must keep separate records and accounts that allow the clearing member distinguish between the assets and positions held on account for a particular client. LSOC protects clearing clients from fellow customer risk.²⁷⁷ However, margining may prove problematic under LSOC; specifically, the treatment of excess margin. Where excess margin is held with the clearing member, the situation is relatively uncomplicated but with the LSOC model, the situation becomes more complicated as said margin will have to be pledged to the CCP, which is operationally more complex. However, the major risk the LSOC model does not address is investment risk.²⁷⁸ That is, the risk that the clearing member will be unable to return the customers' collateral due to losses incurred by the clearing member on its investment of the customers' collateral as permitted under the relevant regulations.²⁷⁹

The above analysis reveals that all segregation models have their respective trade-offs. Individual account segregation offers a higher degree of protection, but this protection is achieved at a greater cost. Omnibus segregation offers the least protection. LSOC however attempts to balance costs with the protection of client margin by retaining the operational benefits of combining customer accounts while offering legal separation of accounts. This benefit typically only applies on a net basis for variation margin, which should only be problematic where there are wide asset price movements. Consequently, the US regime strikes the right balance and is superior to the EU approach. However, the absence of explicit regulatory prescriptions on portability in the US should be remedied.

d. A Theoretical Perspective

Segregation reduces the amount of liquidity available in OTC-DMs and consequently cannot be described as very efficient. This is attributable to a number of factors. In bilateral derivative markets, derivative dealers who in this

²⁷⁷ Gregory (n 96) 221.

²⁷⁸ Ibid 229; Chamorro-Courtland (n 248) 650.

²⁷⁹ Ibid 631.

case will probably be clearing members are able to rehypothecate the client's collateral and obtain profits from this, which is efficiently priced into the cost of clearing or brokering these trades.²⁸⁰ The ability to rehypothecate collateral increases liquidity in OTC-DMs and reduces client's transaction costs. Research has found that in bilateral markets, spreads increase with increasing hypothecation rates.²⁸¹ Furthermore, due to the high costs of operating segregated accounts, clearing members will demand higher clearing fees resulting in less capital and incentive available to clients for liquidity promoting activities in OTC-DMs.

However, lessons bitterly learnt from the MF Global²⁸² and Peregrine Financial²⁸³ debacles illustrate the bounded rationality of OTC-DM participants namely dealers and demonstrates the need for client protection legislation which in this case has taken the form of segregation and portability rules. While this regulatory intervention is laudable, it is difficult to see its importance in the context of financial stability. It can be argued that individual segregation increases as opposed to decreases systemic risk. This is because in the event of a clearing members' default, CCPs port the failed member's client's positions to other solvent clearing members. This results in clients obtaining more than they would if they had to resort to the failed clearing member's bankruptcy estate. Clients are typically nothing like the large complex financial institutions who make up CCP membership. Furthermore, clients do not contribute to the CCP's guarantee fund. This means that in the event of client's segregated accounts being ported away to another clearing member, risk is transferred up from clients to the CCP consequently increasing systemic risk. This problem could perhaps be mitigated by requiring clearing member contributions to the default fund based on segregation with contributions to the

²⁸⁰ Yuji Sakurai and Yoshihiko Uchida, 'Rehypothecation Dilemma: Impact of Collateral Rehypothecation on Derivative Prices under Bilateral Counterparty Credit Risk' (2014) 48 *Journal of Banking & Finance* 361.

²⁸¹ *Ibid* 371.

²⁸² Silla Brush and Matthew Leising, 'MF Global Didn't Segregate Client Collateral, CME Group Says' *Bloomberg* (2011) <https://www.bloomberg.com/news/articles/2011-11-01/mf-global-probe-said-to-involve-hundreds-of-millions-in-funds>.

²⁸³ Silla Brush, 'State Street Urges Futures Client Account Change after MF Global' *Bloomberg* (2012) <https://www.bloomberg.com/news/articles/2012-08-09/state-street-urges-futures-client-account-change-after-mf-global>.

default fund increasing with the amount of segregated collateral to safeguard CCP stability.

Omnibus segregation under the EU regime clearly offers efficiencies where it allows members provide margin on a net basis, allowing clearing members hold excess margin which they are able to rehypothecate for profit and consequently reduces fees to be paid by the client. Furthermore, in the event of a fellow client's default, omnibus segregation prevents the spread of the resultant financial shock upwards by using margin in the omnibus account before deploying resources from the guarantee fund. This ensures the even spread of losses amongst non-systemically market participants approach proselytised by MFT. However, omnibus account segregation generates the most moral hazard. This is because clearing members may be incentivised to take on clients with low credit worth and high counterparty risk. These clients may also be more likely to strategically default and consequently, this moves risk from clients with a high likelihood of default to those with a low likelihood of default²⁸⁴ as all customer margin is mixed regardless of creditworthiness. Furthermore, all forms of segregation engender moral hazard problems. Segregation removes incentives for clients to properly assess the creditworthiness of the clearing members they clear through. This can result in lax due diligence on the part of customers and result in a higher number of customer defaults resulting from a lack of information collection.²⁸⁵

Regulatory prescriptions as regards portability are necessary in periods of financial stress, as in the absence of pre-arranged transfer arrangements, porting large numbers of customer accounts will be difficult. Even with pre-arranged porting arrangements, porting may become impossible where losses have been suffered on positions due to low prices achieved during the CCPs auction procedures.²⁸⁶ A scenario that seems highly likely in environments of significant financial stress. However, portability may ameliorate the endemic uncertainty in OTC-DMs and consequently prevents runs on clearing members and in turn CCPs as clearing clients are assured that even where

²⁸⁴ Pirrong (n 3) 31.

²⁸⁵ Ibid.

²⁸⁶ Gregory (n 96) 223.

their clearing member is in dire financial straits, they have the option of porting upon its failure. Portability is particularly advantageous from a MFT perspective as it obviates the need for the CCP to close out and replace defaulting clearing member's positions held on behalf of clients. This reduces transaction costs and prevents any wild price swings²⁸⁷ that would be the natural consequence of the CCP attempting to auction or acquire new derivative exposures thus also preventing the amplification of systemic risk in environments of significant financial stress. However, the need for pre-porting arrangements with back up clearing members diminish the utility of this tool, as in environments of financial stress where fundamental uncertainty fuelled by imperfect knowledge and irrationality flourishes. Clearing members may be unwilling to take on new clients, especially given the margin implications that portability poses for said clearing members. Supporting the above analysis, research indicates that clients are apprehensive that they face a lot of uncertainty about future access to clearing, especially in environments of financial stress.²⁸⁸ Furthermore, where omnibus accounts are used, and a clearing member defaults, untangling collateral will take time²⁸⁹ further increasing uncertainty.

From the above analysis, it can be concluded that segregation does not necessarily fully follow the precepts of MFT as it reduces liquidity, increases transaction costs, and reduces market discipline. However, it has also been established that segregation does not necessarily follow the precepts of alternative theories of finance as it transfers risk from the bottom up. Portability is however a step in the right direction as while following the precepts of MFT, it also ameliorates the imperfect knowledge constraint to a limited extent but still suffers from its own limits.

4.6. Conclusion

The CCP prescription has placed CCPs in the regulatory spotlight. This has resulted in the promulgation of regulation aimed at ensuring the safe operation

²⁸⁷ Pirrong (n 3) 32.

²⁸⁸ Financial Stability Board and others (n 216) 4.

²⁸⁹ Zebregs (n 252) 277.

of CCPs, while simultaneously ensuring access to CCP clearing. The objective of this chapter has been the examination of regulatory prescriptions on the 'plumbing of the financial system.' Utilising comparative and theoretical perspectives, this chapter has examined regulatory prescriptions on CCP authorisation, operation, and corporate governance. In light of the mandated nature of clearing, it has also examined regulatory mandates on client clearing, and segregation and portability.

This chapter's analysis yields a number of points. From a comparative perspective, the EU approach is to be preferred for a number of reasons including: (i) regulatory oversight of risk committee meetings, (ii) increased financial resource demands, and (iii) specific provisions for indirect clearing and portability. However, the US regime on segregation however offers the most certainty for clients. A theoretical examination however reveals several lacunae in these regulatory prescriptions. In relation to the corporate governance of CCPs, this thesis notes that current regulatory prescriptions assume rationality and the imposition of market discipline on the part of actors involved in the governance of the CCP. Furthermore, this thesis has argued that regulatory prescriptions on CCP financial resources may prove ineffective in environments of financial stress for a number of reasons including: (i) the vulnerability of CCP financial resources to swings in asset prices – a phenomenon attributable to fundamental uncertainty and possible herding; (ii) margin modelling methodologies specifically the Value at Risk and Expected Shortfall methods which are unable to accurately account for endogenous risk; (iii) the questionable informational efficiency of CCPs; and (iv) a predominance of instable finance structures due to increased margin demand engendered by CCP margin requirements. This thesis's analysis of client clearing provides little comfort as the shielding of clients from the CCP's default fund and the segregation and portability of collateral reduce incentives to monitor and promote moral hazard.

In light of these findings among others, this chapter has made a number of recommendations including: (i) mandated regulator presence and contributions in CCP board and risk committee meetings; (ii) the use of recapitalisation mechanisms upon the default of a CCP's largest clearing

member; (iii) to insulate CCPs from asset price bubbles and price collapse, this thesis recommends that CCPs clear multiple classes of derivatives; (iv) to prevent moral hazard, CCPs should tailor margin to clearing member balance sheet risks; (v) to further prevent moral hazard and the resultant risk taking, capital contributions should be capped; (vi) CCPs should directly supervise clearing member clients with clearing members only guaranteeing client trades to avoid excessive risk taking by clients; (vii) the US should explicitly produce rules on portability to ameliorate any uncertainty that clearing clients may feel in periods of financial stress;

This thesis however acknowledges that these reforms are somewhat radical in nature and may be resource intensive. This leads to the conclusion that the CCP prescription is a panacea not a placebo as in its current state, it does not preclude the occurrence of endogenous risk. However, the CCP prescription cannot be discounted immediately as in conjunction with other G20 reforms it may ensure financial stability. Perhaps the amelioration of imperfect knowledge and fundamental uncertainty through the use of trade repositories and the provision of liquidity through the price ordering mechanisms inherent in the centralised trading requirement may remedy the highlighted defects in regulatory prescriptions on CCPs, and render this thesis's conclusion that the CCP prescription is merely a placebo wrong. Consequently, this thesis in its next chapter explores the reporting obligation through the lens of comparative methodologies, and modern and alternative theories of finance.

Chapter 5: The Reporting Obligation: is Sunlight the Best Disinfectant for Opaque Markets?

5.1. Introduction

Due to the role opacity and interconnectedness in OTC-DMs compounded by a lack of data on derivative exposures played in the build-up and amplification of the GFC – especially in light of the fact that regulators lacked accurate views of risk concentration in global financial markets,¹ the G20 mandated that all OTC derivative transactions be reported to trade repositories (TRs).² The objective of trade reporting is to afford regulators and market participants with greater transparency, and the ability to evaluate market movements through the provision of information on derivatives.³ This consequently enables regulators prudentially regulate OTC-DMs and OTC-DM participants effectively. Superficially, the introduction of a reporting obligation in OTC-DMs which traditionally have not been the subject of arrangements facilitating the widespread dissemination of price information, trading volumes, and other relevant information⁴ may be cause for celebration. This can be attributed in part to EMH's assumption that market efficiency is dependent on the availability of information.⁵

Furthermore, the regulatory implications of alternative theories of finance seem to buttress the imposition of a reporting obligation. Under IKE, this could be viewed as regulators ameliorating the imperfect knowledge constraint. Under behavioural finance and the FIH, this could be viewed as regulatory monitoring of market participant behaviour to determine the rationality or otherwise of their actions. However, the reporting obligation can be criticised

¹ Iman Van Lelyveld, 'The Use of Derivatives Trade Repository Data: Possibilities and Challenges', (ICF National Bank of Belgium Workshop on 'Data Needs and Statistics Compilation for Macroprudential Analysis', 2017) 1.

² Supra Section 1.1; Guido Ferrarini and Paolo Saguato, 'Reforming Securities and Derivatives Trading in the EU: From Emir to Mifir' (2013) 13 *Journal of Corporate Law Studies* 319.

³ Niamh Moloney, *EU Securities and Financial Markets Regulation* (Oxford University Press 2014) 604.

⁴ Dan Awrey, 'The Mechanisms of Derivative Market Efficiency' (2016) 91 *New York University Law Review* 1108.

⁵ Supra Sections 2.3 and 2.4; Reinier Kraakman and Ronald Gilson, 'The Mechanisms of Market Efficiency' (1984) 70 *Virginia Law Review* 549.

on a number of grounds. For example, while the reporting obligation will no doubt engender the increased flow of information, whether or not this information is accurately priced into derivative contracts is doubtful especially as for example, publicly disclosed reported information is anonymised. Furthermore, the ability of regulators to fully understand the information provided under this obligation is doubtful given bounded rationality.⁶

It is in the context of the above that this chapter examines EU and US regulatory prescriptions on the reporting obligation from an analytical, comparative, and theoretical perspective. To this end, Section 5.2 first provides a brief overview of transparency as a regulatory tool. Subsequently, this chapter provides a detailed account of the scope of the reporting obligation in Section 5.3. This examination is followed by a comparative and theoretical evaluation of said scope. Furthermore, the identification of counterparties, contracts and transactions is an integral aspect of ensuring the functionality of the reporting obligation and consequently, this chapter examines regulatory prescriptions on identifiers in Section 5.4. In addition, as TRs now form an integral aspect of financial market infrastructure, Section 5.5 explores governance arrangements imposed on TRs from a comparative and theoretical perspective. Finally, this chapter concludes in Section 5.6 that the reporting obligation as it currently stands cannot adequately fulfil its role as a tool of macro prudential regulation and needs recalibration. To this end, this chapter makes a number of recommendations including regulatory cognition of the limits of quantitative analysis utilising data, and the use of a single supervisory mechanism for TRs. These recommendations are further bolstered by recommendations made in Chapter 7 of this thesis.

5.2 Transparency

'Publicity is justly commended as a remedy for social and industrial diseases. Sunlight is said to be the best of disinfectants, electric light the most efficient policeman.'⁷ In line with the aforementioned quote, transparency is a major

⁶ Awrey (n 4) 1160 and 1165.

⁷ Louis Brandeis, *Other People's Money and how the Bankers Use it* (National Home Library Foundation 1933).

tool in the regulatory arsenal with mandatory disclosure underpinning most of the regulation of financial markets. This can be attributed to arguments that transparency supports market discipline, price formation, and facilitates regulatory surveillance.⁸ For OTC-DM purposes, market transparency can be defined as the level to which information on transactions is disseminated amongst market participants and the relevant regulators.⁹ Furthermore, in the context of the reporting obligation, transparency refers to post trade transparency, that is, the dissemination of trade prices, volumes, and completed transactions in markets trading a product.¹⁰ Conversely, pre trade transparency is the amount of information made publicly available about buy and sell orders prior to execution.¹¹ Transparency is a necessary prerequisite for the assessment of a firm's risk profile and systemic risk,¹² especially as it is taken as an established fact among economists that the availability or otherwise of information can have substantial impacts on the functioning of markets.¹³

From a MFT perspective, it may be argued that in an efficient market where prices reflect all publicly available information, the creation of a market participant focused disclosure system is redundant as there should be adequate private incentives to encourage the production and dissemination of information to market participants.¹⁴ This does not however preclude the justification of mandatory disclosure from a MFT perspective. For instance, where information is viewed as a public good, which produces positive

⁸ Iris Chiu, 'Transparency Regulation in Financial Markets – Moving into the Surveillance Age?' (2011) 2 *European Journal of Risk Regulation* 305.

⁹ Marco Avellaneda and Rama Cont, *Trade Transparency in OTC Equity Derivatives Markets* (2010) *Finance Concepts* 12.

¹⁰ Marco Avellaneda and Rama Cont, 'Transparency in Credit Default Swap Markets' (2010) *Finance Concepts* 6.

¹¹ Kyong Eom and others, 'Pre-Trade Transparency and Market Quality' (2007) 10 *Journal of Financial Markets* 319.

¹² Niamh Moloney and others, *The Oxford Handbook of Financial Regulation* (Oxford University Press 2017) 386.

¹³ Kathryn Judge, 'Information Gaps and Shadow Banking' (2017) 103 *Virginia Law Review* 447; Friedrich Hayek, 'The Use of Knowledge in Society' (1945) 35 *The American Economic Review* 519; George Akerlof, 'The Market for 'Lemons': Quality Uncertainty and the Market Mechanism' (1970) 84 *The Quarterly Journal of Economics* 488; Donald Campbell *Incentives: Motivation and the Economics of Information* (3rd edn, Cambridge University Press 2018).

¹⁴ Lawrence Cunningham, 'Capital Market Theory, Mandatory Disclosure, and Price Discovery' (1994) 51 *Washington and Lee Law Review* 846.

externalities; there may be suboptimal production of information.¹⁵ In addition, Coffee notes that disclosure is a means to efficient diversification as where disclosures are made by several market participants, other market participants are better able to calculate the beta value of their portfolios. Especially as historical price movements as opposed to basic investment information reveals beta information. Detailed disclosure of information also enables market participants determine whether risk levels are compatible with their preferences and revise their portfolios or positions accordingly.¹⁶

Consequently, mandatory disclosure significantly reduces information costs, increasing the volume of information provided, and ensures the improved accuracy of investment strategies.¹⁷ It is in fact widely acknowledged that transparency is necessary for the proper functioning and stability of markets and contributes to the provision of liquidity.¹⁸ Furthermore, as has been highlighted above,¹⁹ detailed information on trade activity in OTC-DMs optimally positions regulators to monitor any potential sources of risk in OTC-DMs. Factors regulators will be better able to monitor include position concentrations, and the size and depth of markets which may contribute to the design of clearing determinations, and the anticipation of wild price swings.

Transparency can also be an extremely useful tool in ameliorating the imperfect information constraint, and any consequent irrational behaviour by market participants. For instance, the publication of available information can provide perspective into counterparty credit risk.²⁰ Transparency in this context could be in the form of disclosure of firm risk and product risk. Disclosure of a firm's risk enables other market participants assess the creditworthiness of a counterparty, and consequently contract accordingly. The disclosure of product risk enables market participants understand the risk

¹⁵ Frank Easterbrook and Daniel Fischel, *The Economic Structure of Corporate Law* (Harvard University Press 1998) 91.

¹⁶ John Coffee, 'Market Failure and the Economic Case for a Mandatory Disclosure System' (1984) 70 *Virginia Law Review* 748.

¹⁷ *Ibid* 722.

¹⁸ Avellaneda and Cont (n 10) 1.

¹⁹ *Supra* Chapter 4.

²⁰ Darrell Duffie and others, 'Policy Perspectives on OTC Derivatives Market Infrastructure' (2010) 24 *Federal Reserve Bank of New York Staff Report* 17.

profile of a product and any possible interactions with said market participant's portfolio.

Contextualising the benefits of transparency in OTC-DMs, it is interesting to note that prior to 2005, there was no central repository for information on credit derivatives, which rendered the determination of life cycle events in relation to said derivatives difficult.²¹ This is unsurprising as from a historical perspective, OTC-DMs have not benefitted from market structure designed for the dissemination of price volume and trading information.²² Pre-GFC, while regulators and market participants had initiated efforts targeted at the mitigation of the information asymmetries in OTC-DMs namely the establishment of a central trade registry for CDS, these efforts were hampered by their non-mandatory nature.²³ The Depository Trust and Clearing Corporation (DTCC) acted as a TR for credit derivatives from 2006.²⁴ The accessibility, quality, and scope of trade information held at this repository was however not standardised.²⁵ DTCC only provided aggregate net notional data on single reference products, which does not provide an accurate picture of counterparty exposure which should include exposures net of collateral.²⁶ Furthermore, DTCC's data did not provide a comprehensive picture of all CDS trades – especially trades that were not electronically confirmed.²⁷ However, despite the inadequacy of the information held, DTCC was a key resource of market information for regulators during the financial crisis.²⁸ Consequently, it is unsurprising that the G20 has mandated that OTC derivative trades be regulated in the aftermath of the GFC. In light of these developments, this chapter analyses the scope of the reporting obligation in its next section.

²¹ Ibid 3.

²² Awrey (n 4) 1108.

²³ U.S. Government Accountability Office (GAO), 'Systemic Risk: Regulatory Oversight and Recent Initiatives to Address Risk Posed by Credit Default Swaps' (2009) 4 <https://www.gao.gov/products/GAO-09-397T>

²⁴ Karel Lanoo, 'The New Financial Regulatory Paradigm: A Transatlantic Perspective' (2013) 287 Centre for European Policy Studies Policy Briefs 5.

²⁵ Nout Wellink, 'Mitigating Systemic Risk in OTC Derivative Markets' (2010) Financial Stability Review.

²⁶ Rama Conte, 'Credit Default Swaps and Financial Stability' (2010) Financial Stability Review 42.

²⁷ GAO (n 23) 20.

²⁸ Avellenda and Cont (n 9).

5.3. Scope of the Reporting Obligation

The scope of derivative trades covered by the reporting obligation is important as to gain a holistic perspective of the health of OTC-DMs, the amount of information regulators have access to on activity in OTC-DMs is crucial. The volume of information requested by regulators also dictates whether or not said regulators have the financial and operational resources to accurately interpret the provided information and consequently, fulfil their macroprudential supervisory duties. The nature of information to be publicly disclosed is also extremely important for the efficient pricing of information into derivative prices, and additionally, the efficient functioning of financial markets in environments of financial stress. Recognising these considerations, regulators in the EU and US have produced a number of rules in this regard. These rules are discussed and analysed in detail below.

a. European Union

EMIR mandates that all EU counterparties must report the details of any derivative contracts and any modification or termination of said contracts to an ESMA registered or recognised TR²⁹ by the working day following said entry, modification or termination.³⁰ This requirement is further supplemented by an implementing regulation,³¹ which provides technical standards in relation to the form and frequency of trade reporting, and a delegated regulation³² which provides for the minimum amount of data to be reported.

FC and certain NFC must also report collateral and daily mark to market/model valuations.³³ As the reporting obligation applies to all counterparties established in the EU, both counterparties to a derivative transaction must report the derivative transaction from their idiosyncratic perspectives. The reporting obligation can be met by individual reporting by each counterparty, or through reporting by a third party to whom this task has been delegated

²⁹ Given this thesis's coverage of recognition in Section 3.5, it will not be discussed in this chapter.

³⁰ Article 9 EMIR.

³¹ Commission Implementing Regulation (EU) 1247/2012.

³² Commission Delegated Regulation (EU) 148/2013.

³³ Article 5(5) Commission Implementing Regulation (EU) 1247/2012.

beforehand.³⁴ It should however be noted that counterparties remain legally responsible for the accuracy of these reports.

Furthermore, counterparties and CCPs must avoid duplication in their reports. This essentially means that only one report exempting subsequent modifications must be submitted by a counterparty or CCP (or the relevant delegatee) in relation to a specific derivative transaction. Counterparties reporting derivative trades must also ensure that there is consistency in the common data reported. Information about the counterparties to a derivative trade called 'counterparty data' and information about the derivative contracts known as 'common data' must be reported.³⁵ The reporting delegated and implementing regulations specify the type of information to be reported, and the format said report should take.³⁶ Counterparty data includes the identification and trading capacity of parties involved in the trade, the domicile, whether the reporting counterparty is above the clearing threshold, the value and currency of the contract, and details on the collateralisation of the contract. The common data, which contains 94 fields includes information on the transaction and product type, the underlying, notional value, currency, trade IDs, and specification of any master agreement used.³⁷

In addition, the reporting obligation mandates that counterparties keep records of any derivative trade concluded and any modifications thereto for at least five years following the termination of the contract.³⁸ Due to the sensitive nature of the information disclosed by the reporting counterparty, EMIR explicitly states that any counterparty that reports details of a derivative contract in fulfilment of the reporting obligation is not in breach of any contractual, legislative, or regulatory provision restricting the disclosure of information.³⁹ TRs must regularly and in an easily accessible manner publish aggregate positions by class of derivatives on the transactions reported to it.⁴⁰

³⁴ Article 9(1) EMIR.

³⁵ Article 1 Commission Implementing Regulation (EU) 1247/2012.

³⁶ Not all fields will have to be reported in every case.

³⁷ Annex, Commission Delegated Regulation (EU) 2017/104.

³⁸ Article 9(2) EMIR.

³⁹ Article 9(4) EMIR.

⁴⁰ Article 81 EMIR.

b. United States

Title VII of the Dodd Frank Act requires that the CFTC adopt rules mandating the reporting of derivative transactions to swap data repositories (SDRs),⁴¹ and the dispersal of specific swap trade information in such form or at such intervals as to enhance price discovery.⁴² The CFTC in implementing this rule has specified three types of reports to be made namely real-time reporting, regulatory reporting, and historical reporting. These rules are discussed below.

In relation to real-time public reporting,⁴³ four categories of swap are subject to this obligation. Specifically, these are swaps subject to the CCP prescription, cleared at CCPs, reported to a TR, and determined to be subject to the CCP prescription but not cleared. This leads to the conclusion that all swaps are subject to the reporting obligation. The CFTC has delineated the particulars of a publicly reportable swap transaction as an executed swap, which is conducted at an arm's length between two parties resulting in a corresponding transformation in the market risk position with the two parties.⁴⁴ Additionally, any termination, assignment, novation, exchange, transfer, amendment, conveyance, or extinguishing of rights or obligations to a swap that affects the pricing of the swap are publicly reportable swap information. Interaffiliate swaps⁴⁵ are however excluded from this definition as their inclusion could create the illusion of market depth and these transactions do not contribute to price discovery or transparency. Furthermore, portfolio compression exercises are exempt as their primary purpose is the mitigation of risk between counterparties.⁴⁶ Swaps traded on a swap execution facility (SEF) or a designated contract market (DCM) are typically reported by the SEF or DCM.⁴⁷ Where one party is a swap dealer and the other party is not, the swap dealer must do the reporting. Where both parties are swap dealers, they must agree on who is to report, and where both parties are neither swap dealers nor major

⁴¹ The terms trade repository and swap data repository are used interchangeably.

⁴² Section 727 Dodd-Frank Act. Chiu (n 8) 314.

⁴³ 17 CFR 43.

⁴⁴ 17 CFR 43.2.

⁴⁵ Swaps between 100% owned subsidiaries.

⁴⁶ 17 CFR 43.2.

⁴⁷ 17 CFR 43.3.

swap participants – they must agree on who is to report.⁴⁸ Information that must be reported includes transaction and pricing data including cancellations, correction, time of execution, clearing status, indication of collateralisation, contract type, and end date.⁴⁹ This information is to be reported as soon as technologically possible after the execution of the swaps and is to be disseminated to the public.

As regards regulatory reporting, registered entities and swap counterparties must report required swap creation data electronically to TRs.⁵⁰ Swap creation data consists of the primary economic terms of a swap transaction and comprises all the terms of a swap matched or agreed to by counterparties in verifying the swap. It includes at a minimum terms listed by the CFTC for each asset class in the latest appendix to Part 45.⁵¹ This includes counterparty information, domicile, a description of the instrument, contract type, block trade indicator, time of execution, maturity and termination/end date, the notional value of the swap, price, the clearing information, and collateralisation.⁵² Furthermore, confirmation data⁵³ comprised of all the terms of the swap confirmed/matched by the counterparties must be reported. The parties responsible for reporting this data are vastly similar to those responsible for the reporting of real time data. The time limit for general reporting ranges from 15 minutes to 24 hours depending on the party tasked with reporting.⁵⁴ Reported information is only accessible by regulators. Market participants must also keep full, complete, and systematic records, and relevant data of all their swap related activity.

The CFTC has also mandated the historic trade reporting of all swaps entered into after 21 July 2010 and before 28 February 2013 to a registered TR.⁵⁵ Reporting details for these purposes include: first, the reporting counterparty must report electronically to the TR an initial data report containing all

⁴⁸ 17 CFR 43.3.

⁴⁹ 17 CFR 43.3 Appendix A.

⁵⁰ 17 CFR 45.3.

⁵¹ 17 CFR 45.1.

⁵² 17 CFR Appendix 1 to Part 45, Tables of Minimum Primary Economic Terms Data.

⁵³ 17CFR 45.1.

⁵⁴ 17 CFR 45.4.

⁵⁵ 17 CFR 46.

minimum primary economic transaction data specified in appendix 1 of the rule. Furthermore, for pre-enactment or transition swaps, the receiving counterparty must report continuation data.

c. A Comparative Perspective

While both implementing the same broad regulatory mandate, there are differences between the EU and US trade reporting regimes.⁵⁶ Crucially, while the EU requires two sided reporting, the US regime merely requires that one party to the trade reports. Trade reporting typically engenders significant transaction costs and consequently, it can be concluded that the EU regime places a more onerous burden on small OTC-DM participants. Furthermore, there is a significant difference in the time required for reporting. This burden is however mitigated by the provision for delegated reporting. EU mandated double sided reporting can be justified as a system of checks. Where data provided by the parties to a transaction does not match, this can indicate problems with the underlying transaction or errors in a counterparty's reporting. Additionally, while onerous on smaller counterparties, double sided reporting renders the implementation of the reporting obligation less complex. Conversely, it could be argued that single sided reporting makes the party with the cheapest and fastest access to data report. This is typically the party with automated systems.

While EMIR does allow parties to delegate reporting, the delegating counterparty is still responsible for the accuracy of the information provided and will consequently either have to check the delegatee's report for accuracy, or make the report itself. This could however lead to double reporting. This is due to the fact that intermediation in data chains increases the likelihood of breaches in data integrity. For example, where a delegating counterparty reviews the reported information and cannot find its trades due to unknown and unidentified differences in its and the reporting delegatee's identifiers – which may occur in an environment with different IT systems, said delegating

⁵⁶ Ian Ackner, 'Strength in Transparency through Harmonization of Reporting Requirements for OTC Derivatives' (2017) 49 *George Washington International Law Review* 966.

counterparty may then report the specific trade again consequently resulting in double reporting.

Furthermore, the EU regime requires that market participants report derivative trades no later than the day after the working day following the conclusion, modification, or termination of a derivative transaction whereas the US regime mandates that swaps are to be reported as soon as technologically possible. This indicates different priorities on the part of regulators. US reporting seems to prioritise almost instantaneous reporting to facilitate the quick dissemination of price information to ensure transparency. EU regulators on the other hand seem to be more focused on the assessment of systemic risk and market abuse. Delayed reporting in the EU can also be viewed as regulatory acknowledgment of the heavy compliance costs imposed by two sided reporting; and of the need for necessary trade reconciliation.

Differences between EU and US reporting timelines may also prove problematic for a number of reasons. First, real time reporting is reliant on the incremental updating of information due to the fact that the short time frames may result in trades being reported before they are 100% complete. Any errors or changes in the information reported are typically updated throughout the day. Conversely the granularity of information required by EMIR especially as regards valuation and collateral – which are typically computed periodically results in firms whose systems are primarily designed for real time reporting placing EMIR reportable transactions in an internal queue until collateralisation and valuation are complete. This raises complex monitoring issues and can put undue strain on IT systems.⁵⁷ There is also the possibility that EMIR reporting fails to capture trades that are concluded and cancelled or reversed on the same day as under the current reporting regime, only trades that exist at the end of the day must be reported.

Further differences can be noted in the scope of the reporting obligation on both sides of the Atlantic. Under the EU regime, both OTC and exchange

⁵⁷ Anne-Charlotte Duhaut, 'Challenges of EMIR Delegated Reporting for Derivatives Trades Part 2' 2018 <https://regteksolutions.com/challenges-of-emir-delegated-reporting-for-derivatives-trades-part-2/>

traded derivatives are to be reported,⁵⁸ while the under the Dodd-Frank Act, only OTC derivatives are to be reported. The plethora of information required by the EU may prove onerous for exchange traded derivative users due to the sheer volume of derivatives transacted on exchanges. EMIR's heightened focus on the mitigation of systemic risk can also be detected when examining the number of data fields to be reported. While there are broad similarities in the information to be provided for instance domicile and clearing, the EU requires more detailed data fields. For example, while the US rules merely ask for an indication that a contract is collateralised, the EU requires detailed information on the collateral's portfolio status, initial and variation margin posted, the currency of initial and variation margin, information on excess collateral, and data on the contract's mark to market or mark to model valuations.

Both regimes require the reporting of historical trades. This can be rationalised on the grounds that the provision of information on historic trades gives regulators a better perspective of OTC-DMs generally. Additionally, the provision of historical data could be useful in calibrating regulatory models to be used to monitor systemic risk. Furthermore, both regimes require recordkeeping on the part of counterparties for different periods. The ubiquity of this requirement no doubt promotes regulatory ability to investigate any violations of regulatory requirements.

To conclude on the differences between the EU and US regulatory regimes, the EU regime seems to prioritise market surveillance and the mitigation of systemic risk over the enhancement of price transparency and market discipline. The US regime on the other hand seems to lean heavily towards the use of price discipline and market transparency. This coheres with this thesis's conclusion in previous chapters that in comparison with the EU regime, the US regime seems to accord primacy to flexibility and market discipline.⁵⁹ In light of this analysis, this chapter analyses the theoretical ramifications of these prescriptions in its next section.

⁵⁸ Julien Jardelot and Martin Mitov, 'The Drivers Behind the Reporting Obligations of EMIR, Mifir and SFTR' (2015) 7 *Journal of Securities Operations & Custody* 348.

⁵⁹ *Infra* Chapters 3 and 4.

d. A Theoretical Perspective

The above discussions on transparency indicate that the provision or otherwise of information can have a profound impact on market microstructure.⁶⁰ Pre-GFC, significant information asymmetries existed between dealers who typically performed market making roles and the buy side, especially in CDS markets. This market making capability was a consequence of dealer-sourced information. The crucial role played by derivative dealers in pre-GFC OTC-DMs⁶¹ resulted in their optimal placement for collecting and quantifying information that they could successfully capitalise on via the extraction of rents through bid-ask spreads.⁶² As Gilson and Kraakman note, only when prices do not fully reflect all available information and consequently fall short of strong form efficiency is there room for arbitrage by sophisticated investors through the costly gathering of information.⁶³ Consequently, while prima facie, transparency promotes informationally efficient markets, it also renders dealer sourced information redundant and consequently may remove incentives on the part of dealers to make markets; reinforcing Grossman and Stiglitz's seminal criticism of EMH.⁶⁴ Furthermore, opacity on the OTC derivatives position of a market participant results in suboptimal pricing and collateral provision. Disclosing information on a firm's derivatives position however requires its permission and as this disclosure benefits the system at large, the firm may not internalise the costs of transparency which provides little incentive for the production of counterparty information.⁶⁵ Consequently it can be assumed that there may be some reluctance and subsequent innovation on the part of market participants in the implementation of the reporting obligation.

In relation to the dissemination of information to the public, prima facie, mandatory disclosure reduces information costs by ensuring the dissemination

⁶⁰ Judge (n 13) 447.

⁶¹ Discussed Infra Section 6.2.

⁶² Awrey (n 4) 1143.

⁶³ Gilson and Kraakman (n 5) 623.

⁶⁴ See Section 2.3.1; Sanford Grossman and Joseph Stiglitz, 'On the Impossibility of Informationally Efficient Markets' (1980) 70 the American Economic Review 393.

⁶⁵ Viral Acharya, 'A Transparency Standard for Derivatives' (2011) NBER Working Paper Series 3

of information in derivative markets.⁶⁶ However, the lack of real time reporting under EMIR does not help reduce market participants' information costs, and the format of said reports results in no observable benefits to market participants. For instance, DTCC's EU repository publishes a breakdown of aggregate open transaction volumes, open positions, and aggregate value.⁶⁷ Similar public information is made available by Regis-TR,⁶⁸ and UnaVista⁶⁹ TRs. Unfortunately, market participants may not find this sort of information useful due to the high level of aggregation, and the absence of information on new transactions by currency, product, and maturity. This also calls into question any market discipline functions this information could have performed as user discipline is only effective when disclosed information is utilised in the market participant's decision-making process.⁷⁰ Furthermore, double sided reporting and parties' freedom to report to different TRs call any aggregation efforts into question⁷¹ and consequently undercuts the usefulness of any information disclosed. These problems are compounded by the fact that in the EU, aggregated reported information is only made publicly available every week.

US real time reporting however seems to follow the tenets of MFT in a sense as a wide array of information is provided including the underlying, time of execution, clearing status, block trade status, currency, and payment.⁷² Prior to the implementation of the reporting obligation, financial market participants had to create their own datasets and communicate with other market participants to gather information on the prevailing span of bid-ask spreads.⁷³ Consequently, real time reporting and public dissemination of trade

⁶⁶ Coffee (n 16) 747.

⁶⁷ Information on DTCC's EU public data reporting can be found at <http://www.dtcc.com/repository-otc-data/emir-public-reports>.

⁶⁸ Information on Regis-TR's EU public data reporting can be found at <http://www.regis-tr.com/regis-tr/public-data/emir-public-data/aggregate-open-position>.

⁶⁹ Information on UnaVista's EU public data reporting can be found at <https://www.lseg.com/markets-products-and-services/post-trade-services/unavista/unavista-solutions/emir-trade-repository/trade-repository-public-data>.

⁷⁰ David Weil and others, 'The Effectiveness of Regulatory Disclosure Policies' (2005) 25 *Journal of Policy Analysis and Management* 155.

⁷¹ Though this issue could potentially be mitigated by trade identifiers, discussed infra Section 5.4.

⁷² Information on DTCC's US public data reporting can be found at <https://pddata.dtcc.com/gtr/cftc/dashboard.do>

⁷³ Awrey (n 4) 1133.

information could be viewed as enhancing price transparency and providing market participants with more information, consequently reducing information asymmetries and its attendant problems for example, agency costs.⁷⁴ This exhibits regulatory reliance on market discipline and assumes that the GFC may have been avoided if rational market participants had been provided the benefit of increased disclosure.⁷⁵

However, this raises questions on whether the information that's disseminated to market participants is actually useful. Unfortunately, publicly disseminated information does not include counterparty or customer information which results in the inhibition of market transparency and discipline to an extent. A solution could be the disclosure of counterparty and position information on OTC-DM participants. This could result in improved pricing and management of counterparty risk, and incentivise market participants to lower their risk profiles and the level of suboptimal financial innovation. Furthermore, this would have beneficial effects in ameliorating the imperfect information constraint in environments of financial stress possibly preventing irrational herding via flights to quality. Acharaya notes that a counterargument to this degree of market transparency is the reduction in the economic benefits of assuming these positions and consequently the deleterious effects on risk sharing and liquidity in OTC-DMs and the economy at large. A compromise could be the provision of this information after some time to allow price impacts disseminate.⁷⁶

From a regulatory perspective, MFT assumes that not only will information be freely available, but said information will also be interpreted correctly.⁷⁷ From this perspective, data provided to regulators could be very useful in ensuring that market participants are compliant with the reporting obligation, providing enhanced micro and macro prudential supervision. For example, analysing the risk of individual market participants, and assessing risk flows in OTC-DMs.⁷⁸

⁷⁴ Ibid 1160.

⁷⁵ Emiliios Avgouleas, 'The Global Financial Crisis, Behavioural Finance and Financial Regulation: In Search of a New Orthodoxy' (2009) 9 *Journal of Corporate Law Studies* 28.

⁷⁶ Acharaya (n 65) 3-4.

⁷⁷ Gilson and Kraakman (n 5) 597.

⁷⁸ Lelyveld (n 1) 2.

In fact, a body of theoretical and empirical work has rapidly been developing following the implementation of the reporting mandate in the EU and the US. For instance, the Bank of England has conducted a pilot study on systemic risk in derivative markets using TR data on CDS,⁷⁹ and the Federal Reserve has investigated the impact of counterparties' matching and negotiation skills on the terms of CDS.⁸⁰ The collection of data on the granular scale that trade reporting requires gives regulators the ability to flexibly aggregate information to suit their needs using just one report. The microprudential benefits of reporting such data are immediately obvious. For instance, frequent reporting of a market participant's position enables regulators assess the value of a firm's position – which would otherwise be difficult due to the non-linear nature of derivative contracts. Furthermore, granular information enables regulators assess net risk properly – especially in light of the fact that margin is typically provided on a net basis. Consequently, information on netting arrangements is required which the EU demands.⁸¹ TR information is also a valuable source of information on market microstructure, economic fundamentals, and market expectations.⁸²

However, the above arguments reinforce assumptions of perfect information and rational regulators capable of quantitatively synthesising the information provided to them completely. This may however be problematic for a number of reasons the most important of which is the size and complexity of the information to be provided. Given the volume and complexity of OTC derivative transactions, it is natural to question regulatory resources: time, technology, and expertise wise in dealing with and interpreting this information. OTC-DMs are extremely complex and the analysis of the massive volume of information

⁷⁹ Robleh Ali and others, 'Systemic Risk in Derivatives Markets: A Pilot Study Using CDS Data' (2016) 38 Bank of England Financial Stability Paper. For further research by the Bank of England using TR data, see Olga Cielinska and others, 'Gauging Market Dynamics Using Trade Repository Data: The Case of the Swiss Franc De-Pegging' (2017) 41 Bank of England Financial Stability Paper; Fernando Cerezetti and others, 'Market Liquidity, Closeout Procedures and Initial Margin for Ccps' (2017) 643 Bank of England Working Paper.

⁸⁰ Diana Iercosan and Alexander Alberto Jiron, 'The Value of Trading Relationships and Networks in the CDS Market' (2017) SSRN Electronic Journal. For further US regulatory research utilizing TR data, see Mark Paddrik and others, 'Contagion in the CDS Market' (2016) Office of Financial Research (OFR) Working Paper Series; Jill Cetina and others, 'Stressed To The Core: Counterparty Concentrations and Systemic Losses in CDS Markets' (2016) Journal of Financial Stability.

⁸¹ Lelyveld (n 1) 4.

⁸² Cielinska and others (n 79) 4.

that is sure to be provided to regulators may overwhelm them. Cielinska and others note that regulatory ability to utilise reported information is dependent on data provided being complete and accurate, and on regulatory ability to analyse said data.⁸³ Lelyveld notes that information provided to Netherlands Bank which is typically limited to reported information on transactions involving Dutch counterparties is daunting.⁸⁴

Furthermore, financial market participants generally and OTC-DM participants especially typically have vaster resources that can be devoted to the analysis and utilisation of provided data.⁸⁵ In addition, regulatory analysis of provided information may be constrained by bounded rationality. For example, the representativeness heuristic⁸⁶ could result in regulators interpreting current market data using the lens of lessons learnt from the GFC engendering a retrospective approach to the evaluation and maintenance of current systemic risk indicators.⁸⁷ Resultantly, regulators may ignore or remain oblivious to the development of new avenues of systemic risk. Additionally, regulators may also be susceptible to anchoring, that is selecting a reference point that is subsequently used to arrive at a decision. This is not inherently bad but can be detrimental where probabilistic inferences are ignored.⁸⁸

These facts are made even more crucial by the constant innovation and dynamism inherent in OTC-DMs and the fact that OTC derivatives are by their very nature hard to value due to the fact that a vast amount of data including the underlying's volatility, the contract's maturity, collateral, and creditworthiness of the protection seller are taken into consideration. Armour and others note that financial innovation typically results in the creation of new structural designs for financial contracts, which due to limited intellectual property protections can be replicated by competitors. This then leads to a new cycle of products which regulators struggle to stay current with.⁸⁹ In

⁸³ Ibid.

⁸⁴ Lelyveld (n 1) 7.

⁸⁵ John Armour and others, *Principles of Financial Regulation* (Oxford University Press 2016) 83.

⁸⁶ Supra Sections 2.5.1, 4.2, and 4.3.

⁸⁷ Chiu (n 8) 319.

⁸⁸ Supra Section 2.5. Robert Shiller, 'Human Behaviour and the Efficiency of the Financial System' (1998) 6375 NBER Working Papers 14 <http://www.nber.org/papers/w6375.pdf>

⁸⁹ Armour and others (n 85) 84.

addition, Awrey identifies two sources of opacity in financial markets prior to the GFC namely a lack of information, and the inability to comprehend vast volumes of information.⁹⁰ Of course, the use of identifiers⁹¹ helps regulators navigate this dense information thicket but aggregating and analysing this information involves substantial costs and technical expertise. For instance, the EU regime requires information on valuation, which while reasonable, raises questions on the ability of EU regulators to comprehend the valuation models or structures of complex derivative contracts developed by private actors.

Furthermore, comprehending the rate of innovation in relation to new and exotic derivative products and their attendant technologies requires significant investment in human capital which may be limited on the part of regulators due to budgetary constraints – especially given that private actors are willing and able to pay significantly higher prices.⁹² Even where these resources are available, lessons learnt from the GFC indicate that even the most sophisticated market participants with the best information could not fully comprehend some of the complexity inherent in new derivative instruments. Consequently, a high degree of transparency may result in more confusion due to the complex nature of the information disclosed.⁹³

MFT's focus on the mechanics of information dispersal ignores the risk-uncertainty construct built by Knight and further developed by Keynes and Minsky, which hypothesises that true uncertainty is distinct from risk and cannot be quantified.⁹⁴ Increased emphasis on fundamental uncertainty definitively shifts regulatory paradigms towards a recognition of the unknowable nature of some information, and the ineffectiveness of complete reliance on calculus in decision making. Building on this taxonomy, Judge

⁹⁰ Dan Awrey, 'Complexity, Innovation and the Regulation of Modern Financial Markets' (2012) 2 Harvard Business Law Review 252.

⁹¹ Discussed *infra* Section 5.4.

⁹² Chiu (n 8) 319.

⁹³ Caroline Bradley, 'Transparency is the New Opacity: Constructing Financial Regulation after the Crisis' (2011) 1 American University Business Law Review 7.

⁹⁴ See generally Frank Knight, *Risk, Uncertainty and Profit* (Dover Publications 2006); John Keynes, *The General Theory of Employment, Interest, and Money* (Palmgrave Macmillan 1936); Hyman Minsky, 'Uncertainty and the Institutional Structure of Capitalist Economies' (1996) 30 Journal of Economic Issues 359.

theorises that there are situations in which information is theoretically knowable or susceptible to quantitative divination but is unknown – this is distinct from information asymmetry. These situations pose unique challenges from those arising out of information asymmetry as these information gaps increase fundamental uncertainty in financial markets.⁹⁵ Regulators are unable to disseminate signals on information that they lack and the pertinence of which they are unaware of. Furthermore, market participants may lack incentives to actually seek out this information. A situation compounded by the fact that the divination of this information utilising probabilistic methods is rendered difficult by the fact that it is hard to prove *ex ante* that information was unavailable to any party.⁹⁶ Judge further notes that this ignorance is however not completely disadvantageous as mutual ignorance pre-empts adverse selection and consequently, there is a given optimal level of information production in a market which cannot be defined in theory alone.⁹⁷

These information gaps featuring information that was not previously known to be pertinent or unknown can exacerbate the imperfect knowledge constraint and fuel fundamental uncertainty in times of crisis when confidence in reported information gives way to the realisation that the information that has been the focus of regulatory attention does not paint a complete picture of risk in financial markets. Furthermore, calls for increased transparency implemented in the reporting obligation can be futile as while mandatory disclosure may be effective in securities regulation due to the fact that the issuer of shares produces required information at the lowest price. This is not necessarily applicable in derivative markets as derivatives are typically complex instruments that are fragmented in structure and in the case of particularly complex derivatives, require tracing through different fragmentation nodes. For example, CDS and the relevant portfolio of referenced fixed income assets. This highlights the importance of regulatory monitoring of not only derivatives themselves but also their underlying assets. Of course, this is facilitated under both the EU and US regimes, which require information on the underlying.

⁹⁵ Judge (n 13) 448.

⁹⁶ *Ibid* 450.

⁹⁷ *Ibid* 452.

However, derivative markets continue to grow and produce new products increasing in complexity and consequently increasing the relevant information needed, and possibly contributing to the growth of information gaps. The reporting obligation may ameliorate this constraint as where regulators accurately interpret information, they can try to fill in any information gaps during times of financial stress. However, given the operational and financially intensive resources this surveillance would require, it is highly unlikely that this will occur. In addition, given the endemic nature of information gaps, regulators may not realise that unreported information is pertinent – especially given the jurisdictionally fragmented implementation of the reporting obligation.

In conclusion, the scope and form of the reporting obligation particularly in the US seems to follow the tenets of MFT, assuming that with increased information, more market efficiency can be achieved. However, the efficacy and usefulness of this information has been called into question. Elements of alternative theories of finance can also be found here as regulators need information on market activity to properly survey markets, and resultantly intervene where necessary. Unfortunately, it has been shown that there may be information gaps – that is the presence of information the existence of which regulators and market participants are unaware of or do not think is pertinent. Consequently, regulators need to be aware of the effects of the complexity and innovation engendered by fundamental uncertainty on their regulatory strategies and amend said strategies accordingly. The market discipline and transparency function that reported information provides is also hampered by the fact that counterparty data is not disclosed. A solution to this problem could be the disclosure of counterparty information after a period of time as this would also curb the excessive use of derivatives for speculative purposes. In addition, the complexity inherent in derivative transactions dictates that the information provided may be too voluminous for regulators to comprehend. However, regulatory ability to digest this information may be improved provided the right identifiers, which this chapter discusses in its next section.

5.4. Identifiers

Pre-GFC, the use of standardised identifiers for OTC derivative transactions, products, and counterparties was not widespread and identifiers were typically limited to the in-house identifiers used by OTC-DM participants. However, the imposition of the reporting obligation has raised a new challenge: how will the multitude of transactions, products and counterparties reported to TRs be identified and aggregated to ensure maximal macroprudential supervision of financial markets? Lessons from the GFC indicate that data generated by financial market participants was difficult to aggregate and resultantly utilise due to incompleteness and a lack of standardisation.⁹⁸ This point is further buttressed by events that occurred in the wake of the Lehman Bankruptcy as there was no uniformity in the identification of Lehman as a counterparty.⁹⁹ This was a result of a number of factors including the complexity of systems used by market participants, the increasing complexity of new derivative products, and a lack of incentives to standardise data.¹⁰⁰ In response to this vexing problem, the G20 declared at its 2011 Toronto summit that it was committed to identifying the relevant data to be provided to TRs.¹⁰¹ Subsequently, regulators in the EU and US have issued detailed rules mandating the use of certain identifiers. This has been described as a long overdue move.¹⁰² OTC-DMs can be described as a network comprised of market participants who can be viewed as nodes, and contracts which can be viewed as links between nodes. Standardising the format of data on these links and nodes is vital for the efficient aggregation of information.¹⁰³ Consequently, rules on identifiers are discussed below and subsequently analysed from an analytical, comparative, and theoretical perspective.

⁹⁸ T Glasser, 'Leveraging Data for Financial Stability Monitoring' (2013) 14 *Journal of Banking Regulation* 200; Robleh Ali, 'Legal Entity Identifiers: The Beginning of a New Platform in Financial Data' (2014) 6 *Journal of Securities Operations and Custody* 295.

⁹⁹ Allan Grody and others, 'Legal and Regulatory Update: Global Identification Standards for Counterparties and other Financial Market Participants' (2012) 5 *Journal of Risk Management in Financial Institutions* 291.

¹⁰⁰ *Ibid* 201.

¹⁰¹ G20, 'Cannes Summit Final Declaration: Building our Common Future: The Renewed Collective Action for the Benefit of all' (2011) <http://www.g20.utoronto.ca/2011/2011-cannes-declaration-111104-en.html>

¹⁰² Grody and others (n 114) 289.

¹⁰³ Ali (n 113) 296.

a. European Union

All reports must use a legal entity identifier (LEI) to identify beneficiaries who are legal entities, broking entities, CCPs, clearing members, counterparties who are legal entities, and submitting entities.¹⁰⁴ A LEI is a 20 character alphanumeric code used to identify legally distinct entities. LEIs are issued by Local Operating Units of the Global LEI System accredited by the global legal entity identifier foundation. Responsibility for the administration of the LEI system lies with the Regulatory Oversight Committee.¹⁰⁵

Reports to TRs must further identify derivative contracts using a unique product identifier. Derivatives are to be identified in reported data using an ISO 6166 International Securities Identification Number (ISIN) code.¹⁰⁶ An ISIN is a 12 character alphanumeric code that is used for the standardised identification of a security. There are three parts to an ISIN: a two-letter country code, a nine digit numeric identifier assigned by country or region, and a single check digit calculated to help prevent the used to counterfeit numbers.¹⁰⁷ Derivatives for which an ISIN is not available are to be classified using a designated code that is unique, neutral, reliable, open source, scalable, accessible, available at a reasonable cost basis, and subject to an appropriate governance framework.¹⁰⁸ Until said code is endorsed by ESMA, these derivatives are to be classified using an ISO 10692 CFI code.¹⁰⁹

Reports must also be identified by global unique trade identifiers (UTI) endorsed by ESMA, or in the absence of said ESMA endorsed identifiers, a UTI agreed by the counterparties. However, ESMA has not provided a specific taxonomy that this identifier is to be designed with.¹¹⁰ Some frameworks exist

¹⁰⁴ Article 3 Commission Implementing Regulation (EU) 1247/2012 as amended by Commission Implementing Regulation (EU) 2017/105.

¹⁰⁵ A group of over 60 regulatory authorities from 40 countries. See further 'The Legal Entity Identifier Regulatory Oversight Committee - LEI ROC' (*Leiroc.org*, 2018) <https://www.leiroc.org/>

¹⁰⁶ Article 4 Commission Implementing Regulation (EU) 1247/2012 as amended by Commission Implementing Regulation (EU) 2017/105.

¹⁰⁷ ISIN Organisation 'International Securities Identification Numbers Organization' (2018) <https://www.isin.org/isin/>

¹⁰⁸ Article 4 Commission Implementing Regulation (EU) 1247/2012 as amended by Commission Implementing Regulation (EU) 2017/105.

¹⁰⁹ Ibid.

¹¹⁰ ESMA, 'Questions And Answers: Implementation of the Regulation (EU) No 648/2012 on OTC Derivatives, Central Counterparties and Trade Repositories (EMIR)' 86

including the Agency for the Cooperation of Energy Regulator's (ACER)¹¹¹ and IOSCO's guidance on the UTI.¹¹² Where parties fail to agree on who is to generate the unique trade identifier, the EU regime provides for a waterfall of responsibility.¹¹³ The UTI must be communicated to the other counterparty in a timely manner so that the latter is able to meet its reporting obligation. There are currently several methods for establishing the UTI in the EU including generation by the relevant financial market infrastructure, the 20 letters of the generating entity's LEI, and a unique code created by the generating entity among others.¹¹⁴

b. United States

Swaps subject to the jurisdiction of the CFTC must be identified through the use of a unique swap identifier (USI).¹¹⁵ USIs are to be created using a name space method. Under this method, the first characters of each USI is the unique code identifying the registered entity creating the code, given to the entity by the CFTC during registration. The subsequent characters of the USI consist of code created by the registered entity that must be unique with respect to all other USIs created by that registered entity. This USI must be transmitted to each counterparty to the swap as soon as technologically possible.

Counterparties to any swap under the CFTC's jurisdiction, and registered entities must be identified by LEIs.¹¹⁶ Furthermore, swaps subject to CFTC jurisdiction must also be identified by a unique product identifier (UPI) and product classification system. Swaps that are sufficiently standardised to receive UPIs must be identified by a UPI. Swaps not standardised to this

https://www.esma.europa.eu/sites/default/files/library/esma70-1861941480-52_qa_on_emir_implementation.pdf

¹¹¹ ACER, 'Annex IV oo The REMIT Trade Reporting User Manual – Guidance On UTI' (2016) <https://documents.acer-remit.eu/remit-reporting-user-package/trum/annex-iv-guidance-on-uti/>

¹¹² IOSCO, 'Technical Guidance - Harmonisation Of The Unique Transaction Identifier' (2017) <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD557.pdf>

¹¹³ Article 4a Commission Implementing Regulation (EU) 1247/2012 as amended by Commission Implementing Regulation (EU) 2017/105.

¹¹⁴ ESMA (n 125) 93.

¹¹⁵ 17 CFR 45.5.

¹¹⁶ 17 CFR 45.6.

extent will be identified using the product classification system.¹¹⁷ UPIs must identify and describe the swap asset class and the sub-type within that asset class to which the swap belongs and the underlying product for the swap, with sufficient distinctiveness and precision to enable the CFTC and other financial regulators fulfil their duties.¹¹⁸ The CFTC is yet to approve of a UPI and product classification system and consequently, TRs have resorted to generating their own internal product identifiers and product descriptions for regulatory reporting purposes.

c. A Comparative Perspective

Similarities in the EU and US approach to identifiers can be found in provisions on who is responsible for the creation of transaction identifiers. A general trend that can be observed in regulatory rule making on trade reporting is that parties with the resources to easily create and transmit these identifiers are given responsibility for identifier creation. This approach also seems congruent with some IOSCO recommendations on this issue.¹¹⁹ However, while the US regime requires the transmission of the unique trade identifier to the non-reporting counterparty as soon as technologically possible, the EU regime merely requires that this transmission occur in a timely manner which is puzzling given the double sided nature of reporting under the EU regime. The EU regime's lack of prescription as to the form of the transaction identifier is also problematic as OTC-DM participants are left to their own devices in creating the relevant procedures. The global nature of OTC-DMs also dictates that transaction identifiers should be neutral. While this is still a possibility under the EU regime, the US regime cannot be viewed as neutral as it reflects jurisdictional peculiarities – this impairs the aggregation of reported data at the global level.

Counterparty identifiers enable the consistent and accurate identification of OTC-DM participants, and are essential for the identification of exposure to risk, the promotion of transparency, and the conduct of macroprudential

¹¹⁷ 17 CFR 45.7.

¹¹⁸ 17 CFR 45.7(a).

¹¹⁹ IOSCO (n 127) 12.

surveillance.¹²⁰ For market participants, LEIs also have benefits for businesses including the accurate calculation of exposures, and free database management.¹²¹ Consequently, it is no surprise that the EU and US regimes mandate the use of LEIs. Prior to Post-GFC reforms, regulators had tried to track the entities they supervised. These schemes were however hampered by their incomplete nature due to a lack of inclusion of all relevant financial and nonfinancial organisations. Furthermore, a plethora of identifiers were utilised by regulators including the Financial Industry Regulatory Authority's central registration depository and investment adviser registration depository identifiers which were used to identify brokers-dealers, investment advisers, and investment adviser agents. This was in addition to a plethora of disparate private sector and industry regimes.¹²²

Finally, product identifiers are crucial in ensuring regulatory ability to aggregate transactions on a taxonomic level and based on a derivative contract's underlying. Consequently, the lack of regulatory consensus between the EU and US regimes on what taxonomy should be used for classifying and identifying OTC derivative products is puzzling. The EU approach however seems to have progressed further with the identification of the ISIN, an international standard as a base line for the identification of derivative products. This ensures that discrepancies in identifiers used in the interim with future regulator mandated identifiers is minimised. In addition, this facilitates cross border aggregation of derivative classes which is crucial in gaining a complete view of the state of derivative markets.¹²³ This orderly approach is in stark contrast to the US approach which leaves TRs free to determine what taxonomies and identifiers should be used.

¹²⁰ Amongst a plethora of other functions including improved service and cost reduction for data dealers and greater institutional transparency. See further Alistair Milne and Paul Parboteeah, 'Counterparty Risk Management and the Global Legal Entity Identifier (LEI)' (2014) SSRN Electronic Journal 25.

¹²¹ ESMA, 'Briefing - Legal Entity Identifier' (2017) 2 https://www.esma.europa.eu/sites/default/files/library/esma70-145-238_lei_briefing_note.pdf

¹²² John Bottega and Linda Powell, 'Creating A Linchpin for Financial Data: Toward a Universal Legal Entity Identifier' (2012) 64 Journal of Economics and Business 107.

¹²³ IOSCO (n 127) 5.

In conclusion, there are crucial differences between EU and US prescriptions on trade and product identifiers. Furthermore, while still in its gestational stages, the EU regime seems to be preferable as there is more flexibility in terms of its ability to meet the neutrality required for the cross-border identification and aggregation of derivative trades.

d. A Theoretical Perspective

The failure of Lehmann Brothers in 2008 and MF Global in 2011 revealed the difficulties faced by counterparties in aggregating information on their exposures and the hierarchy of failed or distressed counterparties, a fact attributable to the multiplicity of internal systems in use.¹²⁴ Intervention by regulators to standardise the means of identification for participants in OTC-DMs could consequently be viewed as fulfilling mandates from MFT. The easy identification of counterparties to a trade enables the aggregation of exposures to a distressed counterparty, and furthermore, promotes the quantification and management of counterparty credit risk through the use of sophisticated modelling tools.¹²⁵ Analysis of credit products is also rendered easier due to the availability of information on the underlying – especially in the case of portfolios containing multiple credit products.

LEIs provide regulators with granular data on counterparties in OTC-DMs and consequently enhance regulatory understanding and oversight of systemic risk. LEIs also enable OTC-DM participants' record and counterparty credit risk in a standardised manner and consequently promotes regulatory ability to collect this information and aggregate it for the entire financial market. This is however reliant on LEI reference data being accurate and consistently used across diverse systems. This is particularly crucial as the LEI supports truly open public data, and reduces informational silos, generating positive externalities in terms of the increased ease of bookkeeping in financial markets,¹²⁶ and can consequently be viewed as performing a public good.

¹²⁴ Ka Kei Chan and Alistair Milne, 'The Global Legal Entity Identifier System: Will it Deliver?' [2013] SSRN Electronic Journal 13.

¹²⁵ For instance, through the appropriate use of Credit Valuation Adjustments. See further Jon Gregory, *The Xva Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital* (John Wiley & Sons 2015).

¹²⁶ Arthur Kennickell, 'Identity, Identification and Identifiers: The Global Legal Entity Identifier System' (2016) 2016 Finance and Economics Discussion Series 17.

Especially in light of the operational costs involved in overhauling data systems to ensure compliance, possibly resulting in a lack of incentives for market participants to ensure the accuracy of information recorded.

From a contextual perspective, the LEI imposes significant costs on small market participants who typically only need LEIs for hedging transactions as opposed to active OTC-DM participants needing LEIs for regulatory reporting, and generating and supporting trades. A cost benefits analysis resultantly suggests that to be truly efficient, the number of uses for the LEI should be expanded to ensure that any benefits of said LEI are greater than its costs. However, given the diverse nature of market participants, this may be some time in coming.

Furthermore, market participant utilisation of information on the network of counterparty exposures made possible by the LEI through credit analysis, credit valuation adjustments, market risk analysis, and position limits is highly doubtful. This can be attributed to the fact that the quantification of counterparty risk does not involve an analysis of said counterparty's contractual obligations or exposures but is instead dependent on internal credit ratings created by a market participant's credit risk department – in a manner similar to that of a credit rating agency. This rating is typically based on a whole group assessment predicated on public accounts, analysis of business model risks, and information about market prices.¹²⁷ The LEI does not provide information needed for counterparty risk management and modelling. However, the use of internal rating systems is not without fault, as said ratings are not independently verified and the use of default correlations has been described as crude.¹²⁸ This system could consequently benefit from the incorporation of hierarchy information contained in the LEI system given further advances in the standardisation of information contained in the LEI on the exposure of market participants to risk factors. From this perspective, the LEI could be viewed as a step towards a more nuanced understanding of risk and fulfils the mandates of both MFT and alternative theories of finance as the

¹²⁷ Milne and Parboteeah (n 135) 7–8.

¹²⁸ Ibid 26. This treatment of default correlations typically involves backing out default frequencies and correlations.

standardisation promoted by the use of LEIs enables market participants better understand the complex networks created by said market participant's structure.

However, the standardisation of counterparty information made possible by the LEI is entirely dependent on the ability of this information to precisely identify its subject and be transparent as regards any constraints on the ability of said identifiers in connection with specific entities. Allowances must also be made for the possibility of severe complexity as regards the subject matter to be identified, and provision must be made to withstand unforeseen circumstances. This problem is particularly crucial as in practice, the availability and quality of information on an entity, and the means for the validation of said information will vary from jurisdiction to jurisdiction, and local regimes may define what constitutes an entity differently.¹²⁹ This highlights inherent problems with the federated system of local operation units issuing the LEI. Furthermore, information required for a LEI may vary from entity to entity and require the submission of additional or different information. There may also be different relationships that could lead to different hierarchies.¹³⁰ Combining this fact with this chapter's earlier discussions on the possibility of the presence of completely unknown information,¹³¹ it is possible that information on certain linkages could be absent from the LEI and could consequently lead to the proliferation of fundamental uncertainty.

From an MFT perspective, the success of the UPI is dependent on said identifier's jurisdictional neutrality, uniqueness, consistency, persistence, adaptability, and clarity¹³² as these factors promote standardisation and granularity. Which in turn promotes the efficient cross border aggregation and quantification of derivative product volumes. Furthermore, the use of UPIs makes the public dissemination of information more efficient as a single UPI could be utilised as opposed to numerous data elements consequently

¹²⁹ Kennickell (n 141) 10.

¹³⁰ Ibid 21. Kennickell notes that the Federal Reserve's National Information Centre database provides information on several types of organisational relationships in connection with bank holding companies.

¹³¹ Infra Section 6.3.

¹³² See generally IOSCO (n 127).

facilitating transparency and price discovery.¹³³ However, just as with the LEI, the success of the UPI is dependent on its compatibility with the electronic systems utilised by market participants. Furthermore, given the rapid nature of innovation inherent in OTC-DMs, ensuring that UPI's persist where bespoke versions of current products are created may be difficult. In addition, the capability to aggregate derivatives by class may not necessarily translate into actual utilisation of this potential by regulators – especially where knowledge is lacking or unknowable in relation to the risks inherent in bespoke derivative contracts, and rationality is bounded. Furthermore, there is a trade-off between the granularity of the UPI's data fields, especially as some derivative products can be ambiguous or combine the characteristics of different products. Consequently, the EU's adoption of the ISIN as the standard for product identification promotes efficiency as the ISIN is comprised of a more granular set of reference data suitable for a vaster range of regulatory surveillance purposes. This leaves the door open for the use of the ISIN for other regulatory reporting purposes,¹³⁴ promotes the standardisation of operational records, and consequently promotes efficiency.

Unique transaction identifiers promote standardisation and enable contracting parties easily take into account the market prices of their products and subsequently adjust for regulatory purposes – ensuring efficiency in planning as regards capital requirements in foreign jurisdictions. Furthermore, the unique transaction identifier is vital in ensuring the success of the reporting obligation's objective of promoting price efficiency as it is vital for estimating market liquidity. However, given previous discussions on the fact that there is such a thing as too much information, and the fact that regulators have chosen not to include counterparty details in published data it is strange that both regimes allow for the use of LEIs in the generation of UTIs. Especially as private parties incentivised to source information from which they can obtain rents may develop the ability to read the UTIs, learn the UTI prefix of a market

¹³³ Ibid 11.

¹³⁴ The ISIN is also required for MIFID II and MIFIR reporting.

participant, and consequently interpret and exploit all relevant contractual information.¹³⁵

On a general note, reliance on identifiers should not be excessive as this could result in the calcification of regulation on what may turn out to be yesterday's problems. In light of the imperfect knowledge constraint, and given the pace of innovation in OTC-DMs, where new risks the analysis of which current identifiers do not enable arise, regulatory surveillance may be insufficient. Consequently, the effectiveness of these identifiers and their underlying taxonomies must be reviewed periodically to ensure that the coverage of surveillance is dynamic enough to keep up with developments in OTC-DMs. Furthermore, regulators must keep the characteristics of real world OTC-DMs in mind when conducting their analysis. This could be through regular consultations with industry participants, the results of which should be fed into surveillance strategies as appropriate.

In conclusion, identifiers seem to promote the objectives of MFT in terms of the standardisation and subsequent price transparency they bring to derivative products. Furthermore, identifiers partially support the regulatory surveillance advocated by alternative theories of finance – with a caveat – that regulators cognisant of the complexity and dynamism inherent in derivative markets adapt their requirements as regards identifiers. Especially in light of some of the deficiencies identified in relation to identifiers, particularly the LEI and unique trade identifiers. Flexibility and a healthy dose of realism may consequently be instrumental in the success or otherwise of identifiers. Furthermore, a harmonised approach towards the taxonomy of identifiers is vital given the need for unified identifiers across borders. Having considered the suitability of identifiers, this chapter in its next section turns its attention to the infrastructures these identifiers are reported to.¹³⁶

¹³⁵ Micah Smith, 'A Privatized Approach to Derivatives Regulation: The CPMI-IOSCO's Proposed Unique Transaction Identifier Scheme and its Practical Effects on Transparency and Regulatory Arbitrage' (2018) 45 Georgia Journal of International and Comparative Law 439.

¹³⁶ Discussions on who is better positioned to harmonise regulation is undertaken in Section 7.3.

5.5. Trade Repositories

A TR is essentially a data warehouse in the business of collecting and maintaining information on OTC derivative transactions.¹³⁷ In the absence of TRs, the maintenance of transaction data in OTC derivative transactions is left to individual counterparties and other OTC-DM participants including CCPs and trading venues. The importance of the transparency TRs facilitate in OTC-DMs both for market participants and regulators dictate that they are the subject of regulation. Unsurprisingly, regulators have enacted regulation dictating the operation and governance of TRs though as the below analysis will show, the level of oversight is lighter than that applied to CCPs.¹³⁸ This light touch is unsurprising given the fact that while TRs perform informationally vital functions in OTC-DMs, they do not warehouse counterparty credit risk or act as nodes through which said risk could be transmitted in financial markets.

a. European Union

TRs must either be authorised or recognised by ESMA.¹³⁹ to be registered by ESMA, TRs must disclose their ownership structure by providing information on all holdings of their capital or voting rights, or on entities/persons whose holding makes the exercise of significant influence possible.¹⁴⁰ In addition, TRs must have a clear organisational structure, well defined transparent and consistent lines of responsibility, and administrative and accounting measures designed to prevent the disclosure of confidential information, and identify and manage conflicts of interests concerning any persons employed or indirectly linked with the TR. TRs must also guarantee their continuity and orderly functioning, and keep any ancillary services separate from their data collection functions.¹⁴¹

TRs are also to identify sources of operational risk and minimise them, establish implement and maintain an adequate business continuity policy and

¹³⁷ Guido Ferrarini and Paolo Saguato, 'Regulating Financial Market Infrastructures' (2014) 259/2014 ECGI Working Paper Series in Law 25.

¹³⁸ Supra Chapter 4.

¹³⁹ Articles 55 and 77 EMIR.

¹⁴⁰ Article 13 Commission Delegated Regulation (EU) 150/2013.

¹⁴¹ Article 78 EMIR.

disaster recovery plans to ensure the maintenance of its functions, the timely recovery of operations, and the fulfilment of the TR's functions. The emphasis on risk mitigation is further reinforced by the fact that application for registration as a TR requires a detailed description of the resources and procedures available to identify and mitigate operational risk. This includes the applicant's business continuity plan and an indication of the policy for updating the plan, and a description of arrangements to ensure the continuity of the TR's activity in the event of disruption.¹⁴²

In relation to the information collected by TRs, they must ensure the confidentiality, integrity and protection of the information, and can only use any information collected under the reporting obligation with the permission of the counterparties. This information must be promptly recorded and maintained for at least 10 years following the termination of said contracts.¹⁴³ Using provided information, TRs must calculate the positions by class and by reporting entity. TRs must also provide certain regulators including ESMA, the relevant NCAs, and third country regulators with whom the EC has an agreement with direct and immediate access to data collected and maintained by them.¹⁴⁴

To ensure compliance with the relevant legislation and prevent the build-up of systemic risk, ESMA has the power to request information from TRs and related third parties to whom the TR has outsourced operational functions or activities. This request for information is usually to enable ESMA carry out its EMIR related duties.¹⁴⁵ Additionally, ESMA has the power to carry out general investigations,¹⁴⁶ onsite inspections,¹⁴⁷ and impose fines and periodic penalty payments on TRs and associated persons.¹⁴⁸

¹⁴² Article 21 Commission Delegated Regulation (EU) 150/2013.

¹⁴³ Applications for registration must demonstrate that the TR has policies in place to ensure that data is maintained both online and offline and that the data is adequately copied for business continuity purposes. See further Article 22 Commission Delegated Regulation (EU) 150/2013.

¹⁴⁴ Article 81 EMIR. The manner in which this obligation is to be fulfilled is left open to the TR though TRs must inform regulators of the resources, methods, and channels to be employed in fulfilment of this mandate. See further Article 23 Commission Delegated Regulation (EU) 150/2013.

¹⁴⁵ Article 61 EMIR.

¹⁴⁶ Article 62 EMIR.

¹⁴⁷ Article 63 EMIR.

¹⁴⁸ See generally Articles 64, 65, and 66 EMIR.

b. United States

TRs are subject to authorisation requirements,¹⁴⁹ and must establish, maintain and enforce procedures for the recording of reported data. TRs must also accept and promptly record all information required to be reported to them.¹⁵⁰ Furthermore, TRs must provide for reliable and secure electronic connectivity with market participants subject to the reporting obligation. TRs are to keep readily accessible¹⁵¹ records of all reported swaps¹⁵² throughout the existence of the swap and five years after the final termination of the swap. TRs are also to comply with the real time public reporting and record keeping requirements and must establish policies for the calculation of positions for position limits and other purposes required by the CFTC for swaps reported to the TR.¹⁵³ Additionally, TRs are to monitor, screen, and analyse all reported swap data in any manner specified by the CFTC.¹⁵⁴

Specific focus is placed on TRs possessing automated systems capable of identifying, aggregating, sorting and filtering all reported uncleared swap transactions.¹⁵⁵ TRs must also establish the systems necessary for the acceptance and public dissemination of reported real time swap data and notify the CFTC of any swap transactions for which swap data is missing.¹⁵⁶ The sensitive nature of the information reported to TRs is recognised by requirements that TRs establish, maintain, and enforce written policies designed to protect the privacy of all TR information not subject to real time reporting, and to prevent the direct or indirect misappropriation or misuse of TR information. TRs must provide direct electronic access to the CFTC or its designee, and provide the CFTC with the tools needed for the analysis, monitoring, and screening of swap data.¹⁵⁷

¹⁴⁹ Section 728 Dodd-Frank Act.

¹⁵⁰ 17 CFR 49.10.

¹⁵¹ To the CFTC via electronic means.

¹⁵² Including historical positions.

¹⁵³ 17 CFR 49.12.

¹⁵⁴ 17 CFR 49.13.

¹⁵⁵ 17 CFR 49.14.

¹⁵⁶ 17 CFR 49.15.

¹⁵⁷ 17 CFR 49.17(c).

Appropriate domestic regulators and foreign regulators seeking to gain access to swap data must apply for access by filing a request for access with the TR and certifying that it is acting within its jurisdiction.¹⁵⁸ These regulators must sign a written confidentiality and indemnity agreement.¹⁵⁹ However, appropriate domestic regulators with regulatory authority over a TR registered with it pursuant to a separate statutory authority that is also registered with the CFTC are not required to apply for access – this provision is also applicable to appropriate foreign regulators with whom the CFTC has agreements. These regulators do not have to sign confidentiality and indemnification agreements.¹⁶⁰ Finally, TRs are to promptly electronically notify the commission of any requests. Once this notification is given, the TR must provide access to the requested data.¹⁶¹

The CFTC additionally requires TR compliance with certain core principles to be registered and maintain said registration.¹⁶² Most importantly, TRs must establish and maintain programs of risk analysis and oversight to identify and mitigate operational risks, emergency procedures, backup facilities, and a business continuity-disaster recovery plan that allows for the timely recovery and resumption of operations and fulfilment of the duties and obligations of the TR.¹⁶³ Critical TRs must be able to recover on the same business day where their normal capabilities become temporarily inoperable for any reason. To this end, they must maintain a certain level of geographical dispersal. Non-critical TRs only need to be able to resume operations on the next business day.¹⁶⁴ Finally, TRs must notify the CFTC of system malfunctions, cybersecurity threats, activations of disaster recovery plans, and give advance notice of changes to automated systems that may impact the reliability of information.¹⁶⁵

¹⁵⁸ 17 CFR 49.17(d).

¹⁵⁹ 17 CFR 49.18(b).

¹⁶⁰ 17 CFR 49.18(c).

¹⁶¹ 17 CFR 49.17(d).

¹⁶² 17 CFR 49.19.

¹⁶³ 17 CFR 49.24(b).

¹⁶⁴ 17 CFR 49.24(e).

¹⁶⁵ 17 CFR 49.24(g)–(h).

c. A Comparative Perspective

The above discussion indicates that there are broad similarities between the US and EU system for the regulation of TRs. For instance, TRs on both sides of the Atlantic have to keep records of all reported transactions in an accessible format. There are however minor differences in this regard as the EU mandated period is five years longer than the US regime's. The central role TRs play in the surveillance of OTC-DMs and the identification of sources of potential systemic risk is further highlighted by the fact that both regimes require that TRs specify business recovery plans that ensure their continued operations.¹⁶⁶ However, the US rules seem to be more specific while the EU rules leave it up to the TRs to determine what the implementation of regulator-mandated policies will be. For instance, the CFTC explicitly addresses the issue of cybersecurity risks by mandating that TRs must conduct vulnerability testing, penetration testing, information security controls testing, security incident plan testing and enterprise technology risk assessment a move lauded by industry participants as ensuring safety while ensuring a measure of flexibility.¹⁶⁷ The issue of cybersecurity is not explicitly addressed by the EU though it will no doubt be covered by the requirement to have a business recovery plan.

The CFTC is also specific about the duties of a TR in relation to the provision of facilities for the analysis of reported data. This shows a heavy reliance on private sector resources and reinforces inferences previously made in this chapter on the inadequacy of regulatory resources used to deal with the massive amount of information provided by derivative market participants. This may be attributable to the fact that the reporting obligation in the US is heavily focused on the dissemination of real time reporting information as opposed to the EU where regulators seem to be self-sufficient and do not explicitly request the use of TR capabilities in analysing reported data.

¹⁶⁶ Guido Ferrarini and Paolo Saguato, 'Post-Trading Infrastructures: A New International Framework' in Niamh Moloney and others (ed), *The Oxford Handbook of Financial Regulation* (Oxford University Press 2015) 588.

¹⁶⁷ Stephen Humenik and James Kwok, 'Proposed CFTC Cybersecurity Testing Rules for Derivatives Market Infrastructure' (2016) 17 *Journal of Investment Compliance* 62.

In conclusion, there are broad similarities between the EU and US regulatory regimes on TR governance. However, it would seem that the US regime recognises and addresses most of the issues relevant to TRs. It provides specific instructions for special treatment of TRs deemed critical, addresses cybersecurity risks, and ensures that regulators have full access to TR resources. Subsequent to this comparative analysis, this chapter conducts a theoretical analysis of the regulatory framework on TRs, and the consequences of any differences in the next section.

d. A Theoretical Perspective

TRs centralise information and when well governed provide effective routes via which information can be collected and subsequently disseminated to regulators and market participants, consequently strengthening the quality of information in OTC-DMs.¹⁶⁸ As has been discussed above, this adheres to both regulatory suggestions from MFT and alternative theories of finance namely improving market efficiency and improving regulatory ability to more effectively supervise OTC-DMs.¹⁶⁹

Prima facie, the reporting obligation following the general theme observed under this thesis's analysis of CCP's¹⁷⁰ makes use of a hybridised form of public-private ordering with private institutions performing very public functions. However, the manner in which TRs are supervised can be said to impede the tenets of MFT and not necessarily in the service of alternative theories of finance. Specifically, the requirement that TRs need to be registered nationally given the global nature of OTC-DMs can be said to impede the flow of information and consequently detracts from any benefits that arise as a consequence of trade reporting. Of course, TRs are to grant access to foreign regulators where information sharing agreements exist, but the mere presence of these national borders in an international context prevents regulators and market participants from easily forming a full and clear picture of market

¹⁶⁸ Committee on Payment and Settlement Systems and the Technical Committee of the International Organization of Securities Commissions (CPSS-IOSCO), 'Considerations for Trade Repositories in OTC Derivatives Markets' (2010) <http://www.iosco.org/library/pubdocs/pdf/IOSCOPD321.pdf>.

¹⁶⁹ Supra Chapter 2.

¹⁷⁰ Supra Chapters 3 and 4.

activity, interconnectedness, and the build-up of systemic risk in OTC-DMs.¹⁷¹ This negates the tenets of MFT, and exacerbates the imperfect knowledge constraint, leaving room for fundamental uncertainty. This further highlights the deficiencies of public regulation due to the difficult coordination issues that arise at a transnational level. A solution to this dilemma would be the use of a single standard data platform from which regulators could access data reported worldwide.¹⁷² Of course, this would be dependent on uniform data protection rules and information security standards.

Another possible solution could be the use of a single international regulatory body with binding authority administering a global network of TRs. Suggestions have included the FSB, or ISDA.¹⁷³ This could be implemented through a move from soft power to direct regulatory oversight in the case of the former institution, and the use of the Master Agreement in the case of the latter. This would also have extremely beneficial effects on the standardisation problems discussed above under the reporting and identifier sections. Chiu's arguments for an international systemic risk regulator citing the success of anti-money laundering surveillance, which operates using a network of state based financial intelligence units¹⁷⁴ could no doubt be useful in this regard when analogies are drawn between TRs and financial intelligence units. General objections to an international regulator have however been made on the grounds of a lack of responsiveness to domestic interests due to the fact that international regulators are unelected, not subject to the scrutiny of national law making bodies, and consequently are prone to rent seeking.¹⁷⁵

Furthermore, given the fact that TRs can hardly be seen as nodes of systemic risk, regulatory intervention in terms of the internal workings of said TRs is unwarranted from an MFT perspective. However, this regulatory interference can be justified on the grounds that, the creation and maintenance of bureaucratic institutions by market participants reduces costs significantly for

¹⁷¹ Ackner (n 56) 973.

¹⁷² Duffie (n 20) 16.

¹⁷³ Ackner (n 56) 974.

¹⁷⁴ Chiu (n 8) 318.

¹⁷⁵ Roberta Romano, 'The Need for Competition in International Securities Regulation' (2001) 2 *Theoretical Inquiries in Law* 390.

tax payers, consequently reducing the possibility of moral hazard. While the private ordering of TRs could result in innovative and efficient policies and organisational structures, there is the possibility that the incentives of TRs to maximise costs may clash with regulatory mandates.¹⁷⁶ Furthermore, Awrey notes that bureaucracies generate costs, which he terms bureaucratic failures that result from the ability to manage complexity, forgive internal errors, engage in log rolling and the treatment of organisational procedures as ends in themselves. Bureaucratic failures can result in the restriction of regulatory flexibility as well as impede regulatory innovation.¹⁷⁷ Furthermore, TRs are an essential feature of OTC-DMs, as data stored by a TR is used by other financial market infrastructures including CCPs and service providers which leaves open the possibility of disruption spreading to other systemically important entities. It is consequently no surprise that despite the non-systemically important nature of TRs, regulators, especially in the US have promulgated detailed rules on how said TRs are to run. These strict requirements are however tempered by the fact that the minutiae of the actual rules themselves are left to the TRs especially under the EU regime.¹⁷⁸

In addition, as has been established throughout this thesis, from a MFT perspective, information is valuable for the pricing of products, and for the accurate prediction of systemic risk. It is consequently rather puzzling that the EU regime does not contain specific procedures to be followed to safeguard information from theft or malicious corruption – especially as regulators or markets acting on incorrect or falsified information could have disastrous results, for example, the amplification of fundamental uncertainty in environments of financial stress. This is particularly crucial given recent increases in financial attacks suffered by financial institutions.¹⁷⁹ IOSCO has identified cyber risks as one of the key risks faced by financial market

¹⁷⁶ Dan Awrey, 'The Dynamics of OTC Derivatives Regulation: Bridging the Public-Private Divide' (2010) 11 *European Business Organization Law Review* 183.

¹⁷⁷ *Ibid* 184.

¹⁷⁸ *Ibid* 191.

¹⁷⁹ For instance the attempted hacking of the Swift network. Finextra 'North Korean hackers used Swift network to steal more than \$100m' (2018) <https://www.finextra.com/newsarticle/32742/north-korean-hackers-used-swift-network-to-steal-more-than-100m---fireeye>.

infrastructure.¹⁸⁰ Financial market infrastructures specifically TRs can be sources or conduits of financial shock,¹⁸¹ especially as cyberattacks can be persistent, and it is often very difficult to identify the extent of the breach and any changes made. Crucially, TRs are particularly vulnerable as they receive massive amounts of electronic communication leaving the door open to sophisticated cyber criminals to obtain sensitive information typically not released to the public. Furthermore, TRs could find themselves being used to propagate these attacks – threatening financial stability. Following from the tenets of MFT and the FIH it would only be natural to ensure that in the case of the former, the infrastructure for the efficient dissemination of information is protected and in the case of the latter theory, any potential sources of systemic risk are explicitly nipped in the bud.¹⁸² The CFTC’s designation of some TRs as critical seems to cohere with this view.

Earlier sections of this chapter have highlighted the fact that regulators are at a significant informational and technological disadvantage in terms of their ability to comprehend the vast amounts of information inherent in the reporting obligation.¹⁸³ OTC-DMs exhibit dynamics that constantly evolve and are consequently technology and knowledge intensive. However, the use of TRs facilitates the transfer of information and expertise from market participants to regulators consequently reinforcing regulators’ ability to police financial markets and mitigate systemic risk. This approach seems to satisfy both the requirements of MFT and the alternative theories of finance as it ensures minimal regulatory intrusion in markets, while also ensuring that regulators are armed with the tools to better understand markets, and step in where necessary.¹⁸⁴ Furthermore, the CFTC’s ability to commandeer TR resources as needed seems to be more congruent with the systemic risk management

¹⁸⁰ IOSCO, ‘Principles for Financial Market Infrastructures’ (2012) <http://www.bis.org/cpmi/publ/d101a.pdf>

¹⁸¹ CPSS-IOSCO, Guidance On Cyber Resilience For Financial Market Infrastructures (2015) 4 <https://www.bis.org/cpmi/publ/d138.pdf>

¹⁸² Supra Chapter 2. See generally Peter Sommer and Ian Brown, ‘Reducing Systemic Cybersecurity Risk’ (2011) SSRN Electronic Journal.

¹⁸³ Supra Section 5.3.

¹⁸⁴ Julia Black, ‘Critical Reflections on Regulation’ (2002) 4 CARR Discussion Papers, Centre for Analysis of Risk and Regulation 3.

solution promoted by alternative theories of finance and can also be said to exhibit regulatory recognition of the limits of public ordering – especially as in OTC-DMs, private actors are typically the best informed and hold vital resources.

Concluding on the regulation of TRs, it can be seen that regulators, especially the CFTC seem to have utilised elements from both MFT and alternative theories of finance, especially under the US regime which recognises the critically important role TRs may come to play in the post-GFC world. However, the EU approach may be preferable due to the fact that its non-specificity may afford it flexibility in dealing with any new developments in this sphere. However, this lack of specificity also leaves it vulnerable to being blindsided by risks that have been unaccounted for as argued above. The major issue that will have to be addressed by regulators on both sides of the Atlantic is however regulatory access to information in other jurisdictions. This section has suggested the use of a single data platform for information reported to TR's, and the use of a transnational regulator.

5.6. Conclusion

Post-trade transparency as a regulatory tool has come to the forefront of regulatory strategies in the aftermath of the GFC – as exemplified by the reporting obligation. This chapter investigating the efficacy of the reporting obligation has examined the concept of transparency in the context of OTC-DMs. Subsequently, utilising comparative and theoretical perspectives, it has also examined the scope of the reporting obligation, the nature of the identifiers to be used in the implementation of this obligation, and the regulation of TRs.

The comparative analysis indicates that the US regime seeks to strike a balance between ensuring price transparency and enabling regulatory surveillance. This is achieved through a series of specific rules on the information that is to be disseminated by TRs to the public, as well as on information that is to be reported for regulatory purposes. Furthermore, the US regime is more advanced in connection with the regulation of TRs, recognising and attempting to fully address any risks that may arise – through the use of

TR resources. The EU regime on the other hand seems to be more focused on the macroprudential regulation of OTC-DMs as can be seen from the voluminous number of data fields. Furthermore, real time reporting is not a priority on the EU agenda. However, the EU reporting regime is not without its faults. For instance, double sided reporting calls the accuracy of reported data into question. Furthermore, EU ambivalence about the use of identifiers while understandable due to the fact that reporting was implemented subsequent to the US proves problematic for the cross border aggregation of trade. Finally, perhaps due to the fact that real time reporting is not a priority in the EU, regulations on the governance of TRs are less stringent than those in the US. However, it can be concluded that once any initial teething problems are overcome, the EU regime may be better than the US regime in terms of the reduction of systemic risk.¹⁸⁵

A theoretical analysis of the reporting obligation reveals that there may be some convergence in terms of the regulatory strategies used to fulfil the mandates of MFT and alternative theories of finance. The reporting obligation seeks to promote price discovery, improve liquidity, and encourage private ordering via the use of market discipline – these all require the use of information. Information is also useful for regulators seeking to ameliorate the imperfect knowledge constraint, and from a FIH and behavioural finance perspective provides regulators with the necessary information where markets are swinging to states of instability in terms of the former theory and to curb any irrational behaviour in the case of the latter theory. An exploration of the actual implementation of the reporting obligation indicates that the US implementation of the reporting obligation seems to follow the tenets of MFT the most as a result of the real time reporting obligation. However, the value of the public dissemination of data is likely to be less useful than intended for market participant's purposes. Furthermore, reporting in the EU seems to follow the tenets of alternative theories of finance with regulators demanding a vast range of information and concentrating on the macroprudential surveillance of OTC-DMs.

¹⁸⁵ This is subject to empirical investigation which is outside the scope of this thesis.

This information gathering will however all be in vain where regulators are unable to navigate their way through the dense information thicket or fail to keep up with new innovations and complexity. Furthermore, it has been argued that information gaps may pose deadly pitfalls to any regulatory strategies. This may however be alleviated through the use of identifiers. However, it has also been argued that these identifiers especially the LEI may not give regulators a clear picture of interconnectedness in financial markets and may be the target of arbitrage activities. Finally, as regards TRs, regulation does not seem to conform to the competition based model advocated by MFT. Instead, there are specific rules governing the conduct of TR affairs. It has further been shown that these rules are antithetical to the attainment of the policy objectives proselytised by alternative theories of finance as they lead to jurisdictional fragmentation. That is, the creation of information silos in what is essentially a global market - consequently hampering any attempts at global surveillance.

This chapter has made a number of recommendations proceeding from its theoretical investigation of the reporting obligation. The overarching theme of these recommendations is that OTC-DMs are rife with fundamental uncertainty, imperfect information, and bounded rationality, and regulators will need to act flexibly to meet these challenges. As regards the informational challenges faced by regulators and market participants, this thesis encourages the disclosure of counterparty information on trades after a certain period of time to ensure greater price transparency. This will also have the effect of discouraging speculation, which is a cause of instability in OTC-DMs and will consequently fulfil the mandates of the FIH and IKE. Furthermore, regulators need to be aware of the fact that there are limits to the quantitative use of the data provided, and consequently, must be flexible in meeting new challenges and information gaps in OTC-DMs. This also applies to regulatory use of identifiers as regulatory use of today's solutions to yesterday's problems in an attempt to pre-empt future disaster may prove futile. In relation to TRs, this chapter has suggested the use of an international body similar to financial intelligence units used to detect and tackle money laundering. It is suggested that these changes along with regulatory awareness of the fact that information

may prove useless or paint a dated picture along with reforms in other area of the financial system will ensure the stability of the financial system.

Chapter 6: The Centralised Trading Requirement: Back to the Futures?

6.1. Introduction

The mandatory trading of OTC derivatives has become a priority on the global regulatory agenda¹ as exemplified by the G-20 commitment that eligible derivatives be centrally traded. In the US, this reform has been implemented through the Dodd-Frank Act. In the EU, it has been implemented through the Markets in Financial Instruments Regulation (MiFIR) and the Markets in Financial Instruments Directive II (MiFID II). The centralised trading requirement places the use of transparency at the forefront of regulatory strategies for ensuring the efficiency, resilience, and liquidity of OTC-DMs specifically, and the stability of the financial system at large as it facilitates both pre and post trade transparency.² This regulatory approach is unsurprising given the opaque nature of pre-GFC OTC-DMs.³ This in essence brings the characteristics of OTC derivatives closer to those of exchange traded derivatives in terms of how both types of derivative are traded.

The centralised trading requirement also reinforces the centrally important role financial market infrastructures play in post-GFC financial markets. This thesis's analysis in Chapters 3, 4 and 5 indicate that increased use of financial market infrastructure in regulatory strategies signify a shift from the bilateral private OTC-DMs to more hybridised public-private markets subject to regulatory oversight. This shift can however not be seen as a wholesale rejection of the private model due to the hybridised nature of the markets in question. Especially as from a MFT perspective, the belief that the auction style mechanisms inherent in centralised trading and the attendant transparency intrinsic to these processes promote market efficiency due to the enhanced production of information is understandable.⁴ However, it could be argued that this reform and any consequent market efficiency and liquidity may come with their own costs⁵ as has been demonstrated in Chapters 3, 4 and 5.

¹ Marco Avellaneda and Rama Cont, 'Transparency in Credit Default Swap Markets' (2010) Finance Concepts 3.

² Guido Ferrarini and Paolo Saguato, 'Post-Trading Infrastructures: A New International Framework' in Niamh Moloney and others (ed), *The Oxford Handbook of Financial Regulation* (Oxford University Press 2015) 580.

³ Robert Bartlett, 'Inefficiencies in the Information Thicket: A Case Study of Derivative Disclosures during the Financial Crisis' (2010) 36(1) *Journal of Corporation Law* 2.

⁴ Ivana Ruffini and Robert Steigerwald, 'OTC Derivatives—A Primer on Market Infrastructure and Regulatory Policy' (2014) III Economic Perspectives, Federal Reserve Bank of Chicago 89.

⁵ *Ibid.*

It is in this context that this chapter critically examines the centralised trading requirement. In Section 6.2, it contextualises this requirement by providing an overview of the manner in which OTC derivatives were traded prior to the GFC, and subsequently discusses the mechanisms through which OTC derivatives are traded, as well as the venues on which derivatives can generally be traded. Section 6.3 then provides an analytical, comparative, and theoretical analysis of the scope of the centralised trading requirement. It finds that the limited scope of this requirement may result in the complex and illiquid derivatives which oftentimes pose the greatest threat to systemic stability not falling within the scope of the centralised trading requirement anytime soon.

Furthermore, given the fact that, while transparency does promote efficiency, the manner in which transparency requirements are implemented can have serious implications on market microstructure and consequently, on the stability of the financial system as a whole. Section 6.4 examines regulatory prescriptions on the operation of trading venues and concludes that while the trading requirement may provide efficient outcomes for end-users and unsophisticated investors, it may not support generalised efficiency due to the heightened possibility of noise trading and market fragmentation. Furthermore, this section argues that the trading requirement engenders unnecessary complexity in financial markets due to the potential for arbitrage on the part of market participants. All of which may result in the transformation of trading venues into instable finance structures which may amplify contagion in environments of financial stress. Section 6.5 concludes by questioning the necessity of the centralised trading requirement and proposing the enhancement of current regulatory guidance ranges and excess dampening measures to safeguard the resilience and stability of trading venues, and of the financial system at large. Given the currently controversial nature of position limits, they are not discussed.

6.2. Trading in OTC Derivatives: ‘Heart of Darkness’

Trading poses a search problem. That is, buyers have to find sellers and vice versa. Furthermore, market participants will want to execute their trades at beneficial prices.⁶

⁶ Larry Harris, *Trading and Exchanges: Market Microstructure for Practitioners* (Oxford University Press 2003) 5; Darrell Duffie and others, ‘Over-The-Counter Markets’ (2005) 73 *Econometrica* 1815.

It is consequently unsurprising that markets on which securities and commodities could be traded emerged.⁷

However, by their very nature, OTC derivatives have traditionally been traded bilaterally, away from exchanges, in a small densely connected network of dealers acting as liquidity providers for their clients. This can be attributed to the bespoke nature and typically large size of these transactions.⁸ The very nature of derivative markets consequently result in the absence of coordination mechanisms as would be found in an exchange.⁹ To ameliorate this problem, pre-GFC OTC derivatives trading was structured around a number of large traders for example JP Morgan, Goldman Sachs, HSBC and Citigroup quoting bid-ask prices amongst each other. Essentially, OTC derivatives were and still are traded in quote driven markets.¹⁰ Dealers quote prices to their counterparts, if a counterparty contacts the quoting dealer and a deal is agreed on, a trade takes place. The quoted price may also evolve if negotiation takes place.¹¹ This network of dealers also provides an important source of liquidity in derivative markets.¹² Prior to the institution of the centralised trading requirement, the G14 dealers¹³ accounted for 82% of global trading in derivatives.¹⁴

Most modern OTC derivative trading has historically taken place through voice execution, which encompasses both telephone and internet messaging.¹⁵ With the advent of technology, a number of other trading models have emerged. Single-dealer platforms are typically proprietary platforms offered by a dealer for the purpose of trading with clients. These platforms display different price quotes for specific trade maturities and volumes. Clients can trade on maturities displayed on the screen or in the cases of bespoke instruments not available on the screen fill customisable fields

⁷ See for example Chris Muellerleile, 'Speculative Boundaries: Chicago and the Regulatory History of US Financial Derivative Markets' (2015) 47 *Environment and Planning A: Economy and Space* 1805; Bruce Carruthers, 'Diverging Derivatives: Law, Governance and Modern Financial Markets' (2013) 41 *Journal of Comparative Economics* 386 on the development of commodities exchanges.

⁸ Nick Smyth and Anne Wetherilt, 'Trading Models and Liquidity Provision in OTC Derivatives Markets' (2011) *Bank of England Quarterly Bulletin* 332.

⁹ Darrell Duffie, *Dark Markets* (Princeton University Press 2012) 13.

¹⁰ Dan Awrey, 'The Mechanisms of Derivative Market Efficiency' (2016) 91 *New York University Law Review* 1137.

¹¹ Smyth and Wetherilt (n 8) 334.

¹² Awrey (n 10) 1137.

¹³ The G14 dealers comprise Bank of America-Merrill Lynch, Barclays Capital, BNP Paribas, Citi, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, JP Morgan, Morgan Stanley, RBS, Societe Generale, UBS and Wells Fargo Bank.

¹⁴ David Mengle, 'Concentration of OTC Derivatives among Major Dealers' (2010) ISDA Research Notes 2.

¹⁵ See generally Terrence Hendershott, 'Electronic Trading in Financial Markets' (2003) 5 *IT Professional* 10.

and electronically send an enquiry to the trader who then indicates a price. This form of execution is called the request for quote method of execution. Only clients can access these services.

Similar to the single-dealer platform is the multi-dealer request for quote model. The major difference between this model and the single-dealer platform is that here, price quotes are predicated on submissions from several dealers. In the multi-dealer limit order book model, customers can browse all firm quotes at different maturities provided by dealers. Access to these systems require permission from the relevant dealers. Additionally, this is an order driven model. Similarly, in the inter-dealer limit order book model, dealers provide continuous quotes that form the foundation of a centralised order book only accessible to dealers.¹⁶ Dealers can view all outstanding limit orders. Subsequent to execution, prices are made transparent, orders are also anonymous. This model works in conjunction with voice execution. Finally, we have the central limit order book typically utilised by exchanges which provides market participants with fully open access. Price quotes and trade sizes are available to all market participants consequently obviating the central liquidity provision role held by dealers in bilateral OTC-DMs. Limit orders can be submitted by dealers and clients.¹⁷

From the above, it can be concluded that trading venues solve the search problem. The term 'trade venue' encompasses a number of market infrastructure and generally refers to a platform on which market participants trade securities or derivatives.¹⁸ Historically, this form of service has always been performed by an exchange. Other functions traditionally performed by exchanges include the provision of liquidity to correct imbalances in order flow, member and product regulation,¹⁹ the standardisation of contracts and consequent reduction of transaction costs, and the provision of regulatory capital to participants.²⁰ Exchanges also perform a number of roles in relation to trade regulation to ensure fair, orderly and efficient trading. This

¹⁶ Marco Avellaneda and Rama Cont, 'Transparency in Over-The-Counter Interest Rate Derivatives Markets' (2010) Finance Concepts 5.

¹⁷ Smyth and Wetherilt (n 8) 334.

¹⁸ Ferrarini and Saguato (n 2) 574.

¹⁹ For instance, through the creation of eligibility rules for members or participants in the case of members, and deciding what instruments are eligible to be traded and on what basis said products are to be admitted to trading.

²⁰ Jonathan Macey and Maureen O'Hara, 'Regulating Exchanges and Alternative Trading Systems: A Law and Economics Perspective' (1999) 28 the Journal of Legal Studies 22; IOSCO, 'Regulatory Issues Arising from Exchange Evolution' 5 <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD225.pdf>

includes the institution of trading rules, trade surveillance to preserve order and prevent market abuse, the enforcement of rules and instigation of disciplinary action in the event of a breach of said rules, and informing the relevant authorities of any relevant breaches.²¹ Exchanges also provide clearing and settlement services.²² While exchanges originally operated on a mutualised basis, that is, exchanges were typically non-profit member owned organisations, they have gone through demutualisation that is, been transformed into for-profit shareholder owned corporations.²³

As their name implies, exchange traded derivatives in contrast to their OTC relatives are centrally traded on regulated exchanges. These exchanges typically trade in standardised contracts and mediate between contractual counterparties. Furthermore, these exchanges also have risk management mechanisms.²⁴ For instance, the exchange's clearinghouse will typically be the counterparty to every contract.²⁵ In these markets, dealers play an intermediary role by accepting and placing trades for clients.²⁶

As highlighted above, exchange traded derivatives typically trade in an order driven market. That is, orders are submitted to a central limit order book. If a buy order and a sell order in the book match, the trade is executed.²⁷ With the advent of technological innovation, alternative trading venues have evolved for the trading of derivatives and securities²⁸ including alternative trading systems in the US and multilateral trading facilities in the EU.²⁹ Furthermore, with the advent of regulatory supervision of trading

²¹ Ibid.

²² Ibid.

²³ Aras Guler and Yobas Banu, *The Governance of Risk: Governance in the Business Environment* (Emerald Group Publishing 2015) 119; Jake Keaveny, 'In Defense of Market Self-Regulation - An Analysis of the History of Futures Regulation and the Trend toward Demutualization' (2005) 70 *Brooklyn Law Review* 1438.

²⁴ Supra Section 1.2. See also Glenn Morgan, 'Reforming OTC Markets: The Politics and Economics of Technical Fixes' (2012) 13 *European Business Organization Law Review* 394.

²⁵ Bernard Karol, 'An Overview of Derivatives as Risk Management Tools' (1995) 1 *Stanford Journal of Law, Business & Finance* 198.

²⁶ Dan Awrey, 'The Dynamics of OTC Derivatives Regulation: Bridging the Public-Private Divide' (2010) 11 *European Business Organization Law Review* 160.

²⁷ Norman Feder, 'Market in the Remaking: Over-The-Counter Derivatives in a New Age' (2017) 11 *Virginia Law and Business Review* 336.

²⁸ Jonathan Macey and Maureen O'Hara, 'From Markets to Venues: Securities Regulation in an Evolving World' (2005) 58 *Stanford Law Review* 569.

²⁹ Both of which are discussed further in Section 7.3 of this thesis. See further Ferrarini and Saguto (n 2) 575.

venues, the emphasis of these venues' functions has shifted from monitoring to the provision of liquidity.³⁰

Having set the scene as regards bilateral OTC derivatives trading and trading venues, this chapter now turns its attention to the substance of the centralised trading requirement in its next section.

6.3. Scope of the Centralised Trading Requirement

The scope of the trading requirement is particularly important as it dictates what derivative products will be subject to centralised trading, and hence, subject to pre and post trade transparency requirements. Furthermore, the determination of what classes of derivatives are to be subject to centralised trading is particularly important in the systemic risk context. Forcing illiquid instruments into centralised trading could prove ruinous in environments of financial stress. Consequently, this section discusses regulatory prescriptions on the scope of the trading requirement in the EU and US and subsequently analyses them from a comparative and theoretical perspective.

a. European Union

FCs and certain NFCs must trade classes of OTC derivatives which have been declared subject to the CCP prescription under EMIR, and declared subject to the trading requirement on a regulated market, multilateral trading facility, organised trading facility or equivalent third country venue when trading with another FC, and certain NFC, or third country entities which would have been subject to the trading requirement if established in the EU. Intragroup transactions and pension schemes are however exempted.³¹ As the trading requirement is clearly attached to derivative contracts subject to the CCP prescription, it can safely be assumed that only CCP eligible contracts are subject to the trading requirement. Consequently, the operator of a regulated market must make provision for the clearing of derivative transactions traded on its platforms.³² These trades must however be declared subject to the trading requirement by ESMA and listed in the register.³³ Derivative contracts must be

³⁰ Macey and O'Hara (n 28) 569. On the supervision of exchanges, see Michael Blair and George Walker, *Financial Markets and Exchanges Law* (Oxford University Press 2007); Alan Rechtschaffen, *Capital Markets, Derivatives, and the Law* (Oxford University Press 2014).

³¹ Article 28 MiFIR.

³² Article 29 MiFIR.

³³ Article 34 MiFIR.

subject to the clearing test,³⁴ be traded on at least one trading venue, and be considered sufficiently liquid to be traded on venues.³⁵ Criteria for determining liquidity include sufficient third party buying and selling interest, average frequency of trades, average size of trades, and the number and type of active market participants.³⁶ Consequently, it can also be seen that not all derivative contracts or classes subject to the CCP prescription will be subject to the trading requirement due to liquidity concerns.

In the determination of what derivatives are to be subject to the trading requirement, ESMA similarly to its CCP regime utilises a bottom up and top down approach as this determination can be made based on what derivatives are already traded on venues.³⁷ Furthermore, to preclude regulatory arbitrage, ESMA is to monitor activity in non-traded derivative classes³⁸ and identify derivatives and classes of derivatives suitable for the centralised trading requirement but which are not cleared or traded and notify the EC. Subsequently, the EC is to publish an open call for development of proposals for the centralised trading of these derivatives.³⁹ ESMA is also to publish and maintain a register on its website detailing in a clear and exhaustive manner, the derivatives subject to the trading requirement, the venues on which they are admitted to trading, and the date from which the obligation takes effect.⁴⁰ The extraterritorial reach of the trading requirement is similar to that of the CCP prescription and consequently is not covered by this chapter.

b. United States

Swaps subject to CCP clearing must be executed on a designated contract market (DCM)⁴¹ or swap execution facility (SEF).⁴² However, this mandate does not apply where a DCM or SEF does not make the swap available for execution or where the transaction in question is not subject to the CCP prescription. DCMs or SEFs are to submit a determination that a swap is available to the CFTC for approval.⁴³

³⁴ Supra Section 3.4.

³⁵ Article 32(1) MIFIR.

³⁶ Article 32(3) MIFIR. See further Commission Delegated Regulation (EU) 2016/2020.

³⁷ Niamh Moloney, *EU Securities and Financial Markets Regulation* (Oxford University Press 2014) 624.

³⁸ Article 28(2) MIFIR.

³⁹ Article 32(4) MIFIR.

⁴⁰ Article 34 MIFIR.

⁴¹ For instance, an exchange.

⁴² Sections 724 and 763 Dodd-Frank Act.

⁴³ 17 CFR 37.10(a).

Consequently it can be concluded that once any SEF or DCM makes a swap available to trade, said swap can no longer be traded bilaterally.⁴⁴ Factors to be considered before a swap is made available to trade include: whether there are ready and willing buyers and sellers, the frequency or size of transactions, the trading volume, the number and types of market participants, the bid-ask spread, or the number of resting firm to indicative bids and offers.⁴⁵

c. A Comparative Perspective

There is significant commonality in regulatory approaches to the scope of the trading requirement under both EU and US regimes. For instance, only contracts eligible for central clearing fall within the ambit of trading requirements. This can be attributed to the degree of customisation and lack of fungibility that characterise a number of OTC derivatives. Consequently, it is only understandable that liquidity and standardisation are the major factors in determining whether or not a contract is eligible for centralised trading under both regimes.

However, there are still some major differences between the EU and US regime. While the EU regime utilises a top down and bottom up approach towards determining what derivatives are to be centrally traded, US regulators seem to have tied their hands with the 'made available to trade' approach. This places the power to determine what derivatives are subject to centralised trading in the hands of private actors. Thus, the EU approach is more flexible and responsive than the US regime and US regulators should play a more hands on role in the determination of what instruments are subject to the trading requirement. The scope of parties covered by the trading requirement also differ under both regimes. With the EU requiring that FC and certain NFC must centrally trade derivatives that fall under the CCP prescription while under the US regime, with the exception of transactions exempt from the CCP prescription, all parties are to centrally trade derivatives that have been 'made available to trade.' Prima facie, this makes the trading requirement particularly onerous on market participants in the US, however, this burden may be lightened by the plethora of exemptions to the CCP prescription in the US. In conclusion, the EU's measured approach to the determination of derivatives eligible for centralised trading is more

⁴⁴ Feder (n 27) 335.

⁴⁵ 17 CFR 37.10(b).

advantageous. In addition, its nuanced approach to persons covered seems to be superior to the US position. However, prior to reaching a decisive conclusion, this chapter examines the issue from a theoretical perspective.

d. A Theoretical Perspective

In no other reform is the performativity of MFT as evident as in the centralised trading requirement. Policy makers have touted the centralised trading requirement as promoting transparency more efficiently than OTC markets,⁴⁶ as centralised trading facilitates both pre-trade and post-trade transparency.⁴⁷ This is a result of market participants having access to quotes and current information on trade prices. From a MFT perspective, this transparency ensures improved market efficiency by reducing search costs, and creates a level arena for market participants, further facilitating liquidity.⁴⁸ The effects of this form of efficiency are likely to be more pronounced with exchange trading, as electronic trading platforms will only perform this function for a limited number of market participants. From a MFT perspective, prices become more competitive when market participants are able to find each other easily. Furthermore, the presence of a search alternative which in the case of the centralised trading requirement would be trading venues, force market makers⁴⁹ to offer competitive price quotes.⁵⁰

However, there are downsides to transparency as discussed in Chapter 5 of this thesis including the impairment of dealer's market making ability,⁵¹ which might result in the withdrawal of much needed liquidity. Furthermore, forcing derivatives into centralised trading which requires standardised contracts could reduce the ability of market participants to hedge risks.⁵² Whatever the benefits of centralised trading may be, the structure of determinations in relation to what derivatives are eligible create the possibility of a significant amount of OTC derivatives trading taking place in the dark. Even the most basic derivative may be exempted from centralised trading due to the

⁴⁶ IOSCO, 'Report on Trading of OTC Derivatives' (2011) <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD345.pdf>.

⁴⁷ Carolyn Wilkins and Elizabeth Woodman, 'Strengthening the Infrastructure of Over-The-Counter Derivatives Markets' (2010) Bank of Canada Financial Stability Review 40.

⁴⁸ Awrey (n 10) 1159.

⁴⁹ In this context, the dealer banks.

⁵⁰ Duffie and others (n 6) 1827.

⁵¹ Supra Section 5.3.

⁵² Wilkins and Woodman (n 47) 40.

fact that it is of no interest to market participants and resultantly not liquid.⁵³ An assessment of US trading determinations⁵⁴ and ESMA's register of derivatives eligible for trading⁵⁵ indicate that mostly vanilla credit and interest rate derivatives have been made available to trade. This raises questions on the utility of the trading requirement in terms of mitigating systemic risk. Especially given the fact that the most customised OTC derivative contracts which are also typically the riskiest are unlikely to be eligible for centralised trading. However, this approach can be endorsed from an alternative theory of finance perspective as forcing illiquid instruments to be centrally traded could result in the institutionalisation of instable finance structures. Of course, the trading requirement may promote liquidity for standardised instruments, and in fact, Benos and others show that the introduction of centralised trading in the US has resulted in significant improvements to liquidity.⁵⁶ However, this does little to reduce endogenous risk, consequently reinforcing the conclusion that the centralised trading is a result of assumptions predicated on MFT.

The structure of the selection process in the US can however not be justified from an alternative theory of finance perspective.⁵⁷ The delegation of decision making to trading venues results in a lack of objective criteria.⁵⁸ This scenario worsens the imperfect knowledge constraint, raises the possibility of heuristics being involved in the determination process, and potentially increases fundamental uncertainty in OTC-DMs. For instance, a new trading venue could inform the CFTC that it has made a derivative available to trade because it may gain a competitive advantage over other trading venues. This would be problematic where the derivative's characteristics render it unsuitable for centralised trading. To ensure that this state of affairs does not threaten financial stability, this thesis suggests that US regulators adopt the determination process currently applicable in the EU – that is, the CFTC play a more

⁵³ Feder (n 27) 335.

⁵⁴ See CFTC 'Swaps Made Available to Trade Determination' (2018) <https://sirt.cftc.gov/sirt/sirt.aspx?Topic=%20SwapsMadeAvailableToTradeDetermination>.

⁵⁵ ESMA, 'Public Register for the Trading Obligation for Derivatives under Mifir' (2018) https://www.esma.europa.eu/sites/default/files/library/public_register_for_the_trading_obligation.pdf

⁵⁶ Evangelos Benos and others, 'Centralized Trading, Transparency and Interest Rate Swap Market Liquidity: Evidence from the Implementation of the Dodd-Frank Act' (2018) 580 Bank of England Staff Working Paper 2. The mechanisms through which this liquidity is achieved are discussed in this chapter's next section.

⁵⁷ Supra Section 2.5.

⁵⁸ ISDA, 'Path Forward For Centralized Execution Of Swaps' (2018) 2 <https://www.isda.org/a/NniDE/path-forward-for-centralized-execution-of-swaps-final.pdf>

involved role in making the determinations about derivatives that are to be subject to the trading requirement.

In conclusion, while prima facie the trading requirement may promote market transparency, the utility of said transparency may be limited given its scope. Furthermore, other than the potential promotion of liquidity in OTC-DMs, centralised trading does not seem to do much for the mitigation of systemic risk. In light of this section's analysis and given the fact that even from a MFT perspective, the efficacy of the trading requirement is dependent on the design and structure of the chosen regulatory regimes,⁵⁹ this chapter in its next section explores the regulation of trading venues.

6.4. The Regulation of Trading Venues

The trading requirement places the efficiency, integrity and resilience of trading venues in the spotlight. Trading venues pose a number of risks to systemic stability. For instance, where market manipulation or excessive volatility characterise trading on the venue. Consequently, regulators have prescribed resilience focused regulation for the governance of all trading venues. This current position is in stark contrast with the position prior to the GFC in which the majority of venue regulation was focused on public equity trading venues and derivative exchanges in the EU and US.⁶⁰ Given this thesis's exhaustive consideration of regulatory prescriptions on the governance and operation of financial market infrastructure,⁶¹ this section will only consider regulatory mandates as regards trading venues from the perspective of transparency, liquidity, and market abuse in detail.

a. European Union

The EU regime has delineated three organisational models for the mandatory trading of OTC derivatives. These are regulated markets, multilateral trading facilities (MTFs), and organised trading facilities (OTFs). A regulated market is a multilateral system administered or operated by a market operator for the purpose of bringing together multiple third party buying and selling interests in financial instruments in a manner that results in the formation of a contract in connection with financial instruments

⁵⁹ Ruffini and Steigerwald (n 4) 89.

⁶⁰ Moloney (n 37) 429.

⁶¹ Supra Chapters 4 and 5.

admitted to trading under its rules and/or systems, and in accordance with Title III MIFID.⁶² Regulated markets are subject to a number of operational requirements. Risk mitigation arrangements must be put into place,⁶³ as well as contingency plans for system disruption.⁶⁴ Regulated markets must also have and implement transparent and non-discretionary rules providing for fair and orderly trading.⁶⁵ The execution of client orders against proprietary capital or matched principal trading is prohibited.⁶⁶

In relation to the resilience of regulated market systems, said systems must ensure orderly trading under conditions of severe market stress.⁶⁷ Furthermore, regulated markets must have the ability to reject orders exceeding pre-determined prices and volumes or which are erroneous,⁶⁸ and to halt or constrain trading when there are significant price movements in a financial instrument in a short period of time, as well as the ability to cancel or vary any transactions.⁶⁹ Appropriate constraints must be placed on algorithmic trading to safeguard orderly trading conditions.⁷⁰ Further demonstrating the importance of liquidity in the implementation of the trading requirement, regulated markets must have agreements with investment firms pursuing market-making schemes on the regulated market.⁷¹

Moving on to the next type of trading venue, a MTF is a multilateral system operated by an investment firm or market operator, which brings multiple parties' buying and selling interests in financial instruments together in a manner that results in a contract in accordance with Title II MIFID.⁷² MiFIR further supplements these definitions by noting that the definitions of regulated venues and MTFs must remain similar.⁷³ This denotes that in the trading sense, they perform very similar functions.⁷⁴ However, they differ in the sense that regulated markets offer both primary and secondary market services. Moloney notes that most MTFs only provide secondary trading facilities, a

⁶² Article 4(1)(21) MIFID II.

⁶³ Article 47(1)(b) MiFID II.

⁶⁴ Article 47(1)(c) MiFID II.

⁶⁵ Article 47(1)(d) MiFID II.

⁶⁶ Article 47(2) MiFID II.

⁶⁷ Article 48(1) MiFID II.

⁶⁸ Article 48(1)&(4) MiFID II.

⁶⁹ Article 48(5) MiFID II.

⁷⁰ Article 48(6)-(10) MiFID II.

⁷¹ Article 48(2) MiFID II.

⁷² Article 4(1)(22) MIFID II.

⁷³ Recital 7 MIFIR.

⁷⁴ Danny Busch, 'Mifid II and Mifir: Stricter Rules for the EU Financial Markets' (2017) 11 Law and Financial Markets Review 126.

phenomenon attributable to the onerous disclosure costs inherent in regulated market membership.⁷⁵

To ensure enhanced transparency in EU financial markets, MiFID II introduces a new venue – the OTF. An OTF is defined as a multilateral system, which is not a regulated market or MTF and in which multiple third party interests in financial instruments come together in a manner that results in a contract.⁷⁶ It can immediately be noted that the definition of OTF is drafted broadly. This is to ensure that all types of organised trading are captured.⁷⁷ This wide definition also ensures that the trading of OTC contracts falls within the ambit of the centralised trading requirement. Unlike MTFs and regulated venues, the OTF operates under discretionary rules, symbolising the discretionary nature of the transactions this classification is engineered to regulate. This discretion comes into play on two different levels: first, when placing or retracting an order, and second, when deciding whether client orders are to be matched with other orders in the system.⁷⁸ Furthermore, OTFs are precluded from executing against proprietary capital⁷⁹ unless in the form of matched principal trading.⁸⁰ Similar to the regulated market regime, OTFs and MTFs must establish rules for fair and orderly trading, system resilience, and comply with Articles 48 and 49 MiFID II. To ensure liquidity, MTFs and OTFs must have at least three active members each having the opportunity to interact with all the others as regards price formation. MTFs and OTFs must also comply with orders from NCAs to suspend or remove a financial instrument from trading.⁸¹ To prevent market abuse, MTFs and OTFs must implement market-monitoring rules.⁸² MTFs may not execute client orders against proprietary capital or engage in matched principal trading.⁸³

⁷⁵ Moloney (n 37) 463.

⁷⁶ Article 4(1)(23) MiFID II.

⁷⁷ Recital 8 MiFIR; Peter Gomber and others, 'The Mifir Trading Obligation: Impact on Trading Volume and Liquidity' (2018) SSRN Electronic Journal 6.

⁷⁸ This discretion is subject to any specific instructions provided by the client and best execution requirements. See Article 20(6) MiFID II.

⁷⁹ Article 20(1) MiFID II.

⁸⁰ Article 20(2) MiFID II. Matched principal trading occurs with transactions where the facilitator imposes itself between the buyer and seller in a manner that ensures that it is insulated from market risk for the duration of the of the transaction's execution, with both sides executed simultaneously and whereas upon the conclusion of the transaction, the facilitator makes no profit or loss other than a previously disclosed commission or charge. See Article 4(1)(38) MiFID II.

⁸¹ Article 18 MiFID II.

⁸² Article 31 MiFID II.

⁸³ Article 19(5) MiFID II.

Finally, we have a final category of firm in the bilateral space specifically systematic internalisers (SI). A SI is a firm that on an organised, systematic, frequent, and substantial basis transacts⁸⁴ on its own account by executing client orders outside of a regulated market, MTF and OTF.⁸⁵ As the bilateral nature of an SI indicates, centralised trading cannot take place through an SI.

Having discussed the basic regulated structures, it is now possible to discuss regulatory prescriptions on pre and post trade transparency as they relate to the derivatives that are the crux of these reforms. Radically departing from the position under its predecessor MiFID, MiFID II prescribes a detailed transparency regime for the trading of non-equity instruments including derivatives. Trading venues must provide information on public current bid and offer prices and the depth of trading interest at these prices. This information is to be made available to the public on a continuous basis during normal trading hours. This requirement however excludes derivatives of NFCs, which are objectively measurable as reducing risk connected with commercial or treasury financing activities of the NFC or of its group.⁸⁶ This transparency requirement is also to be calibrated for the myriad trading systems including order-book, quote driven, hybrid, periodic auction trading, and voice trading systems.⁸⁷ NCAs are however allowed to waive this pre-trade transparency requirement for a number of reasons. First, in respect of orders, which are large in scale in comparison with normal market size, and orders held in an order management facility of the trading venue prior to disclosure. Second, for actionable indications of interest in request-for-quote and voice trading systems of above a size to the financial instrument that would expose liquidity providers to undue risk.⁸⁸ Furthermore, NCAs can suspend transparency requirements when liquidity falls below a specified threshold.⁸⁹

⁸⁴ These factors are determined by reference to quantitative criteria. The frequent and systematic criteria predicated on the number of OTC trades in the financial instrument carried out by the investment firm. The substantial basis compares the total amount of OTC trading conducted by a firm to the total trading of the firm in a specific instrument or the total amount of trading carried out by the firm in comparison with the total trading in the EU of a specific instrument. Article 4(1)(20) MiFID II.

⁸⁵ Article 4(1)(20) MiFID II.

⁸⁶ Article 8(1) MiFID II.

⁸⁷ Article 8(2) MiFID II.

⁸⁸ Article 9(1) MiFID II.

⁸⁹ The commission has set out the methodology and parameters for calculating the threshold for suspension. See further Articles 13 and 16 Commission Delegated Regulation (EU) 2017/583.

SIs also fall within the ambit of pre-trade transparency requirements though this requirement is not as far reaching as the regime applicable to multilateral trading venues. Investment firms must make firm public quotes for derivatives for which they are SIs and which benefit from a liquid market when a number of criteria are met: first, they are prompted for a quote by a client; second, they agree to provide a quote, and third the size of the request for quote does not exceed a threshold that would expose them as a liquidity provider to undue risk.⁹⁰

In relation to post-trade transparency, market operators and investment firms must make public the time, price and volume of derivative transactions.⁹¹ This information is to be made available on reasonable commercial terms and on a non-discriminatory basis as regards the mechanisms utilised in making this information available to the public.⁹² Investment firms settling transactions outside a trading venue must disclose the aforementioned information through an Approved Publication Arrangement (APA).⁹³ An APA is an entity authorised to provide the service of publishing trade reports on behalf of an investment firm under MiFIR.⁹⁴ APAs must ensure that the transparency data they publish is as close to real time as technically possible and is available on a reasonable commercial basis. There is provision for deferred publication of trade venue post-trade data in circumstances vastly similar to those for pre-trade disclosure.⁹⁵ A similar regime also applies to SIs.⁹⁶

b. United States

The Dodd-Frank Act introduces a new type of financial market infrastructure that is, the SEF. A SEF is a trading system or platform in which multiple participants have the ability to execute or trade swaps by accepting bids and offers made by multiple participants in the facility or system through any means of interstate commerce, including any trading facility that facilitates the execution of swaps between persons and is not a DCM.⁹⁷

⁹⁰ Article 18 MiFIR.

⁹¹ Article 10(1) MiFIR.

⁹² Article 10(2) MiFIR.

⁹³ Article 21(1) MiFIR.

⁹⁴ Article 4(1)(52) MiFID II.

⁹⁵ Articles 11 (2) and (4) MiFIR.

⁹⁶ See Article 21 MiFIR.

⁹⁷ Section 721(b)(50) Dodd-Frank Act.

SEFs have to comply with a number of core principles. These principles include ensuring that swaps admitted to trading are not readily susceptible to manipulation, and the establishment of trading rules and processing procedures. To achieve pre-trade transparency, swaps subject to the trading requirement must be executed on an order book or by request for quotes.⁹⁸ Furthermore, SEFs must monitor trading in swaps to prevent manipulation, price distortion, and disruptions of the delivery or cash settlements.⁹⁹ This entails mandating that market participants keep and make available records on their trading¹⁰⁰ and risk control mechanisms to prevent and reduce the effects of potential market disruptions. This includes restrictions that pause or halt trading in certain conditions,¹⁰¹ and the facilities for forensically reconstructing trades.¹⁰² To reduce market manipulation or congestion, SEFs that function as trading facilities must adopt position limits or position accountability for contracts on the facility for speculators.¹⁰³

Importantly, SEFs must make information on price, trading volume, and other trading data on swaps to the extent prescribed by the CFTC publicly available in a timely manner. SEFs must report swaps traded on or through them to TRs to fulfil the reporting obligation.¹⁰⁴ In addition, SEFs are also subject to record keeping and reporting requirements in relation to all activities relating to the business of the facility.¹⁰⁵

Moving on to the other species of trading venue, a DCM is a board of trade that has been authorised to act as a designated contract market.¹⁰⁶ Boards of trade include any organised exchange or other trading facility.¹⁰⁷ For the most part, the core principles DCMs are subject to are similar to those governing SEFs.¹⁰⁸ Differences in the applicable core principles include the mandate that trading information is to be

⁹⁸ 17 CFR 37.9(a). Block trades are not subject to this limitation.

⁹⁹ 17 CFR 37.400.

¹⁰⁰ 17 CFR 37.404.

¹⁰¹ 17 CFR 37.405.

¹⁰² 17 CFR 37.406.

¹⁰³ 17 CFR 36.600. Subject to limits as of yet to be prescribed by the CFTC.

¹⁰⁴ 17 CFR 37.900 and 901. Blocktrades are however subject to delayed reporting. See 17 CFR 43.

¹⁰⁵ 17 CFR 37.1000.

¹⁰⁶ Section 7 CEA.

¹⁰⁷ Section 1(a)(6) CEA.

¹⁰⁸ Similarities include principles on swaps and contracts not readily susceptible to manipulation, the prevention of market disruption, position limitations or accountability, trade information, financial integrity of transactions, conflicts of interest, recordkeeping, antitrust considerations, system safeguards, and financial resources. See generally 17 CFR 38.

published daily¹⁰⁹ as opposed to the situation with SEFs, which are only required to publish trading information in a timely manner. Furthermore, DCMs must provide a competitive, open and efficient market and mechanism for executing transactions that protects the price discovery process of trading.¹¹⁰ DCMs must also implement and enforce rules designed to protect the market and market participants from abusive practices.¹¹¹ This plethora of extra regulation and the increased standards are representative of the relationship between DCMs and SEFs. This is unsurprising given that DCMs will typically be traditional derivative exchanges and consequently, have to be subject to standards that are more stringent.

In terms of transparency, pre trade transparency is guaranteed by mandating the use of a central limit order book or through a request for quote system¹¹²

c. A Comparative Perspective

Having examined the governance and business continuity arrangements of CCPs and TRs,¹¹³ this section merely considers regulatory prescriptions on trading venue liquidity, and transparency. A comparison of the EU and US regimes on the regulation of trading venues reveals that the EU regime is significantly broader than the US regime. This is evidenced by the creation of the OTF category which is designed to ensure that transactions that would previously have been considered off venue are brought into a multilateral trading environment. Continuing the trend, US rules on matched principal trading are more relaxed than under the EU regime as SEFs are allowed to engage in matched principal trading in the form of blocktrades while MTFs and regulated markets cannot execute trades utilising their own capital and are not allowed to engage in matched principal trading. The EU position is ameliorated by the fact that OTFs can engage in matched principal trading where the client is informed.

In relation to emergency authority to safeguard stability, both regimes require trading venues to institute procedures for pausing or halting trades. While the US regime, and the EU regime for registered markets permit the trading venue to suspend trading on

¹⁰⁹ 17 CFR 38.450.

¹¹⁰ 17 CFR 38.500

¹¹¹ 17 CFR 38.651.

¹¹² A request for quote system is defined as a trading system or platform where a market participants transmits a request for quote to buy or sell specific instruments to at least three market participants on the trading system or platform to which all market participants can respond. See 17 CFR 37.

¹¹³ Supra Chapters 3, 4 and 5.

its own initiative, MTFs and OTFs must be instructed by Member States. A further difference is that while US regulation prohibits abusive trading practices, and requires that SEFs have the ability to detect said manipulation, this provision is missing from the EU regime. This is however unsurprising as this issue is dealt with by the Market Abuse Regulation in the EU.¹¹⁴ The EU regime seeks to prohibit abusive trading practices and requires that investment firms and market operators operating an EU venues are to establish and maintain systems for the prevention and detection of market manipulation. This also applies to any entity professionally arranging or executing transactions. Furthermore, EU trading venues must establish transparent rules and procedures for fair and orderly trading and monitor compliance of their members with the rules. Similarly, regimes on both sides of the Atlantic require that trading venues have transparent procedures for entering and placing orders. In the case of OTFs, these rules are discretionary. In addition, both regimes require trade venues to keep records of their activities, collect their participant's trading records, and allow regulators access to this information.

While both EU and US regimes promote pre-transparency, this is achieved using radically different methods in both jurisdictions. Under the US regime, transparency is achieved by mandating two types of execution namely request for quote and through an order book, which enables market participants obtain competing quotes or bid/offers prior to execution. Conversely, the EU regime ensures pre-trade transparency by requiring that exchanges and trading platforms themselves be subject to transparency requirements. The EU regime is preferable given the flexibility of execution methods it affords market participants. In respect of post-trade transparency, both the EU and US regimes require real time reporting and make provisions for this. However, post-trade transparency is not required where the derivative instrument is not fungible in the EU. Finally, the means via which post-trade transparency is achieved are very different with very different implications for operational efficiency. In the US case, SEFs and DCMs are to relay this information to TRs for public dissemination while in the EU regime; the dissemination of the relevant information is to be undertaken by the trading platforms themselves. This leads to the possibility of double reporting.

¹¹⁴ Regulation (EU) No 596/2014.

d. A Theoretical Perspective

From a MFT perspective, the regulation of trading venues is crucial for one reason - ensuring market efficiency. Regulatory efforts in this regard seem to be focused on ensuring and safe guarding market integrity and liquidity while leaving low transaction costs in the back seat. This can be attributed to the fact that there are strong incentives for platforms to ensure that trading with them costs less, as this results in additional orders, which translates into more liquidity.¹¹⁵

Safeguarding market integrity, for instance by requiring rules prohibiting market manipulation or only admitting swaps not easily susceptible to manipulation as obtain under both the US and EU regime protects the price formation process. Ensuring that as far as possible, market prices reflect all available information. Furthermore, market integrity ensures that the price formation process itself is transparent.¹¹⁶ Of course, it could be argued that market integrity should be left to the operation of market forces. That is, where trading venues engage in practices that jeopardise the efficiency and integrity of the venue's price formation process, this results in agency costs leading to market participants defecting to other trading venues resulting in a loss of orders, liquidity, and profits.¹¹⁷

However, this is not always the case – especially given the conflicts of interest that arise due to the demutualised nature of exchanges – similar to those faced by CCPs as analysed in Chapter 4 of this thesis. For instance, the Chicago Mercantile Exchange has been accused of facing conflicts of interest due to the profits it makes from high frequency and algorithmic trading.¹¹⁸ The protection of the price formation process can also be observed in the ban and increased surveillance of certain trading strategies. To further buttress the promotion of market efficiency, regulators on both sides of the Atlantic have institutionalised different categories of trading venues.¹¹⁹ The creation of

¹¹⁵ Andreas Fleckner, 'The Regulation of Trading Practices', in Niamh Moloney and others (ed), *The Oxford Handbook of Financial Regulation* (Oxford University Press 2015) 600.

¹¹⁶ Ibid 600.

¹¹⁷ On the incentives for self-regulation in relation to securities and futures markets, see Daniel Fischel and Sanford Grossman, 'Customer Protection in Futures and Securities Markets' (1984) 4 *Journal of Futures Markets* 273; Paul Mahoney, 'The Exchange as Regulator' (1997) 83 *Virginia Law Review* 1453; Roberta Romano, 'Empowering Investors: A Market Approach to Securities Regulation' (1998) 107 *The Yale Law Journal* 2359.

¹¹⁸ Douwe Miedema and Ann Saphir, 'Delayed Flash Crash Arrest May Herald Future Spoofing Detection Woes' Reuters (2015) <https://www.reuters.com/article/us-flashcrash-trader-cme-analysis/delayed-flash-crash-arrest-may-herald-future-spoofing-detection-woes-idUSKBNONE00P20150423>

¹¹⁹ Fleckner (n 115) 613.

different categories of trading venues with their attendant different levels of transparency and discretion attempts to strike a balance between regulatory intervention to ensure market efficiency and prevent dark trading, while restricting the intrusiveness of said regulatory intervention. Centralised trading is bound to be transparent and consequently more efficient given the fact that these organisations direct order flow through a central limit order book.¹²⁰

Transparency is the main tool utilised to ensure the efficiency and consequent liquidity of OTC-DMs via the mandated disclosure of pre-trade and post-trade data. Given this thesis's focus on the analysis of post-trade disclosure requirements in Chapter 5, this section's analysis will focus solely on pre-trade transparency. As highlighted above, prima facie, greater transparency, and presumably, greater market efficiency can be achieved by trading through a central limit order book. Especially as market participants may be able to decode new information from published quotes, and adjust their investment strategies accordingly consequently improving the allocative efficiency of financial markets,¹²¹ and ensuring that market prices are more informative and less volatile.¹²²

Additionally, the presence of pre-trade transparency has been found to promote competition amongst informed dealers incentivising the production of improved quotes consequently reducing transaction costs and improving liquidity.¹²³ Consequently, the EU position requiring that trading venues make pre-trade information public can be viewed as strict regulatory intervention to ensure market efficiency and transparency. The US position while mandating that SEFs and DCMs utilise central order limit books can be viewed as reinforcing its characteristic laissez faire approach to regulation as market participants can utilise request for quote. This is however counterbalanced by the real time reporting of this information.

¹²⁰ Avellaneda and Cont (n 1) 5.

¹²¹ Emiliios Avgouleas and Stavros Degiannakis, 'The Impact of the EC Financial Instruments Markets Directive on the Trading Volume of EU Equity Markets' (2005) 219 Athens University of Economics and Business, Department of Statistics, Technical Report 5.

¹²² Ananth Madhavan, 'Consolidation, Fragmentation, and the Disclosure of Trading Information' (1995) 8 Review of Financial Studies 579.

¹²³ See generally Terrence Hendershot and Ananth Madhavan, 'Click or Call? Auction versus Search in the Over-The-Counter Market' (2015) 70 The Journal of Finance 419; Smyth and Wetherilt (n 8) 336; Duffie (n 6).

However, the presence of a price discovery mechanism does not automatically lead to efficient prices¹²⁴ especially given the disincentives for market participants to supply information discussed in Chapter 5 of this thesis.¹²⁵ Different market structures have different implications for pre-trade transparency. The precise structure and calibration of these requirements can also have a profound impact on market liquidity. To ensure full transparency, data that may be disseminated includes the price, quantity, time, and counterparties to the last trade; high, low, opening, and closing trade prices, aggregate price data and indices, trade volume, best bid-ask prices, the relevant quantities, and the identities of parties who request quotes amongst others. All of this information can obviously not be disseminated, for confidentiality reasons in some cases.¹²⁶ Furthermore, as has been highlighted in earlier sections of this thesis,¹²⁷ full disclosure of information can have harmful effects on market conditions, especially in conditions of financial stress. Consequently, it is unsurprising that pre-trade regulatory mandates on both sides of the Atlantic have focused on the production of bid-ask quotes and the relevant volumes.

However, research also indicates that pre-trade transparency is not always a panacea. For instance, in markets with a small number of large participants,¹²⁸ market participants may engage in strategic behaviour by gaming the order submission process. A practice that can lead to excessive volatility – a hallmark of endogenous risk, and create conditions of financial stress.¹²⁹ The tension between transparency and liquidity is illustrated by the fact that several exchanges make provisions for large orders only visible to market makers but excluded from the limit order book to prevent market volatility,¹³⁰ and the block trade exemptions granted by regulators on both sides of the Atlantic. In addition, increased pre-trade transparency may inhibit market liquidity. In addition to the impossibility of informationally efficient markets discussed in Chapter 5 of this thesis.¹³¹ This is attributable to the fact that in opaque markets,

¹²⁴ Avgouleas and Degiannakis (n 121) 3.

¹²⁵ Supra Section 5.2.

¹²⁶ Ruben Lee, *What Is An Exchange? The Automation, Management, and Regulation of Financial Markets* (Oxford University Press 1998) 98–99; Ananth Madhavan, 'Market Microstructure: A Survey' (2000) 3 *Journal of Financial Markets* 205.

¹²⁷ Supra Section 5.3.

¹²⁸ Several examples of which can be found in OTC derivative markets. Supra Section 6.2.

¹²⁹ Madhavan (n 126) 253.

¹³⁰ Avellaneda and Cont (n 1) 7.

¹³¹ Supra Sections 2.3.1 and 5.3.

dealers may quote narrow bid-ask spreads to attract order flow which can be analysed to obtain valuable market information – an incentive that is absent in transparent environments – consequently resulting in widening bid-ask spreads. However, this reduction in liquidity increases market efficiency by reducing the need to compete for order flow.¹³²

From the above, it can be concluded that pre-trade transparency may improve market efficiency and consequently, follows the precepts of MFT. However, there is the possibility that this increased efficiency comes at the expense of market liquidity as it disincentivises dealer's market making, and reduces the importance of professionally informed traders. Given the mandatory nature of the trading requirement, this could be viewed as engendering instable market structures via the institutionalisation of liquidity inhibiting mechanisms. This trade off seems peculiar given the fact that the likely beneficiaries will be uninformed traders and end users,¹³³ unlikely to be regular participants in the sophisticated OTC-DMs.

Surprisingly, from a behavioural finance perspective, pre-trade transparency does seem to prevent herding behaviour in financial markets where the price of an asset is efficiently set by a market maker utilising the order flow.¹³⁴ Consequently, even from a behavioural perspective, the presence of an efficient price mechanism precludes information cascades. This hypothesis has been proven in experiments that show that where prices are adjusted to reflect order flow, herding rarely occurs.¹³⁵ State mandated transparency is also to be applauded from the perspective of the IKE as it ameliorates the imperfect knowledge constraint.¹³⁶ However, the transformation of this data into plausible guidance range measures is nowhere to be found. There is currently no system via which regulators can provide public warnings when market prices overshoot standardised benchmarks. The absence of provisions to this effect would be understandable if regulators did not have better information than market

¹³² Robert Bloomfield and Maureen O' Hara, 'Can Transparent Markets Survive?' (2000) 55 *Journal of Financial Economics* 425.

¹³³ Ananth Madhavan, 'Security Prices and Market Transparency' (1996) 5 *Journal of Financial Intermediation* 255.

¹³⁴ Christopher Avery and Peter Zemsky, 'Multidimensional Uncertainty and Herd Behavior in Financial Markets' (1998) 88 *the American Economic Review* 748.

¹³⁵ Marco Cipriani and Antonio Guarino, 'Herd Behavior in A Laboratory Financial Market' (2005) 95 *American Economic Review* 1428.

¹³⁶ *Supra* Section 2.5.3.

participants. In light of the reporting obligation it would seem that this is not the case as regulators have access to almost real-time granular information on the state of OTC-DMs, and it is consequently disappointing that guidance range measures utilising this information have not been designed. Of course, regulators in the EU can ask MTFs and OTFs to stop trading but this power is limited to these venues and could also result in market participants herding given the sudden absence of centralised bodies tasked with price coordination. It is therefore suggested that regulators design a process via which trading on all venues can be frozen, and information and assurances can be disseminated to market participants to ameliorate the imperfect knowledge constraint. This process could utilise the avenues already utilised by trade venues in disseminating pre and post trade data.

In addition, pre-trade transparency does not necessarily preclude the presence of noise trading on trading venues. Noise trading has been attributed to myriad factors including a continuous supply of naïve traders who are subsequently eliminated by efficient markets,¹³⁷ trader's enjoyment of trading,¹³⁸ pressure from investors/clients on traders to trade as opposed to remaining idle, and trading by sophisticated agents.¹³⁹ As has been noted in Chapter 2 of this thesis,¹⁴⁰ noise trader risk is a major example of inefficiency in financial markets. Additionally, given the increased riskiness of trading strategies deployed, it is unsurprising that noise trading strategies generate higher returns than those accruing to rational traders.¹⁴¹ Furthermore, arbitrageurs instead of implementing price correction strategies may feed into irrational trading to ensure sustained profits – especially given agency issues.¹⁴²

Relating noise trading risk to the regulation of trading venues, a case study can be drawn from high frequency trading. High frequency trading typically involves extremely short holding periods. A holding period is the time between assuming a position and unwinding it. These transactions are usually made by computers running complex

¹³⁷ Milton Friedman *Essays in Positive Economics* (University of Chicago Press 1983).

¹³⁸ Fischer Black, 'Noise' (1986) 41 *The Journal of Finance* 533.

¹³⁹ James Dow and Gary Gorton, 'Noise Trading, Delegated Portfolio Management, and Economic Welfare' (1997) 105 *Journal of Political Economy* 1024.

¹⁴⁰ *Supra* Section 2.5.1.

¹⁴¹ Robert Waldmann and others, 'Positive Feedback Investment Strategies and Destabilizing Rational Speculation' (1990) 45 *The Journal of Finance*

¹⁴² Lawrence Summers and Andrei Shleifer, 'The Noise Trader Approach to Finance' (1990) 4 *Journal of Economic Perspectives* 19.

algorithms.¹⁴³ High frequency trading has been praised for promoting efficiency¹⁴⁴ and the facilitation of trading in large volumes.¹⁴⁵ Simultaneously, high frequency trading has come under fire for a number of reasons including unfairness due to the speed advantage, the manipulative or parasitic trading strategies deployed, the disruption of established sources of liquidity and the fact that the sheer volume of high frequency trades slows down and can overwhelm markets.¹⁴⁶ High frequency trading can result in excessive volatility as the ‘flash crash’ of 2010 shows.¹⁴⁷

From a MFT perspective, centralised trading and the consequent increased capability for high frequency trading is to be celebrated given that the stochastic models and technology utilised in the process, reinforce the tenets of MFT. However, this thesis argues that high frequency trading should be viewed as a form of noise trading in light of the fact that these algorithms typically follow trends – a fact exacerbated by the extremely short holding periods that typically characterise high frequency trading. Given the endemic nature of high frequency trading on trading venues, this calls the efficiency of prices on trading venues into question. Furthermore, given the short-term focus of high frequency trading, it is quite possible that high frequency trading may exhibit herding characteristics, moving prices even further away from their fundamental value.¹⁴⁸ While it could be argued that high frequency trading provides much needed liquidity in financial markets,¹⁴⁹ it could be responded that an increase in trading volume does not necessarily lead to an increase in liquidity given high

¹⁴³ Imad Moosa, ‘The Regulation of High-Frequency Trading: A Pragmatic View’ (2013) 16 *Journal of Banking Regulation* 72–73.

¹⁴⁴ On improvements on market efficiency, See Terrence Hendershott and others, ‘Does Algorithmic Trading Improve Liquidity?’ (2011) 66 *The Journal of Finance* 1. On improvements to price efficiency, see Jonathan Brogaard and Corey Garriott, ‘High-Frequency Trading Competition’ (2018) *Journal of Financial and Quantitative Analysis* 1.

¹⁴⁵ Joel Hasbrouck and Gideon Saar, ‘Low-Latency Trading’ (2013) 16 *Journal of Financial Markets* 646.

¹⁴⁶ Charles Korsmo, ‘High Frequency Trading: A Regulatory Strategy’ (2013) 48 *University of Richmond Law Review* 528.

¹⁴⁷ Andrew Keller, ‘Robocops: Regulating High Frequency Trading after the Flash Crash of 2010’ (2012) 73 *Ohio State Law Journal* 1457; Andrei Kirilenko and others, ‘The Flash Crash: High-Frequency Trading in an Electronic Market’ (2017) 72 *The Journal of Finance* 967. It is useful to note at this point that high frequency trading is also regulated by other regulation. For instance the Market Abuse Regulation in the EU deals with high frequency trading. However a discussion of this regulation is beyond the scope of this thesis. See further Tilen Čuk and Arnaud Van Waeyenberge, ‘European Legal Framework for Algorithmic and High Frequency Trading (Mifid 2 And MAR)’ (2018) 9 *European Journal of Risk Regulation* 146.

¹⁴⁸ Didier Sornette and Susanne Von Der Becke, ‘Crashes and High Frequency Trading’ (2011) No 11- 63 *Swiss Finance Institute Research Paper Series* 6.

¹⁴⁹ Edward Sun and others, ‘High Frequency Trading, Liquidity, and Execution Cost’ (2013) 223 *Annals of Operations Research* 403; Albert Menkveld, ‘High Frequency Trading and the New Market Makers’ (2013) 16 *Journal of Financial Markets* 712.

frequency trading's predilection for 'flow toxicity.'¹⁵⁰ This raises concerns that high frequency trading may engender instable finance structures which disastrously unravel in environments of financial stress and raises systemic risk concerns.¹⁵¹ Of course, regulatory prescriptions requiring that trading venues guard against potential market disruptions stemming from high frequency trading may mitigate these problems. Especially when combined with the ability to order MTFs and SEFs to stop trading – both strategies in line with the precepts of behavioural finance and IKE.¹⁵² However, the innovation endemic in high frequency trading, and consequently on trading venues when combined with perverse incentives means that the law may constantly struggle to maintain the same pace as technological innovation.

Additionally, the institutionalisation of centralised trading may also be problematic as it results in a proliferation of trading venues in the market; this in turn creates competition between trading venues for orders, and the attendant liquidity and profits. This results in the same genus of an instrument trading on several venues.¹⁵³ This can result in excessive price dispersal – that is, the same instrument trading at various prices at the same point in time, resulting in market fragmentation.¹⁵⁴ A fact attributable to the difficulty in obtaining complete information. Of course, from a MFT perspective, the presence of rational arbitrageurs in financial markets is enough to move prices back in line. However, insights from behavioural finance indicate that arbitrage is costly, markets can remain inefficient for longer than the arbitrageur has resources and furthermore, the relevant arbitrageurs may not have the resources needed to satisfy the relevant monitoring costs, or may benefit from this mispricing anyway. Furthermore, informed investors may exploit the fragmentation of markets. Cognisant of this fact, dealers may widen bid-ask spreads leading to an increase in trading costs and constraining liquidity in these markets. Market fragmentation also defeats the purpose

¹⁵⁰ That is the provision of liquidity in times of plenty and the hoarding of liquidity in environments of financial stress. See further Sornette and Von Der Becke (n 148) 5.

¹⁵¹ Ivan Rainey and Gbenga Ibikunle, 'A Taxonomy of the 'Dark Side' of Financial Innovation: The Cases of High Frequency Trading and Exchange Traded Funds' (2012) 16 *International Journal of Entrepreneurship and Innovation Management* 51.

¹⁵² *Supra* Section 2.5.

¹⁵³ Ferriani and Saguato (n 2) 678.

¹⁵⁴ Nicholas Taylor, 'Time-Varying Price Discovery in Fragmented Markets' (2011) 21 *Applied Financial Economics* 717–718. On market fragmentation generally, see Mark Klock, 'The SEC's New Regulation ATS: Placing the Myth of Market Fragmentation Ahead of Economic Theory and Evidence' (1999) 51 *Florida Law Review* 754; Gabriel Matus, 'Regulation of Alternative Trading Systems: Market Fragmentation and the New Market Structure' (2000) 44 *New York Law School Law Review* 583; Amy Kwan and others, 'Trading Rules, Competition for Order Flow and Market Fragmentation' (2015) 115 *Journal of Financial Economics* 330; Macey and O'Hara (n 20) 17.

of centralised trading by increasing search costs.¹⁵⁵ Furthermore, market fragmentation renders the regulation of trading venue supervision and regulation of trading activity inconsistent. Trading venues are primarily responsible for supervising their members and are given a certain degree of latitude in how they implement and enforce these rules. Given the need to be competitive to attract even more order flow, it is not beyond the realm of possibility that some trading venues may institute comparatively lax market supervision rules.

The fragmentation of trading also creates difficulty in detecting market manipulation and unfair trading practices even where trading venues have draconian rules prohibiting such acts. For instance, market participants can engage in regulatory arbitrage by trading in small amounts on several trading venues obfuscating any perspective the respective venues and regulators may have of these activities.¹⁵⁶ This could result in the entrenchment of instable financial structures via Ponzi finance practices in trading venues, a fact that may then render trading venues instable finance structures vulnerable to a run on liquidity in environments of financial stress. However, all is not lost as empirical research on the effect of fragmentation in US equity markets indicates that fragmentation results in lower transaction costs and faster execution speed. Additionally, fragmented stocks were more efficient and were closer to following a random walk.¹⁵⁷ From a MFT perspective, market fragmentation can be viewed as competition driven innovation by the market - consequently, it is unsurprising that regulatory solutions to market fragmentation result involve the provision of information on trades and quotes, and ensuring that market participants are incentivised to provide best conditions.¹⁵⁸

Restrictions on proprietary trading are reasonable from the perspectives of behavioural finance given the endemic nature of irrationality in financial markets. Furthermore, given the imperfect knowledge constraint, this restriction is also justifiable from an IKE point of view. The GFC has revealed the risks and financial

¹⁵⁵ Ferriani and Saguato (n 2) 678.

¹⁵⁶ Alexis Collins, 'Regulation of Alternative Trading Systems: Evolving Regulatory Models and Prospects for Increased Regulatory Coordination And Convergence' (2002) 33 *Law and Policy in International Business* 481.

¹⁵⁷ Maureen O'Hara and Mao Ye, 'Is Market Fragmentation Harming Market Quality?' (2011) 100 *Journal of Financial Economics* 460. It should however be noted that securities markets are very different from OTC-DMs.

¹⁵⁸ Giovanni Petrella, 'Mifid, Reg NMS and Competition Across Trading Venues in Europe and the USA' (2010) 18 *Journal of Financial Regulation and Compliance* 260; Larry Harris, *Trading and Exchanges: Market Microstructure for Practitioners* (Oxford University Press 2003).

instability inherent in proprietary trading, involving maturity transformation. However, from a MFT perspective, this ban is unjustifiable for a number of reasons. For instance, precluding MTFs and OTFs – which provide investment services from engaging in proprietary trading could result in a scarcity of liquidity given the fact that these investment firms are precluded from performing important market making functions and consequently improving market efficiency. However, given current regulator hostility towards proprietary trading in any form, this ban is unsurprising. This position is however ameliorated by the fact that trading venues are to enter into market making arrangements with market participants and the fact that OTFs can engage in matched principal trading.

This section has argued that the trading requirement can have deleterious effects on market liquidity. Furthermore, pre-trade transparency can have adverse effects on derivatives dealers. These consequences could result in dealers innovating avenues through which they can avoid strict compliance with the trading requirement. Drawing on an example from securities markets, the attainment of pre-trade transparency is still threatened by the existence of SIs in the EU. Market participants unwilling to share trade information or seeking to take advantage of the relative lack of SI regulation may decide to innovate ways through which they can trade through or offer services as SIs. For instance, SIs are not subject to the detailed rules governing tick sizes and consequently may be able to offer some price improvements while still meeting the centralised trading requirement. Combined with the SI's ability to execute within the public spread and enjoy the benefits of the price discovery process, this makes SI's attractive to market participants – especially given that liquidity providers in transparent markets may be reluctant to quote competitive prices in transparent markets.¹⁵⁹ This route for innovation is however unavailable to dealers in derivative markets as for the purposes of derivatives trading, SIs are not trading venues. This has also made the prospect of being classified as an SI unattractive to OTC derivatives dealers.

However, this will not stop market participants from engaging in regulatory arbitrage. For instance, research has found that when the trading requirement came into force in the US, dealers determined to retain their market power shifted a significant amount

¹⁵⁹ Gomber and others (n 77) 9.

of their inter-dealer trading to EU desks where the trading requirement was not in force.¹⁶⁰ This results in a loss of liquidity and in even more acute market fragmentation. This also raises the possibility of market participants engaging in unforeseen innovation and regulatory arbitrage, which could hinder the efficacy of the trading requirement, and create instable finance structures, consequently, posing potential sources of endogenous risk. This type of innovation also highlights how important it is that regulators fully understand the implication of their prescriptions and adopt a uniform approach towards regulating increasingly global financial markets.

In summary, the above analysis indicates that the key regulatory approach towards the regulation of trading venues follows the tenets of MFT in a sense through the promotion of market efficiency via the institutionalisation of trading market infrastructure, and the promotion of transparency. Startlingly, this approach mirrors the approach typically utilised by regulators for securities markets. This section has however shown that while mandatory pre-trade transparency may benefit end-users, it may have deleterious effects on derivatives dealers and consequently, on market liquidity. Furthermore, while centralised trading partly plays into the tenets of the IKE by ameliorating the imperfect knowledge constraint; and to the tenets of behavioural finance by preventing herding, it also promotes noise trading and fails to provide adequate guidance range and enforcement measures. Even worse, the centralised trading requirement engenders market fragmentation and regulatory arbitrage which may result in a proliferation of instable finance structures. In markets typified by fragmentation, illiquidity, regulatory arbitrage, and high frequency trading, factors which will all no doubt combine in novel ways to form new interlinkages and create new types of risk, the use of maladapted and archaic regulatory approaches founded on idealised conceptualisations of OTC-DMs can prove fatal.

6.5. Conclusion

In no other OTC-DM reform can the performativity of MFT be seen as clearly as in the trading requirement. This chapter has argued that the major rationale behind the design and implementation of the trading requirement is the promotion of transparency and liquidity, and by extension, market efficiency. This is slightly antithetical to the very

¹⁶⁰ Benos and others (n 56) 3; ISDA, 'Path Forward for Centralized Execution of Swaps' (2015) 1 <https://www.isda.org/a/NniDE/path-forward-for-centralized-execution-of-swaps-final.pdf>

purpose of OTC-DMs which by their very nature thrive in conditions of asymmetric information, and presupposes that OTC-DMs operate like securities markets. This chapter has also shown that there are several flaws in the implementation of this requirement. This include crucial differences between regulatory approaches in implementation which highlight the controversial nature of this reform and illustrate the fact that there is no single optimal market structure for the promotion of market efficiency.¹⁶¹ Furthermore, the trading requirement's provision of transparency is limited given the narrow range of instruments it covers.

Regulatory prescriptions on the operation of trading venues also give cause for worry. The trading requirement may remove incentives for derivatives dealers to make markets. While this provides minimal benefits for end users, these benefits come at the expense of dealers resulting in possible financial innovation and regulatory arbitrage by market participants that results in further market fragmentation and engenders the proliferation of instable finance structures. Furthermore, the trading requirement may result in a retraction of liquidity. It is consequently little wonder that French and others, counsel that any trading requirement needs to be cognisant of the innovation and dynamism inherent in OTC derivative markets.¹⁶² Moreover, some countries still have not implemented this mandate.¹⁶³ In the light of these findings, this chapter argues that the trading requirement is of little utility in the mitigation of systemic risk and advocates the use of an opt-in system as opposed to the current mandatory system. This conclusion is corroborated by this thesis's analysis so far. For instance, despite its many demerits,¹⁶⁴ the CCP prescription can be justified given its potential reduction of counterparty credit risk, and the reporting obligation is essential due to the transparency it facilitates in OTC-DMs. However, a mandatory centralised trading requirement has little merit to corroborate its non-voluntary nature, especially given the fact that as this chapter has argued, it will be ineffective in mitigating endogenous risk, and in fact, may actually result in the worsening of this risk.

¹⁶¹ Madhavan (n 126) 251.

¹⁶² Kenneth French and others, *The Squam Lake Report* (Princeton University Press 2010) 70.

¹⁶³ Ruffini and Stiegerwald (n 4) 90. For example, only thirteen jurisdictions have comprehensive assessment standards or criteria for determining when products should be platform traded in force. See further 'FSB Publishes Reports on Implementation of OTC Derivatives Reforms and Removal of Legal Barriers - Financial Stability Board' (Fsb.org, 2018) <http://www.fsb.org/2018/11/fsb-publishes-reports-on-implementation-of-otc-derivatives-reforms-and-removal-of-legal-barriers/>.

¹⁶⁴ Discussed Supra Chapters 3 and 4.

Absent the removal of mandatory centralised trading, this chapter argues for the increased use of regulatory guidance range and excess dampening measures especially in relation to high frequency and algorithmic trading. Currently, trading venues are to monitor trading on their venues, and ensure that they are resilient in relation to the risks they face from high frequency trading. However, it would be better if regulators using real-time post-trade information issued guidance range measures. For example through announcements that markets were experiencing exceptionally high volatility and where necessary addressing the cause of this instability through the use of a tax on market participants engaging in manipulative trading or excessive speculation.¹⁶⁵ Given regulatory access to detailed post-trade information, they are in a special position to make these allocative decisions. Finally, an important point to note here is the vast similarity between regulatory approaches towards the regulation of securities markets, and the regulation of post-GFC markets. This renders some of these recommendations applicable to securities markets as well.

¹⁶⁵ This concept is addressed further in Section 7.3.

Chapter 7: Conclusion and Recommendations

7.1. Overview

This thesis has demonstrated that theories of finance matter for the manner in which we conceptualise and resultantly regulate financial markets. Fanatical reliance on ‘flawed theories’ can have disastrous consequences as exemplified by the relationship between MFT and the financial crisis - most evident in the deregulation of OTC-DMS – attributable to assumptions of perfect markets fuelled by MFT. This thesis has also argued that while the hypotheses and methodology of MFT have no doubt been beneficial to the development and continued evolution of financial markets generally, and OTC-DMs specifically, regulatory strategies need to recognise the important role that endogenous risk - a product of the fundamental uncertainty, irrationality, complexity, and imperfect information endemic in financial markets plays in the creation and exacerbation of financial instability.

Consequently, this thesis has explored the G20 mandated post-GFC reforms in OTC-DMs. Specifically, it has explored the CCP prescription, the reporting obligation, and the centralised trading requirement as implemented by the EU and US to (i) determine what effects MFT has had on said reforms, and (ii) utilising alternative theories of finance as an evaluative framework to discover any lacunae in said reforms. This analysis reveals limited convergence between MFT and alternative theories of finance in the implementation of these reforms by EU and US authorities. Predominantly however, regulators on both sides of the Atlantic continue to cling to the anachronistic belief that information is king in financial markets, and that risk can be quantitatively defined – both approaches being seminal characteristics of regulatory conceptualisations significantly grounded in MFT. This raises questions on the effectiveness of regulatory reforms in OTC-DMs and puts the ability of these reshaped markets to withstand or better still pre-empt future crises into question.

This concluding chapter ties together the various strands of analysis present throughout this thesis in order to better identify general themes in current approaches to the regulation of OTC-DMs and better identify challenges regulators face in the effective regulation and supervision of these markets.

Utilising insights from alternative theories of finance, this chapter subsequently attempts to articulate a way forward from current gaps in OTC-DM reforms by making a number of non-exhaustive general recommendations. Finally, this chapter briefly details possibilities for a future research agenda, and subsequently concludes that from the perspective of alternative theories of finance, current OTC-DM reforms may do more harm than good.

7.2. General Themes

a. In the Land of Opacity, Information is King

Information is essential in a MFT world. In this sense, information is vital for pricing derivatives and discerning current states of OTC-DMs. In addition, as regulatory cluelessness in relation to the distribution of risk during the GFC also shows, information is key in ensuring the effective supervision of OTC-DMs. Consequently, it is unsurprising that a general theme in regulatory reforms in OTC-DMs is the requirement that a substantial amount of information be produced and in some cases, publicly disseminated. For instance, CCP clearing provides greater transparency given that CCPs collect and broadcast a significant amount of data on the derivatives cleared through them, simplify the complex web of exposures that characterises bilateral derivatives trading, and promote the standardisation of otherwise complex derivatives instruments.¹

Furthermore, *prima facie*, trade reporting provides valuable post-trade data, thus giving regulators the granular information needed to assess and mitigate any risks OTC-DMs pose to systemic stability.² Mandatory dissemination of trade data by TRs enables market participants gauge current states of OTC-DMs, and quantitatively determine possible future states of this market.³ Finally, the centralised trading requirement solves the search problems and consequent transaction costs and illiquidity that plague OTC-DMs through the introduction of co-ordination mechanisms that are subject to both pre and post trade transparency.⁴

¹ Supra Section 3.3.

² Supra Sections 5.3 and 5.4.

³ Supra Section 5.3.

⁴ Supra Chapter 6.

Sadly, this thesis's detailed examination reveals that while all may be well with post-GFC reforms from a MFT perspective, from an endogenous risk perspective, they are not. This thesis has argued that while information on derivatives contracts may be sufficient in good times, said information may be found to be inadequate in times of financial stress.⁵ For instance, CCPs depend on the information they receive for the quantification of risk through models, this information and models utilising it may prove to be of little utility in environments of financial stress give fundamental uncertainty. Additionally, while CCPs simplify interconnectedness in OTC-DMs, this simplification of exposures results in CCPs becoming nodes and transmitters of systemic risk themselves. Furthermore, given the complex and esoteric nature of some OTC derivatives, it is highly likely that information on these contracts may not be readily available. This position is further complicated by the complexity inherent in client clearing, making it likely that these lacunae may render CCPs' ability to clear these contracts cause for concern.⁶

In relation to trade reporting, it is assumed that all information is knowable; however, this thesis has argued that certain information relevant for the discernment of systemic risk may not be discernible *ex ante* and can only be discerned *ex post*. Furthermore, the collection of information on the granular scale required by trade reporting has been hampered by inconsistent regulatory implementation of the reporting obligation in the EU and US. This problem is compounded by the fact that while the provision of information is all well and good, the ability of the information receiver to correctly process said information is essential for the proper utilisation of the information. In light of this fact, this thesis has argued that given the voluminous amount of information provided to regulators, and the complex and constantly evolving nature of OTC-DMs, it is highly unlikely that regulators are able to properly analyse and digest reported data.

While this problem is no doubt ameliorated by the use of identifiers, the inconsistent implementation of identifier requirements in the EU and US hampers the necessary aggregation of reported data. Given the global nature of OTC-DMs,

⁵ *Supra* Sections 3.3, 4.3, 4.4, 5.3, and 6.4.

⁶ See generally Chapters 3 and 4

the siloing of information behind jurisdictional firewalls is also concerning as this indicates that no single regulator has a global perspective on systemic risk in OTC-DMs.⁷ Finally, the centralised trading requirement prioritises the dissemination of both pre and post trade information. However, while this information may be useful in times of stability, given the heterogeneous nature of OTC derivatives, it is highly unlikely that the dissemination of information on the level required by the trading requirement will be useful in environments of financial stress.⁸

In conclusion, this thesis's analysis indicates that while information is important from both a MFT and alternative theories of finance perspective, sole reliance on information as a means for achieving stable financial markets may be deleterious from an endogenous risk perspective. Especially given the complexity, irrationality, innovation, and fundamental uncertainty that characterise OTC-DMs and the counter-performativity they may achieve in financial markets. This stresses the need to move away from a conception of financial markets in which information is king to one in which endogenous risk and its constituent elements are recognised, and take primacy in regulatory strategies. To this end, this thesis makes a number of recommendations throughout its analysis some of which are consolidated and expanded upon in Section 7.3. of this chapter.

b. Continued Sole Reliance on Modern Finance Theory and its Tools

The main thrust of OTC-DM reforms represent an attempt to move these markets towards equilibrium and consequently, towards efficiency. This conceptualisation of financial markets, which regards all innovations as efficiency enhancing given the fact that supply is merely responding to demand is severely deleterious. This stance is evident in the inflexible regulation that has been reflexively promulgated in response to the GFC, and in the absence of regulatory provisions on complexity and financial innovation in the analysed reforms. This indicates that the pre-GFC assumption that complexity is a good thing has been carried over in post-GFC OTC-DM reforms. Of course, given the reporting obligation, regulators may assume that they have the information necessary to understand these

⁷ See generally Chapter 5.

⁸ See generally Chapter 6.

complex products. While true to an extent, this thesis has demonstrated that regulators' ability to process this information may be limited. Furthermore, this thesis has noted that not all relevant information is easily delineated ex ante.⁹ This calls into question regulators ability to understand complex new derivative products, and consequently, regulators' ability to detect and mitigate any systemic risks these products may pose. Furthermore, market participants will often have better information than regulators, especially given these participants' high tolerance for complexity and resources, which combined with their need to generate rents, and consequent incentives to undermine regulatory prescriptions mean that it is unlikely that regulators will fare as well as they imagine.¹⁰

In terms of ensuring the liquidity of financial markets, this reliance is also present in the heavy promotion of information dissemination, and models of modern finance as the primary means for ensuring that markets are fully efficient as evidenced by detailed prescriptions on CCP financial resources, and the imposition of a centralised trading requirement for certain OTC derivatives.¹¹

c. Derivatives as Securities

This thesis's analysis has also revealed that regulators have extended the manner in which securities markets are regulated to OTC-DMs. This chapter's previous analysis has shown the important role information plays in post-crisis reforms. Ostensibly, these reforms promote price discovery and consequently, market efficiency. However, this thesis has shown especially in relation to the centralised trading requirement that OTC-DMs are characterised by idiosyncratic endogenous risk not found in securities markets.¹² Given the heterogeneous nature of OTC derivatives, while the liquidity provided by centralised trading may be adequate in times of stability, in times of crisis, market participants will care about the identity of their counterparties to minimise their counterparty credit risk – thereby reducing the liquidity that centralised trading mechanisms offer. This same deficiency is evident in the reporting obligation as the information to be disseminated to market participants is generally aggregated rendering the ability

⁹ Supra Chapter 5.

¹⁰ See for example Sections 4.3 and 4.4.

¹¹ Supra Section 6.4.

¹² See generally Chapter 6.

of market participants to decode any relevant signals from this data impossible. The aggregation of data currently in play with TR disseminated data may also render efforts by market participants to isolate market signals relevant to their position from the noise of unrelated trades difficult or near on impossible.¹³ Finally, these heterogeneities may result in the inappropriate standardisation of complex derivatives and result in market participants calling the clearing and settlement procedures of CCPs into question given the fact that market participants cognisant of the fact that CCPs clear myriad instruments some of which may be more complex than others may have diminished belief in the ability of said CCPs to actively manage the relevant liquidity and collateral risks associated with the more complicated derivatives contracts. This problem may then be compounded by a lack of information on the ability of clearing members to safeguard the continued viability of CCPs in times of crisis and result in a run on collateral, or on the CCP's resources. Furthermore, given the innovation and dynamism immanent in OTC-DMs, and the inadequacy of current financial market infrastructure governance arrangements, there is the possibility of regulatory arbitrage via the engineering of financial products that fall outside the ambit of the CCP prescription and the trading requirement.¹⁴

Another point of concern is that there is a continued lax regulatory attitude towards speculation. MFT dictates that speculation via derivatives is economically beneficial in light of the fact that the liquidity and market depth speculation in these instruments provides enable price discovery in the underlying, complete markets by enabling the reallocation of risk in a manner that suits market participant's tolerance, consequently rendering the highly leveraged speculation that takes place in OTC-DMs economically beneficial. However, an endogenous risk perspective indicates that speculation, and the leverage that typically accompanies said speculation especially with OTC derivatives can have disastrous effects on financial markets and the economy at large. While recent reforms whether advertently or inadvertently have taken steps which curb excessive speculation, these reforms do not seem to explicitly recognise the extremely deleterious effects speculation can have, or seem to support the

¹³ Supra Section 5.3.

¹⁴ See generally Chapters 3 and 4.

argument that the efficiency benefits of speculation outweigh its detriments. This approach ignores the fact that speculation is of little productive value and poses a massive threat to systemic risk.

In summary, derivatives markets are extremely different from securities markets and should be treated accordingly. In light of these facts, this thesis makes a number of recommendations on possible avenues through which the problems associated with endogenous risk in OTC-DMs could be ameliorated in Section 7.3.

d. Hybridity in Regulatory Approaches: Frankenstein's Monster?

The introduction of this thesis sought to explore who was better positioned to regulate OTC-DMs, and notes in Chapter 2 that state actors are best positioned to regulate these markets given the propensity of market participants to herd, and the high tolerance these actors have for the complexity that results in financial instability and begets endogenous risk.¹⁵ This thesis's analysis indicates that regulators have adopted an approach to regulation that attempts to make the best of MFT and endogenous risk worlds. In sharp contrast to the unregulated nature of pre-GFC OTC-DMs, post-GFC OTC-DMs are subject to a substantial amount of regulation. This however raises the question of whether said regulation places responsibility for the formation of allocative decisions in private or public hands.

This thesis's analysis indicates that the post-GFC regulatory framework seems to utilise a hybridised public-private framework, that is, state mandated use of certain private ordering mechanisms. With strict state supervision of the relevant financial market infrastructures through the use of state mandated principles that these FMIs are subject to. These entities are in turn responsible for the design of rules on the manner in which they operate and are utilised. This relationship has its merits in light of a significant dearth in regulatory knowledge on OTC-DMs. A lack of knowledge that is compounded by the constantly evolving nature of financial markets. The hybridised model of regulation also facilitates knowledge transfer between regulators and market participants and provides regulators with access to technologies and techniques that they would not normally have access

¹⁵ Supra Sections 2.5 and 2.6.

to; further strengthening regulators' ability to safeguard the stability of financial markets, and promulgate increasingly pre-emptive regulation.

This thesis has however shown that this approach towards regulation may have a number of deficiencies. First, the delegation of financial stability provision to private entities may result in conflicts of interests. For instance, dealers may exert their influence over CCPs for monopolistic reasons. Perhaps, by excluding competitors from membership of the CCP. Second, it is very possible that in order to preserve their market making activities and further sustain rent seeking activity, members of a CCP may exert some influence over any clearing determinations made by the CCP.¹⁶ Third, in their bid to maintain a competitive edge, CCPs may resort to Ponzi finance by accepting derivative contracts ill-suited to central clearing. Further endogenous risk mechanisms exist where small clearing members exert influence over the CCP to ensure reduced capital requirements. The reliance on risk committees seems to ignore the components of endogenous risk as detailed in this thesis.¹⁷ Fourth, this hybridity is particularly fragile in relation to CCP financial resource requirements. While from a MFT perspective, CCPs are perfectly positioned to quantify and resultantly manage the risks they assume. This thesis has however argued that CCPs are vulnerable to asset price swings, that CCP mutualisation of risk engenders moral hazard, that CCP risk models may not adequately quantify risk, that CCP information on complex derivatives may not be as good as that of market participants – resulting in suboptimal contracting and adverse selection, that mandated CCP clearing has an uncertain but likely negligible effect on the amount of risk in the financial system, and using collateral transformation as a case study, has shown that market participants will always innovate new market structures, a process that entails a substantial amount of endogenous risk.¹⁸

Mandatory reporting of derivatives trades provides regulators with the means to collect information on OTC-DMs with little cost. Furthermore, the ability of regulators in the US to request both TR equipment and personnel in the analysis of this data highlight the efficiency of the hybridised approach towards the

¹⁶ Supra Section 4.2.

¹⁷ Supra Section 4.2.

¹⁸ Supra Section 4.3.

regulation of financial markets. This thesis has however argued that the reporting obligation is problematic due to the proliferation of TRs in the market. Given the important role TRs play in affording regulators a bird's eye view of systemic risk in OTC-DMs, it may be imagined that the collection of this information would take place on a global scale. However, the presence of jurisdictional firewalls in place when it comes to access to TR data promote neither the tenets of MFT, nor cohere with the postulations of alternative theories of finance.¹⁹

As mentioned above, this hybridity is also evident in the centralised trading requirement. Regulators have tasked trading venues with ensuring the efficiency and liquidity of OTC-DMs. Given the efficiency promoting characteristics of these venues, this mandate is unsurprising from a MFT perspective. However, from an endogenous risk perspective, this thesis has argued that the precise structure and calibration of the centralised trading requirement facilitate endogenous risk engendering activities including high frequency trading, trade fragmentation, and regulatory arbitrage by market participants.²⁰

e. Agreeing to Disagree: Regulatory Fragmentation

OTC-DMs are inherently global in nature. Furthermore, reforms in OTC-DMs are a result of the G-20's 2009 mandate. Resultantly, it is only reasonable to assume that regulators in the EU and US implement these mandates uniformly as this inherently global characteristic raises complex issues in relation to regulatory strategies, and is crucial to the effective policing of global OTC derivative transactions and markets. This thesis's comparative analysis however reveals that this is sadly not the case. While implementing the same broad mandate, regulatory prescriptions on both sides of the Atlantic diverge when it comes to substance. This is exemplified by differences in the rulemaking powers granted to regulators in the EU and US with US regulators having significantly broader powers than their EU counterparts. Furthermore, the definitions of derivatives covered by the relevant legislation in the EU and US diverge substantially.²¹ In addition, there are crucial differences between regulatory prescriptions on CCP

¹⁹ See generally Chapter 5.

²⁰ See generally Chapter 6

²¹ Supra Section 3.3.

governance,²² financial resource requirements²³ as well as on the segregation and portability of client accounts.²⁴ Further differences can be found in the implementation of the reporting obligation with the EU requiring double sided reporting in sharp contrast with the US position where only one party needs to report. Crucially, there is also substantial divergence in the timing of reporting in the EU and US regime requiring real time reporting and the EU regime requiring reporting the day after the transaction. The EU and US regimes diverge even further when it comes to the scope of instruments to be reported with the EU requiring the reporting of all derivative transactions and the US only requiring the reporting of OTC derivative transactions.²⁵ Differences in the implementation of the reporting obligation are even starker when considering the use of identifiers. While there is commonality in the use of LEIs in the identification of entities connected to a reported transaction, the similarities stop here with EU and US prescriptions on the identification of transactions and products diverging substantially. In relation to the supervision of TRs, US regulatory prescriptions also seem to be more detailed and responsive.²⁶

The trend of regulatory divergence continues with the implementation of the centralised trading requirement with EU bodies adopting a top down and bottom up approach to making eligibility to trade determinations, and US regulators utilising a 'made available to trade' determination system which seems to fetter their discretion. The avenues through which pre and post trade transparency are achieved are also significantly different with the EU regime placing the onus for ensuring this transparency on the trade venues and the US utilising the means of execution and trade reporting as the means via which transparency is to be achieved.²⁷ These coordination problems are cause for concern in relation to CCPs as this thesis has established that the CCP prescription has transformed CCPs into too big to fail nodes of systemic risk. Given the global nature of OTC-DMs, rent seeking market participants are likely to engage in regulatory arbitrage by shopping for jurisdictions with the weakest protections and transacting in said

²² Supra Section 4.2.

²³ Supra Section 4.3.

²⁴ Supra Sections 4.4 and 4.5.

²⁵ Supra Section 5.3.

²⁶ Supra Section 5.4.

²⁷ Supra Sections 6.3 and 6.4.

jurisdictions to ensure access to CCPs with the lowest protections. This increases the amount of Ponzi finance structures' in the global OTC-DM and consequently, the levels of endogenous risk. These problems are compounded by the broadly drafted extra territorial scope of these rules raising the possibility that entities outside the relevant jurisdictions of these regimes could be brought within their regulatory scope. Both regimes however have systems in place for the recognition of compliance with rules in foreign jurisdictions.²⁸

While in light of the previously highlighted possibility of regulatory arbitrage, the wide ambit of the extra territorial provisions are understandable, and the argument has been made that the wide reach of these regulations exports the EU and US world leading approach to the regulation of financial markets to less developed markets. This will however require a significant amount of regulatory coordination. This thesis's theoretical analysis notes that this regulatory fragmentation does not cohere with MFT's need for liquid frictionless markets. In fact, the widely drafted extraterritorial provisions indicate regulatory awareness of endogenous risk as engendered by fundamental uncertainty and irrationality. These jurisdictional firewalls function as circuit breakers and may be vital in preventing the spread of financial contagion from one jurisdiction to another – but at an extremely high price. Of course efficiency may be provided by the application of substituted compliance and equivalence regimes.²⁹ This thesis has however noted that current models for substituted compliance may not be fit for purpose and will revisit possible solutions to this problem in Section 7.3 of this chapter.

In conclusion, this thesis has highlighted some of the coordination challenges that plague post-GFC reforms in OTC-DMs. These challenges no doubt stem from idiosyncratic political and economic characteristics, the amount of resources available to regulators, or regulatory capture but are fundamentally attributable to uncertainty. Divergences in regulatory approaches towards the regulation will always be plagued by arbitrage given the global nature of OTC-DMs. This may result in the inefficacy of regulatory ability to decisively address systemic risk in OTC-DMs specifically and in financial markets generally. Furthermore, there is

²⁸ Supra Section 3.5.

²⁹ Ibid.

always the possibility of contagion being transmitted from countries with lower standards to countries with higher standards. In addition, these coordination problems result in the siloing of information, providing market participants with arbitrage opportunities and ensuring that no single regulator has a global perspective of systemic risk in OTC-DMs.

7.3. The Way forward

Having synthesised the general themes and the regulatory challenges discovered by this thesis's analysis, this section makes a number of proposals for the regulation of OTC-DMs specifically, and financial markets generally. As a caveat, it should be noted that these recommendations are fundamentally normative - especially given the controversy that may surround some of them.

a. 'It Takes a Village': Global Regulatory Cooperation

This thesis's analysis has shown that the regulatory response to the crisis has resulted in the promulgation of extensive extra territorial regulation. For instance, the CCP prescription in both the EU and US is capable of extending to foreign entities and CCPs must either be authorised or recognised by the relevant regulator.³⁰ Furthermore, the implementation of the trade reporting has resulted in the creation of information silos.³¹ Finally, the trading requirement results in market fragmentation and engenders regulatory arbitrage.³² This raises the question of who is best suited for the regulation of OTC-DMs. Generally, the nature of these extraterritoriality regimes results in legal fragmentation and imposes duplicative and inconsistent requirements on market participants.

In light of these issues, this thesis recommends a system of global regulation to be applied to OTC derivatives, one in which financial regulators actively work together towards the elimination of systemic risk. One version could be the implementation of a global treaty based international regulatory regime for OTC derivatives.³³ This would consist of mandatory rules that operate in the context of

³⁰ Supra Chapter 3.

³¹ Supra Chapter 5.

³² Supra Chapter 6.

³³ For arguments in this vein, see Bin Gu and Tong Liu, 'Enforcing International Financial Regulatory Reforms' (2014) 17 *Journal of International Economic Law* 139; Pierre-Hugues Verdier, 'Transnational Regulatory Networks and their Limits' (2009) 34 *Yale Journal of International Law* 113; Eric Pan, 'Challenge

public international law that govern the operation of OTC-DMs and activities of OTC-DM participants. However, in light of endogenous risk, especially given fundamental uncertainty, the adoption of this approach is not advisable. This is because given fundamental uncertainty, the substance of optimal regulation cannot be divined *ex ante*. Furthermore, where endogenous risk results in the development of new risks, a uniform global financial regulatory regime may be unable or ill equipped to respond in an adequate and responsive manner. In addition, Romano notes that international law instruments may themselves be subject to creative interpretations using the Basel capital requirements as an example.³⁴

Consequently, this thesis recommends that what is needed is a flexible and responsive approach to global OTC derivatives regulation generally, and CCP regulation specifically. A suitable framework would be that proposed by Romano for the reform of the Basel accords.³⁵ This would consist of a global voluntary regulatory framework similar to the Basel Capital Accords. This global regulatory framework would prescribe uniform regulatory standards via which the OTC-DMs are to be governed. To engender flexibility, the approach to the implementation of the Basel Accords suggested by Romano would be implemented. That is individual states could apply for permission to vary or depart from specific substantive rules in the regulatory framework.³⁶ Justification for these departures could be based on the unique social, political or economic peculiarities of the relevant jurisdiction. This ensures that any regulatory divergence is justified and not merely a result of regulatory tussles for superiority. This global voluntary framework could be governed by IOSCO which is already involved in the coordination of OTC-DM reforms. Approvals for departures from the framework could be approved by a specially created IOSCO committee comprised of

of International Cooperation and Institutional Design in Financial Supervision: Beyond Transgovernmental Networks' (2010) 11 *Chicago Journal of International Law* 243; Andrew Cooper, 'Consolidated Institutional Cooperation and/or Competitive Fragmentation in the Aftermath of the Financial Crisis' (2019) 12 *Whitehead Journal of Diplomacy and International Relations* 11; Joel Trachtman, 'The International Law of Financial Crisis: Spillovers, Subsidiarity, Fragmentation, and Cooperation' (2010) SSRN Electronic Journal.

³⁴ Roberta Romano, 'For Diversity in the International Regulation of Financial Institutions: Redesigning the Basel Architecture' (2014) 31 *Yale Journal on Regulation* 49.

³⁵ *Ibid* 27.

³⁶ *Ibid*.

regulators from the G20 countries, with these committee members considering the effects of said departures on financial stability, and with reputational sanctions for departure without approval. However, given the difficulty in ensuring homogenous global OTC-DM regulatory regime, initial efforts could be focused on the harmonisation of regulation at the level of G20 countries at the very minimum.

b. Time to get Flexible?

In the aftermath of the financial crisis, regulators the world over have responded by promulgating a plethora of regulation designed to mitigate any systemic risks OTC-DMs may pose. There however remains the concern that given the rapidly evolving nature of financial markets - a result of fundamental uncertainty and a principal component of endogenous risk, regulatory efforts in this regard may result in the calcification of regulation, and subsequent inability to respond flexibly to new challenges posed by OTC-DMs. Given the fact that this thesis has argued that endogenous risk is partially a result of conditions of imperfect information, innovation, complexity, and irrationality,³⁷ it is highly likely that regulation created in response to current problems is incomplete. In this sense, the concept of incomplete law as theorised by Pistor and Xu proves useful. Incomplete law in this sense does not stipulate for all future contingencies consequently rendering regulatory flexibility crucial.³⁸ While to an extent regulators have been given some discretion in the promulgation of technical standards and the core principles in both the EU and US. The detailed nature of EMIR and the Dodd-Frank Act suggest that domestic regulators may be hamstrung when faced with new forms of endogenous risk in OTC-DMs. Furthermore, regulatory flexibility is not the end of the road in mitigating financial stability, while due to their position on the frontlines; regulators are optimally positioned to flexibly respond to innovations and sources of systemic risk. This can result in regulation becoming reflexive, resulting in a continual disconnect between current market innovations and current regulatory strategies. Furthermore, regulatory approaches of this nature tend to engender regulatory arbitrage through financial innovation.

³⁷ Supra Section 2.5.

³⁸ Katharina Pistor and Chenggang Xu, 'Incomplete Law' (2003) 35 New York University Journal of International Law and Politics 932.

Consequently, it is suggested that this regulatory flexibility is to be combined with the use of the current market monitoring methods implemented by OTC-DM market reforms. This includes the monitoring of financial market infrastructures, and financial markets to spot general trends and possible sources of endogenous risk, and then creating and implementing new regulatory strategies to mitigate any systemic consequences said endogenous risk may have. Of course, given imperfect information and bounded rationality, this proposal is not without its demerits and raises the question of whether regulators are able to consistently accurately identify and effectively respond to risk.

c. ‘Throwing a Spanner in the Works’: A Financial Transaction Tax on Speculative Derivatives

The GFC has revealed the deleterious effects endogenous risk generated by unfettered speculative activity in financial markets and OTC-DMs specifically can have on financial stability, the real economy, and innocent taxpayers. This thesis’s analysis has also highlighted the ability of OTC derivatives to exacerbate systemic risk in financial markets – even more so now that these instruments are centrally cleared,³⁹ and there is an increased potential for noise trading in these markets via high frequency trading due to the centralised trading requirement.⁴⁰ Consequently, this thesis suggests the implementation of a financial transaction tax on speculative derivative transactions. This suggestion is further bolstered by the absence of any positive welfare effects the speculative trading of OTC derivatives may have on the economy at large, and the consequent questionable social utility of speculative OTC derivatives as highlighted in Chapters 1 and 2 of this thesis.

The concept of a financial transaction tax is not new to financial markets with an early proponent of financial transaction taxes being Keynes who noted that it was imperative that speculative bubbles were curbed while also noting that this mandate was to be balanced with the financing of real enterprise arguing that:

‘The capital development of a country becomes the byproduct of the activities of a casino, the job is likely to be ill-done. The measure of

³⁹ Supra Chapters 3 and 4.

⁴⁰ Supra Section 6.4.

success attained by Wall Street, regarded as an institution of which the proper social purpose is to direct new investment into the most profitable channels in terms of future yield cannot be claimed as one of the outstanding triumphs of laissez faire capitalism-which is not surprising if I am right in thinking that the best brains of Wall Street have in fact been directed towards a different object.’⁴¹

Similarly Tobin proposed a one per cent tax on foreign exchange transactions to be levied unilaterally by governments all over the world to discourage cross-border currency flows which inhibited governments’ ability to regulate aggregate demand.⁴² Arguments for a financial transaction tax have subsequently been made by Stiglitz,⁴³ and Summers and Summers⁴⁴ amongst others with these authors emphasising the effectiveness of financial transaction taxes in curbing short-term speculation, consequently, reducing market volatility and deviations from fundamentals. Additionally, in the aftermath of the financial crisis, there have been increased calls for the taxation of the financial sector⁴⁵ with one thousand scientists from 53 countries in the world writing to the 2011 G20 meeting to impose a tax on financial transactions.⁴⁶

A tax on speculative transactions coheres with the regulatory precepts of the alternative theories of finance from which this thesis’s conception of endogenous risk is drawn. For instance from the perspective of IKE, a financial transaction tax can be viewed as an excess dampening measure.⁴⁷ From, a behavioural perspective, it can be viewed as the solution to irrationality and any consequent

⁴¹ John Maynard Keynes, *The General Theory of Employment, Interest, and Money* (Palmgrave Macmillan 1936) 156.

⁴² James Tobin, ‘A Proposal for International Monetary Reform’ (1978) 4 *Eastern Economic Journal* 153; James Tobin, ‘A Currency Transactions Tax, why and how’ (1996) 7 *Open Economies Review* 493; See further Mahbub ul Haq and others, *The Tobin Tax* (Oxford University Press 1996).

⁴³ Joseph Stiglitz, ‘Using Tax Policy to Curb Speculative Short-Term Trading’ (1989) 3 *Journal of Financial Services Research* 101.

⁴⁴ Lawrence Summers and Victoria Summers, ‘When Financial Markets Work too Well: A Cautious Case for a Securities Transactions Tax’ (1989) 3 *Journal of Financial Services Research* 261.

⁴⁵ See for example Dean Baker, ‘Financial Transactions Taxes: Potential Revenue and Economic Implications’ (2017) 60 *Challenge* 141; Stephan Schulmeister, ‘Boom-Bust Cycles and Trading Practices in Asset Markets, The Real Economy and the Effects of a Financial Transactions Tax’ (2010) *SSRN Electronic Journal*.

⁴⁶ Heather Stewart, ‘Robin Hood Tax: 1,000 Economists Urge G20 to Accept Tobin Tax’ (2019) <https://www.theguardian.com/business/2011/apr/13/robin-hood-tax-economists-letter>.

⁴⁷ *Supra* Section 2.5.3.

volatility,⁴⁸ and from a financial instability hypothesis perspective, it can be viewed as inhibiting the proliferation of Ponzi finance structures.⁴⁹

Consequently, applied to OTC derivatives, a financial transactions tax could cure the disease of excessive speculation that currently ails markets for these products. The imposition of a financial transactions tax increases transaction costs. In the context of the centralised trading requirement, a financial transaction tax would ensure that noise trading activity for instance high frequency and algorithmic trading would be reduced. Especially given the ease with which these activities lend themselves to market volatility, front running, and market manipulation. A financial transactions tax would signify the end of high frequency trading as the gains made on each high frequency transaction is so small that entering into the transaction would be prohibitive.⁵⁰ Furthermore, this tax could also operate as a form of bail in fund to which OTC-DM participants contribute to, subsequent to which any lender of last resort assistance would first resort to this bail in fund, before drawing on government resources. This ensures that OTC-DMs contribute to the resolution of any deleterious effects their excessive speculation, and resultant leverage may have on the economy at large.

The notion of a tax on financial transactions is not new with the EU in the aftermath of the GFC proposing a tax on financial transactions where at least one party to the transaction was established in an EU Member State. Financial instruments in the scope of this proposal included derivatives transactions.⁵¹ Financial transactions include the sale and purchase of financial instruments prior to netting and settlement, and the conclusion or modification of derivative contracts. Consequently, it can be assumed that entry into, modification, extension or closing out of a derivative transaction come under the scope of the EU's proposed financial transaction tax.⁵²

⁴⁸ Supra Section 2.5.1.

⁴⁹ Supra Section 2.5.2.

⁵⁰ Schulmeister (n 45) 21.

⁵¹ See European Commission, 'Proposal for a Council Directive Implementing Enhanced Cooperation in the Area of Financial Transaction Tax' (2013) https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/com_2013_71_en.pdf.

⁵² Adam Blakemore, 'Proposals for a European Union Financial Transactions Tax' (2012) 2 *Journal of International Banking and Financial Law* 105.

This thesis proposes the adoption of the EU's proposed financial transaction tax for speculative derivatives globally with the financial transactions tax being applicable to financial institutions established in the relevant jurisdiction. The hedging test used for calculating clearing eligibility under EMIR's CCP prescription⁵³ could be adopted in determining whether or not a derivative is speculative or not. Any entity entering into a speculative derivative transaction would be liable to pay this tax on the notional value of the derivative contract. Alternatively, the tax could be charged on the transaction value of the derivative as opposed to the contracts notional value. This thesis also proposes a rate at the very minimum on the same level as stamp duty currently paid on shares in the UK – that is 0.5%.⁵⁴

Arguments have however been made against the adoption of a financial transactions tax. For instance, it has been argued that the implementation of a financial transactions tax prejudices all financial market participants including those whose activities do not necessarily prejudice the stability of financial and that a financial activities tax would be better suited to force changes in the behaviour of financial market participants.⁵⁵ Further examples of these arguments can be found in an EC report on the feasibility of a financial transactions tax which notes that the implementation of a financial transactions tax may result in a reduction in liquidity and market efficiency, and subsequently questions the utility of a financial transactions tax given the difficulty in distinguishing between hedging and speculative transactions.⁵⁶ An IMF paper echoes similar sentiments arguing that it is difficult to distinguish desirable from undesirable trading.⁵⁷ However, much of the arguments against the imposition of a financial transactions tax are framed around issues of market efficiency, for

⁵³ Supra Section 3.4.

⁵⁴ For a detailed discussion of the mechanics of a financial transactions tax, see Ross Buckle and Gill North, 'A Financial Transactions Tax: Inefficient or Needed Systemic Reform' (2012) 43 *Georgetown Journal of International Law* 745.

⁵⁵ John Grahl and Photis Lysandrou, 'The European Commission's Proposal for a Financial Transactions Tax: A Critical Assessment' (2013) 52 *Journal of Common Market Studies* 248.

⁵⁶ European Commission, 'Innovative Financing at a Global Level' (2010) Commission Staff Working Document 23
http://ec.europa.eu/economy_finance/articles/international/documents/innovative_financing_global_level_sec2010_409en.pdf; Patrick Honohan and Sean Yoder, 'Financial Transactions Tax: Panacea, Threat, or Damp Squib?' (2010) 26 *The World Bank Research Observer* 139.

⁵⁷ International Monetary Fund, 'A Fair and Substantial Contribution by the Financial Sector' <https://www.imf.org/external/np/g20/pdf/062710b.pdf>.

example, lower asset prices, decreased liquidity, greater market volatility, arbitrage and the distortion of financial markets,⁵⁸ and seem to repeat arguments that resulted in the deregulation of OTC-DMs in the run up to the financial crisis.

The effectiveness of a financial transaction tax on OTC derivative transactions is however dependent on its unilateral adoption on a global scale, or at the very least in all G20 countries. Regulatory cooperation in the implementation of said mandate is therefore crucial. This is especially important as studies show that the imposition of a financial transaction tax can result in the migration of trading volume from one jurisdiction to another.⁵⁹ For example, if the EU was to unilaterally impose a tax on financial transactions, it is likely that said tax could merely drive the activities it aims to curb out of the EU and to off shore tax free jurisdictions.⁶⁰ It is also unlikely that these jurisdictions would be willing to impose an equivalent tax on the arbitrageurs.⁶¹ This generally highlights the importance of regulatory coordination in ensuring the effectiveness of regulatory reforms.

d. Blockchain to the Rescue?

Blockchain technology has gained rising popularity on the agendas of financial market participants due to its perceived ability to generate efficiencies in the post-trade environment. Blockchain can be described as a sequential, decentralised, and shared database that is synchronised across a network of diverse entities, sites, and jurisdictions, and secured by methods of cryptographic proof.⁶² Records of a transaction are entered into the database, subsequently verified, incorporated into a block, marked with a timestamp, and then connected to the next block using a cryptographic signature.⁶³ Furthermore, as the decentralised

⁵⁸ See for example Paul Kupiec, 'Noise Traders, Excess Volatility, and a Securities Transactions Tax' (1996) 10 *Journal of Financial Services Research* 115.

⁵⁹ Katuscia Mannaro, Michele Marchesi and Alessio Setzu, 'Using an Artificial Financial Market for Assessing the Impact of Tobin-Like Transaction Taxes' (2008) 67 *Journal of Economic Behavior & Organization* 445; Paolo Pellizzari and Frank Westerhoff, 'Some Effects of Transaction Taxes under Different Microstructures' (2009) 72 *Journal of Economic Behavior & Organization* 850.

⁶⁰ Phillip Arestis and Malcom Sawyer, 'How Many Cheers for the Tobin Transactions Tax?' (1997) 21 *Cambridge Journal of Economics* 753.

⁶¹ Blakemore (n 52).

⁶² David Yermack, 'Corporate Governance and Blockchains' (2017) 21 *Review of Finance*.

⁶³ Gareth Peters and Guy Vishnia, 'Blockchain Architectures for Electronic Exchange Reporting Requirements: EMIR, Dodd Frank, Mifid I/II, Mifir, REMIT, Reg NMS And T2S', *Handbook of Blockchain, Digital Finance, and Inclusion*, Volume 2 (Elsevier 2017); Carla Reyes, 'Moving Beyond Bitcoin to an Endogenous Theory of Decentralised Ledger Technology Regulation: An Initial Proposal' (2016) 61 *Villanova Law Review* 197.

nature of blockchain suggests, each participant has an identical copy of the record.⁶⁴ The distributed nature of blockchain means there is no single institution responsible for the control and maintenance of the ledger.⁶⁵ In addition, the continual reconciliation of blockchain networks ensures that the blockchain is updated to reflect new transactions.⁶⁶ This design also ensures that data on a blockchain is immutable, as to retrospectively change data recorded on a blockchain, an actor would need to alter all subsequent blocks - which would require consensus by a majority of the participants on the network.⁶⁷

While all blockchains necessarily use distributed ledger technology, it should be noted that not all distributed ledger technology can be classified as blockchains due to the use of blocks in blockchains – a feature that may not be present in other distributed ledgers. In addition, other distributed ledgers typically do not track the chronological details of a transaction. Instead these ledgers operate on the basis of consensus on said ledgers which are updated with new transactions subsequent to a validation exercise.⁶⁸ Blockchain was originally developed to support the functioning of bitcoin, a digital currency⁶⁹ due to its ability to negate the need for intermediaries in payment, clearing, and settlement systems.⁷⁰ This disintermediation is possible due to the fact that Bitcoin and its blockchain obviate the need for trust in payment transactions, replacing the role of gatekeepers with a proof of work consensus process for the verification of transactions. This stage of blockchain usage has been colloquially termed Blockchain 1.0.⁷¹

⁶⁴ Primavera De Filippi and Benjamin Loveluck, 'The Invisible Politics of Bitcoin: Governance Crisis of a Decentralized Infrastructure' (2016) 5 Internet Policy Review 7.

⁶⁵ Conrad Bahlke and Marija Pecar, 'Unlocking the Blockchain: Regulating Distributed Ledger Technology' (2016) 36 Futures & Derivatives Law Report 2.

⁶⁶ Ryan Surujnath, 'Off the Chain! A Guide to Blockchain Derivatives Markets and Its Implications for Systemic Risk' (2017) 22 Fordham Journal of Corporate and Financial Law. 262.

⁶⁷ Philipp Paech, 'The Governance of Blockchain Financial Networks' (2017) 80 The Modern Law Review 1081.

⁶⁸ Andrea Pinna and Wiebe Ruttenberg, 'Distributed Ledger Technologies in Securities Post-Trading' (2016) 172 European Central Bank: Occasional Paper Series 9.

⁶⁹ Subsequent to the advent of bitcoin, over one thousand, five hundred cryptocurrencies in existence. See for example Ether, <https://www.ethereum.org/ether>; Litecoin, <https://litecoin.org>; Monero, <https://www.getmonero.org>.

⁷⁰ For more on Bitcoin, see: Satoshi Nakamoto, 'Bitcoin: A Peer-To-Peer Electronic Cash System' (2009) Working Paper <<https://bitcoin.org/bitcoin.pdf>>; Rainer Böhme and others, 'Bitcoin: Economics, Technology, and Governance' (2015) 29 Journal of Economic Perspectives 213; Angela Walch, 'The Bitcoin Blockchain as Financial Market Infrastructure: A Consideration of Operational Risk' (2015) 18 New York University Journal of Legislation & Public Policy 837.

⁷¹ Surujnath (n 66) 264.

Subsequent variations of bitcoin's blockchain called Blockchain 2.0 have been more flexible in terms of the transactions that can be recorded on the blocks. An example being Ethereum's blockchain, which enables users trade entitlements, and which is capable of running smart contracts.⁷² Consequently, it is unsurprising that proposals have been made for the extension of blockchain to other real-world problems on a wholesale basis. In the financial context, the possible extension of blockchain to the trading of financial assets, for example, securities and derivatives has given rise to proposals for its extension to a variety of uses in financial markets including clearing, settlement, trading and regulatory reporting, with financial industry participants viewing blockchain as a major innovation.⁷³

The taxonomies of specific blockchains range from permissioned to permissionless blockchains, and from private to public blockchains.⁷⁴ A permissioned blockchain⁷⁵ typically has one or more identifiable and accountable participant(s). Additions to this type of blockchain are verified through a limited consensus process implemented by pre-selected trusted individuals. An example of a permissioned blockchain is Corda⁷⁶ a distributed ledger developed by R3 CEV.⁷⁷ Conversely, a permissionless blockchain allows anyone input data into the ledger and cannot be owned. To preserve the veracity of data entered into the ledger, participants have to reach consensus on the state of the blockchain.⁷⁸ In the Bitcoin context, consensus is achieved through the proof of work model, a decentralised consensus procedure that combines cryptography and economic incentives to ensure participation and security.⁷⁹

⁷² Paech (n 67); Philipp Paech, 'Securities, Intermediation and the Blockchain: An Inevitable Choice between Liquidity and Legal Certainty?' (2016) 21 Uniform Law Review 630.

⁷³ Chris Reed and others, 'Beyond Bitcoin - Legal Impurities and Off-Chain Assets' (2018) 26 International Journal of Law and Information Technology 160; Walch (2015) 844.

⁷⁴ Peter Yeoh, 'Regulatory Issues in Blockchain Technology' (2017) 25 Journal of Financial Regulation and Compliance 197.

⁷⁵ Examples of permissioned blockchains include Ripple and Hyperledger. See <https://ripple.com/> and <https://www.hyperledger.org/> respectively.

⁷⁶ <https://www.corda.net/>

⁷⁷ R3 CEV is a company that leads a consortium of over 70 of the world's leading financial institutions in exploring the application of blockchain in financial markets. See <https://www.r3.com/>

⁷⁸ Paech (n 72) 1081.

⁷⁹ De Filippi and Loveluck (n 64) 6.

Blockchain is also promising in the area of smart contracts. Consequently, while this thesis does not deal with the compatibility of smart contracts with extant legal frameworks, it is useful to briefly consider their potential application to derivative contracts.⁸⁰ While there is no precise legal definition of a smart contract due to disparities in legal and technological characterisations, a smart contract can be described as a computerised process tasked with executing the terms of a contract.⁸¹ Smart contracts rely on code to execute and enforce contracts without external input from contractual parties, dispensing with the need for trust.⁸² Smart contracts provide the means via which contractual obligations can be transposed into blockchain⁸³ as these contracts reduce these contractual obligations into if/then statements.⁸⁴ Blockchain subsequently enables the immutable and secure recording and functioning of smart contracts, as these contracts are typically created by inserting lines of code into the blockchain.⁸⁵ The manner in which these smart contracts are uploaded to a blockchain vary, dependent on the genus of blockchain in play.⁸⁶

Blockchain and smart contracts may have radical effects on the clearing, settlement, trading and reporting of OTC derivatives, which are currently significantly intermediated through the efficiencies they provide for the reconciliation and recording of derivative trade. Smart contracts' automated nature can also reduce the operationally intensive operations of CCP risk mitigation tools.⁸⁷ It is not entirely clear whether blockchain is able to entirely replace CCPs as intermediaries in OTC-DMs given the fact that CCPs also mitigate counterparty credit risk. Arguments can however be made for blockchain and smart contract based CCPs. Awrey theorises that this could be possible through the structuring of these blockchain based CCPs as permissioned

⁸⁰ For a full discussion of the legal implications of smart contracts, see ISDA and Linklaters, 'Smart Contracts and Distributed Ledger – A Legal Perspective' (2017) White Paper <https://www.isda.org/a/6EKDE/smart-contracts-and-distributed-ledger-a-legal-perspective.pdf>.

⁸¹ Pierluigi Cuccuru, 'Beyond Bitcoin: An Early Overview on Smart Contracts' (2017) 25 International Journal of Law and Information Technology 185.

⁸² Maya Chilaeva and Pia Dutton, 'Smart Contracts: Can They be Aligned with Traditional Principles or are Bespoke Norms Necessary?' (2018) 8 Journal of International Banking and Financial Law 480.

⁸³ Pinna and Ruttenberg (n 68) 18.

⁸⁴ Surujnath (n 66) 273.

⁸⁵ Pinna and Ruttenberg (n 68) 18.

⁸⁶ Surujnath (n 66) 273.

⁸⁷ Discussed Supra Chapter 4.

networks, which ensures that participants of the blockchain meet the requisite OTC-DM participant requirements, and can be held accountable for breaches of the CCP's rules. Smart contracts, are subsequently then responsible for calculating margin amounts.⁸⁸ Margin could be automatically provided through a pre-filled cash ledger whose funds are held in escrow, or alternatively, transferring assets from other ledgers to a collateral ledger. Upon the maturation of the contract, all obligations are calculated by a smart contract and the relevant payments are made and the derivative position is closed out. These calculations could be made via access to third party databases which would provide the necessary variables necessary for the calculation of payment and margin obligations, which will be adjusted in real time.⁸⁹

The advent of smart contracts also raises new possibilities of a decentralised autonomous organisation administering the crypto clearing house. This could occur through the use of a number of smart contracts interacting amongst each other, and attached together to form an autonomous decentralised organisation. The relevant governance and decision making processes of these decentralised autonomous organisations could be coded directly into the relevant smart contracts – consequently removing the inefficiencies that characterise large organisations and the regulatory capture rampant in financial markets generally and OTC-DMs specifically.⁹⁰ In terms of the centralised trading of derivatives, blockchain could also provide an alternative to limit order books typically offered by trading venues. A blockchain based OTC derivatives trading venue would be a peer to peer trading platform, market participants could submit bids and asks anonymously directly to the blockchain which then computes the perfect match. This results in a reduced or minimal role played by traditional trading venues and brokers in OTC-DMs. However, this would still be quite similar to the role played by traditional trading venues.

⁸⁸ Dan Awrey, 'Split Derivatives: Inside the World's Most Misunderstood Contract' (2018) SSRN Electronic Journal 59.

⁸⁹ Euroclear and Oliver Wyman, 'Blockchain in Capital Markets: The Prize and the Journey' 10 <http://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/feb/BlockChain-In-Capital-Markets.pdf>.

⁹⁰ For more on autonomous decentralised organisation, see Wright and De Filippi (n 92) 15–17.

Blockchain however provides the greatest efficiencies in the area of trade reporting. Blockchain's ability to accommodate complex transactions through the freedom it affords users to create complex structures also lends itself easily to adaptation for trade reporting purposes.⁹¹ Current derivatives market infrastructure typically utilises centralised databases. Given the constantly evolving nature of a derivative contract's lifecycle, and the need to constantly communicate and record derivative contract lifetime events, the current centralised trade reporting regime can be viewed as inefficient. Incorporating blockchain into the trade reporting process ensures that the relevant market participants possess a single shared and accurate record of financial transactions, authorised updates to which can be made and viewed by the relevant parties in real time, thus ameliorating the fragmentation that now characterises financial record keeping in the post-GFC regulatory climate.⁹² As highlighted above,⁹³ this fragmentation of information creates difficulty in aggregating data for regulatory reporting purposes. This is especially crucial given the fact that market participants are bound to be using different internal systems. Blockchain based trade reporting will result in the creation of a single record of a transaction, promoting seamless compliance with record keeping mandates. Given that information in the blockchain's blocks are immutably stored, the need for onerous record keeping on the part of reporting counterparties is obviated as all the pertinent information is stored on the blockchain within easy regulatory reach when required. Consequently, market participants will not have to separately report transactions to TRs and maintain records of these transactions.

Generally, the advent of blockchain and smart contracts opens up the possibility of self-executing smart derivative contracts.⁹⁴ The feasibility of smart derivative contracts has been demonstrated by a Barclay's bank pilot, which imported the terms of an interest rate swap into Corda resulting in the automatic performance

⁹¹ Pietro Ortolani, 'Self-Enforcing Online Dispute Resolution: Lessons from Bitcoin' (2016) 36 *Oxford Journal of Legal Studies* 608.

⁹² ISDA, 'The Future of Derivatives Processing and Market Infrastructure' [2016] ISDA Whitepaper 36.

⁹³ *Supra* Chapter 5.

⁹⁴ Aaron Wright and Primavera De Filippi, 'Decentralized Blockchain Technology and the Rise of Lex Cryptographia' (2015) *SSRN Electronic Journal* 11.

of the trade.⁹⁵ Efficiencies are created for market participants as there could be a single point for the execution, clearing, and reporting of OTC derivative transactions - further promoting standardisation and the availability of information that firms can use for risk management processes, as well as simplifying the route to price discovery.⁹⁶ In addition, the reporting of lifecycle events would be much simpler as smart contracts can be programmed to collect lifecycle data and automatically report these to regulators.⁹⁷

However, the complexity inherent in the use of a blockchain based OTC-DMs especially given the esoteric cryptographic techniques utilised in this process leads to the conclusion that blockchain based derivatives trade reporting may be the source of endogenous risk in environments of financial stress. For instance, by inhibiting regulatory oversight in periods of crisis. In addition, new methods and technologies provide the means via which market participants can innovate new regulatory arbitrage strategies as advances in technology drive financial innovation.⁹⁸ Oliver Wyman note that:

‘In the first instance, unbundled securities could enable new approaches to financial engineering, enabling specialists to construct bespoke instruments consisting of individual cash flows that meet precise needs in terms of timing and credit risk. These instruments could be financed by issuers selling their own instruments that match the cash flows they expect to achieve, in essence creating swaps without the need for balance sheet intermediation.’⁹⁹

Consequently, regulators must endeavour to stay ahead of these developments to safeguard their ability to survey financial markets and prevent systemic risk.

⁹⁵ Cointelegraph ‘R3’s Corda Could Become the Future of Derivative Contracts’ (2016) <https://cointelegraph.com/news/r3s-corda-could-become-the-future-of-derivative-contracts>.

⁹⁶ For an interesting proposal for blockchain based derivative markets, see Massimo Morini, ‘How the Business Model Must Change to Make Blockchain Work in Financial Markets: A Detailed Example on Derivatives, Two Years Later.’ (2017) SSRN Electronic Journal https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3075540.

⁹⁷ A proposal for the use of smart contracts in reporting can be found in Marc Sel and others, ‘How Smart Contracts Can Implement ‘Report Once’ (2017) SSRN Electronic Journal 3 https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3111508.

⁹⁸ Supra Chapter 2.

⁹⁹ Euroclear and Oliver Wyman (n 89) 10.

This could involve developing a regulatory regime tailored to test and address any risks incidental to the use of blockchain. However, any such regulatory regime must ensure that financial stability and the promotion of innovation are well balanced. That is, regulatory responses to blockchain must not unnecessarily stifle innovation in this area. In other words, any regulatory responses must be flexible.

e. CCP Recovery and Resolution

While as this thesis has shown, CCP clearing has been moderately successful, CCP failure now has an enhanced ability to incapacitate a large segment of derivative markets, and the financial system at large. This raises questions on what steps if any regulators have taken to prevent or mitigate the effects of CCP failure. As has been highlighted in Chapter 4 of this thesis, US authorities have taken steps to designate certain CCPs as systemically important. However, little is said about what is to be done in the event of CCP resolution specifically. Instead the Dodd-Frank Act provides for a general orderly liquidation authority designed to provide the authority required for the liquidation of failing financial companies that significantly threaten the financial stability of the United States.

Under the orderly liquidation authority, the Federal Deposit Insurance Corporation can be appointed receiver of a distressed financial entity. However, the applicability of the orderly liquidation process to CCPs is not entirely clear as its design does not seem to fit in squarely with the design of CCPs. In addition, CCPs and the CFTC are not explicitly referred to in the relevant legislative provisions.¹⁰⁰ From an EU perspective, a major shortcoming of EMIR was its lack of a framework for the recovery and resolution of CCPs.¹⁰¹ The EU has however created a draft regulation to remedy this defect.¹⁰² As of the time of this thesis's submission, the draft of this regulation has not been finalised. A substantial

¹⁰⁰ See for example Stephen Lubben, 'Central Counterparties and Orderly Liquidation Authority' (2016) 36 *Futures and Derivatives Law Report* 1; Julia Lees Allen, 'Derivatives Clearinghouses and Systemic Risk: A Bankruptcy and Dodd-Frank Analysis' (2012) 64 *Stanford Law Review* 1079.

¹⁰¹ Some member states have directed CCPs to create contingency plans, and some member states have also brought CCPs within the general financial sector resolution regimes. See further Alexandra Balmer, *Regulating Financial Derivatives: Clearing and Central Counterparties* (Edward Elgar Publishing 2018) 132.

¹⁰² EU Commission draft Regulation on a Framework for the Recovery and Resolution of Central Counterparties 2016/0365 (COD).

amount of work has also been undertaken by transnational soft law bodies on the issue of CCP recovery and resolution.¹⁰³ Given the embryonic and uncertain nature of the US and EU regimes, CCP recovery and resolution has not been included in this thesis's analysis of the CCP prescription.¹⁰⁴ However it is still useful to briefly consider a few relevant issues at a high level utilising alternative theories of finance of finance as an evaluative framework.

Recovery involves an attempt to restore the CCP to a healthy position, while resolution usually aims for liquidation or recapitalisation and is typically carried out by a public body called a resolution authority.¹⁰⁵ The major difference between these two procedures is that in the case of recovery, loss is allocated in a contractual manner, typically via the rules contained in the CCPs rulebook. Resolution on the other hand is an external process that takes precedence over any contractual arrangements. Having already undertaken a robust discussion of CCP financial resources in Chapter 4, only two contractual restructuring techniques need discussion in this section. These are 'variation margin haircuts,' and 'tear-up'. With variation margin haircuts, CCPs cancel or reduce variation margin payments due to clearing members, while collecting all the variation margin due from clearing members.¹⁰⁶ 'Tear up,' involves the unilateral termination or reduction of exposures by CCPs.¹⁰⁷ From an MFT perspective, these methods of recovery encourage competition by ensuring that market participants hold smaller positions with weak CCPs.¹⁰⁸ However, from an endogenous risk perspective their use promotes uncertainty, given the fact that market participants will be unable to predict the distribution of losses ex ante. This

¹⁰³ See for example Financial Stability Board, 'Key Attributes of Effective Resolution Regimes for Financial Institutions' [2014] https://www.fsb.org/wp-content/uploads/r_111104cc.pdf; 'FSB 2018 Resolution Report: Keeping the Pressure Up' [2018] Seventh Report on the Implementation of Resolution Reforms <https://www.fsb.org/2018/11/fsb-2018-resolution-report-keeping-the-pressure-up/>; 'Financial Resources to Support CCP Resolution and the Treatment of CCP Equity in Resolution' [2018] <https://www.fsb.org/2018/11/financial-resources-to-support-ccp-resolution-and-the-treatment-of-ccp-equity-in-resolution/>; CPMI-IOSCO, 'Recovery of Financial Market Infrastructures' [2019] <https://www.bis.org/cpmi/publ/d121.pdf>.

¹⁰⁴ See generally Chapters 3 and 4.

¹⁰⁵ Darrell Duffie, 'Resolution of Failing Central Counterparties' [2014] SSRN Electronic Journal; Jo Braithwaite and David Murphy, 'Get the balance right: private rights and public policy in the post-crisis regime for OTC derivatives' (2017) 12 Capital Markets Law Journal 488.

¹⁰⁶ David Elliot, 'Central Counterparty Loss-Allocation Rules' [2013] Bank of England Financial Stability Paper No. 20

¹⁰⁷ Ibid.

¹⁰⁸ Duffie (n 105) 5.

is especially crucial given the volatility that characterises the environments of financial stress that would necessitate a CCP's resort to these methods of loss allocation. The fundamental uncertainty precipitated by the use of these tools may also trigger a loss of confidence in the relevant CCP,¹⁰⁹ and result in herding and a run on said CCP. There may also be legal challenges to the legality of the substantive rules under which the haircuts or tear-ups were performed, or on the basis of procedural irregularities¹¹⁰ – exacerbating endogenous risk by amplifying fundamental uncertainty.

Furthermore, the imposition of these loss allocation mechanisms may constitute liquidity drains on otherwise solvent clearing members, and promote moral hazard as their existence may result in a lax approach towards risk management by CCP management, and encourage the adoption of risky positions by clearing members.¹¹¹ CCP ability to judge and mitigate the effects of the use of these tools is also questionable given the fact that CCPs do not pose information on clearing member balance sheets.¹¹² This raises questions on the efficacy of these measures as recovery tools to be used by the CCP. Consequently, it is suggested that these tools should only be available to the relevant regulators. Other strategies for CCP recovery planning include the design of adequate supervisory stress tests.¹¹³ However, given this thesis's preceding analysis of risk modelling and CCP risk management, it is highly unlikely that this strategy will fully account for endogenous risk.¹¹⁴

In addition, there are historical antecedents for CCP failure,¹¹⁵ which makes the existence of rules on CCP resolution paramount. It is essential that CCP resolution rules are framed in transparent and predictable terms given the effect that this framing would have on ameliorating the imperfect knowledge constraint

¹⁰⁹ Braithwaite (n 105) 491.

¹¹⁰ Ibid 494.

¹¹¹ Concerns with the use of these loss allocation tools are similar to those highlighted by this thesis in its analysis of CCP financial resources. See further Section 4.3.

¹¹² Awrey (n 88) 57.

¹¹³ Financial Stability Board, 'Progress Report on the CCP Workplace' [2016] <https://www.fsb.org/2016/08/progress-report-on-the-ccp-workplan-2/>; CPMI-IOSCO, 'Framework for Supervisory Stress Testing of Central Counterparties (CCPs)' [2018] <https://www.bis.org/cpmi/publ/d176.htm>.

¹¹⁴ Supra Section 4.3.

¹¹⁵ For a discussion of these failures, see Jon Gregory, *Central Counterparties: Mandatory Central Clearing and Initial Margin Requirements* (John Wiley & Sons 2014).

and reducing fundamental uncertainty. This raises questions on the optimal allocation of CCP losses while preventing the occurrence of fire sales and ensuring the smooth continuation of clearing services. The complex contractual networks inherent in CCP clearing¹¹⁶ complicate this issue. This reinforces the need to provide regulators with broad, far reaching powers to enable them respond dynamically to curtail endogenous risk. It is also imperative that rules on resolution triggers are drafted as broadly as possible to ensure that regulators are able to respond flexibly by stepping in where a CCP hasn't exhausted its recovery resources, but the use of said resources would further exacerbate financial instability by draining systemically important clearing members.¹¹⁷

Possible resolution outcomes include the liquidation of the CCP, the sale of the CCP, the reorganisation of the CCP using capital injections, and the transfer of the CCP's clearing obligations to a 'bridge' CCP. Given the potential for catastrophic effects of liquidating a CCP, this is not an option. However, it is essential that regulators do not adopt a one size fits all approach when resolving CCPs and respond flexibly to the complexity that characterises these financial market infrastructures. For instance, the use of 'bridge' CCPs may disrupt cross CCP netting in the case of CCPs with complex group structures, thus exacerbating endogenous risk.¹¹⁸ Furthermore, given the possibility of runs on a CCP in which market participants have lost confidence, it would be useful if resolution authorities were given the power to stay member's contractual rights to terminate their clearing agreements with the CCP. However, it is also essential that CCPs retain the ability to continue making payments to market participants given the severely deleterious effects of doing otherwise.¹¹⁹ Given the essential nature of CCP continuity, CCP recapitalisation appears to be the option that mitigates endogenous risk.

¹¹⁶ Duffie (n 105) 17.

¹¹⁷ Given word count constraints, this thesis does not discuss limits on the exercise of resolution powers, for example, the 'no creditor worse off' principle. On this, see further Braithwaite (n 105) 503.

¹¹⁸ Duffie (n 105) 8.

¹¹⁹ CPMI-IOSCO (n 103).

The above discussions raise questions on what sources of liquidity could be accessed during the resolution of a CCP. It is in this vein that this chapter in its next section makes the case of institutionalised lender of last resort assistance.

f. ‘Brother, can you Spare a Dime?’ Institutionalised Lender of Last Resort Provisions

As discussed in the preceding section, CCP financial resources may be inadequate in environments of financial stress due to certain components of endogenous risk, specifically irrationality, fundamental uncertainty, and imperfect information.¹²⁰ Furthermore, this thesis has demonstrated that while perfectly suitable for securities markets, it is highly unlikely that the centralised trading requirement will withstand environments of financial stress, and that in environments of financial stress, there may be a reduction in liquidity notwithstanding the presence of a price ordering system.¹²¹ Both of these instances can have significantly deleterious effects on the stability of OTC-DMs and the financial system at large. To pre-empt the build-up and amplification of a crisis, insights from alternative theories of finance contextualise the role of the central bank as one of a lender of last resort.¹²² Consequently, given the pernicious nature of endogenous risk, and following the precepts of alternative theories of finance, this thesis recommends that regulators will inevitably have to either provide lender of last resort or liquidity provision assistance¹²³ to market infrastructure, or risk facing a loss of confidence and subsequent withdrawal of liquidity in periods of crisis. The GFC itself highlighted the importance of lender of last resort assistance with regulatory authorities in several jurisdictions including the US and EU providing lender of last resort assistance to a diverse set of financial entities.¹²⁴ Bailouts during the GFC typically took the form of an injection of state funds into the distressed bank in exchange for shares, the

¹²⁰ See also the discussion in Chapter 4.

¹²¹ *Supra* Chapter 6.

¹²² *Supra* Section 2.5.

¹²³ On lender of last resort, see Henry Thornton, *An Inquiry into the Nature and Effects of the Paper Credit of Great Britain* (AM Kelley 1978); Walter Bagehot, *Lombard Street* (Cambridge University Press 2011); Charles Goodhart; Gerhard Illing, *Financial Crises, Contagion, and the Lender of Last Resort* (Oxford University Press 2002).

¹²⁴ Awrey (n 88) 62; Gary Gorton and Andrew Metrick, ‘The Federal Reserve and Panic Prevention: The Roles of Financial Regulation and Lender of Last Resort’ (2013) 27 *Journal of Economic Perspectives* 45.

guarantee to third parties of some or all of the liabilities of the bank, or a state guarantee to the distressed bank of certain of the said bank's assets.¹²⁵

Lender of last resort services in this context could involve the use of central bank liquidity to stabilise CCPs or to stabilise markets and ensure their continued efficient functioning.¹²⁶ Central banks are best positioned to provide lender or dealer of last resort assistance given their virtually unlimited balance sheets, a product of the central bank's monopoly on issuing legal tender,¹²⁷ which in turn instils confidence in market participants.

Historically, lender of last resort assistance has been reserved for deposit taking institutions, with this preference being justified on the grounds of the important role banks play in the economy, and the consequent regulation and supervision banks are subject to.¹²⁸ However, in the post-GFC landscape, CCPs and trading venues while private institutions now perform very public, mandatory functions comparable in a sense to banks. It is only justifiable that these institutions have access to lender of last resort assistance as normal banks would have given the fact that for instance, a loss of confidence in a CCP could result in the failure of the CCP which would have similar effects to the failure of a bank, that is, contagion in the financial system exacerbated by interconnectedness. Consequently, a limited approach towards the construction of lender of last resort may not meet the needs of CCPs and may actually hinder their needs and engender systemic risk.¹²⁹

In the CCP context the institution of lender of last resort assistance ensures that CCPs are not subject to 'runs' from clearing members who are concerned about the financial viability of the CCP. In practice, the provision of lender of last resort services to a CCP would involve the central bank providing emergency liquidity assistance to solvent but distressed i.e. illiquid CCPs, which ensures that the

¹²⁵ John Armour and others, *Principles of Financial Regulation* (Oxford University Press 2016) 346.

¹²⁶ Steven Schwarcz, 'Systemic Risk' (2008) 97 *Georgetown Law Journal* 225; 'The Functional Regulation of Finance' (2014) *SSRN Electronic Journal* 42.

¹²⁷ Ross Cranston, *Principles of Banking Law* (Oxford University Press 2017) 133. See generally Perry Mehrling, *The New Lombard Street* (Princeton University Press 2011).

¹²⁸ Marc Dobler and others, 'The Lender of Last Resort Function after the Global Financial Crisis' (2016) IMF Working Paper 11 <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/The-Lender-of-Last-Resort-Function-after-the-Global-Financial-Crisis-43643>.

¹²⁹ Emiliós Avgouleas, 'Fundamentals of Bank Supervision and the Lender of Last Resort in the Post-2008 Era: A Critical Appraisal and Forward Looking Recommendations' (2017) *SSRN Electronic Journal* 39.

CCP does not become the victim of the endogenous risk that may be associated with it in environments of financial stress. Alternatively, the lender of last resort can guarantee all or some of the CCP's obligations. In the context of the centralised trading requirement, where due to endogenous risk, market participants refuse to participate in trading, this thesis adopts Awrey's suggestion that the central bank could step in to post continuous bid-ask prices on derivative contracts like a dealer normally would.¹³⁰ This encourages market participants to resume trading on venues as soon as possible.¹³¹

A framework determining the manner of assistance lender of last resort assistance will provide, as well as the process for determining how and to whom assistance will be provided is consequently necessary.¹³² The optimal structure of institutionalised lender of last resort assistance is controversial with questions posed on whether these rules should be framed in a discretionary manner, or whether a predefined framework should be set out.¹³³ This thesis recommends that while explicit provisions should be made for lender of last resort assistance, they should not be rigidly defined given that, the lack of an explicit legal framework may cause undue delay when lender of last resort assistance is urgently needed, and that the absence of legal backing to provide lender of last resort to OTC-DM infrastructure may amplify any stress these infrastructures may be subject to. However, the over-formalisation of the lender of last resort process may result in current tools being rendered useless in unique and unforeseen circumstances. Furthermore, where these formalised rules do not reflect reality, they may hold little to no credibility with market participants, and consequently fail to dispel endogenous risk.¹³⁴

A downside to the provision of lender of last resort assistance is the moral hazard it engenders. This moral hazard is the reduced incentive the availability of lender of last resort assistance may have on the incentives of financial entities to protect

¹³⁰ Awrey (n 88) 63.

¹³¹ Steven Schwarcz and Iman Anabtawi, 'Regulating Systemic Risk: Towards an Analytical Framework' (2011) 86 *Notre Dame Law Review* 1404.

¹³² Charles Calomiris and others, 'Establishing Credible Rules for Fed Emergency Lending' (2017) 9 *Journal of Financial Economic Policy* 260.

¹³³ Avgouleas (n 129) 35.

¹³⁴ Calomiris (n 132).

themselves from risk.¹³⁵ For instance, knowledge of the availability of lender of last resort assistance may result in CCPs and clearing members taking on excessive risk. However, it could be argued that given the fact that CCPs are subject to significant operational and prudential regulation, this may be sufficient or if need be may be enhanced, perhaps, in line with the recommendations made by this thesis in this regard.¹³⁶ Furthermore, the institutionalised lender of last resort framework could contain severe financial and non-financial penalties for the management and shareholders of the relevant entities.¹³⁷ Where policy makers also stress the fact that their exercise of lender of last resort assistance is entirely discretionary and that resolution is the preferred route, moral hazard is further disincentivised.¹³⁸

In conclusion, from a MFT perspective, markets tend towards equilibrium and situations requiring the provision of lender of last resort assistance should never come up. Furthermore, the institutionalisation of lender of last resort assistance could result in public intervention in private markets, which goes against the tenets of MFT. However, history has shown time and again that lender of last resort assistance is vital for financial stability. Consequently, it is vital that provisions be made for lender of last resort services.

7.4. Future Research Agenda

This thesis represents the tip of the iceberg in terms of research on the effects theories of finance have on the manner in which financial markets are conceptualised and consequently regulated. In addition, this thesis has only undertaken a fraction of the research necessary for the investigation of the mechanisms of systemic risk, as this thesis's framework has necessarily been restricted by the constraints imposed by the word and temporal limits of doctoral research. It is consequently useful to outline potential areas for future research.

The first area of further research is related to the potential effects alternative theories of financial economics may have on the manner in which financial

¹³⁵ Stéphane Lavoie and others, 'Lessons from the Use of Extraordinary Central Bank Liquidity Facilities' (2011) Bank of Canada Spring Review 27.

¹³⁶ Supra Chapters 3 and 4.

¹³⁷ Bagehot (n 123) 77, 88.

¹³⁸ Schwarz (n 126) 226.

markets are conceptualised, and resultantly regulated. This thesis has attempted to move the conversation away from the dominant economic orthodoxy prevalent in financial markets - MFT. It has done so by introducing three alternative theories of finance, which it argues account more accurately for endogenous risk. There are diverse theories in financial economics which provide a useful alternative to MFT and may be better suited for the evaluation of systemic risk. These include the money view of finance,¹³⁹ game theory,¹⁴⁰ and chaos theory¹⁴¹ among many others. Research which extracts insights from these theories to determine the optimal nature of financial regulation will therefore be worthwhile. Furthermore, empirical research into market participant and regulator perceptions of the performativity or otherwise of financial economics generally and MFT on the regulation of financial markets generally and OTC-DMs specifically will make significant contributions to the literature in this area.

Second, further research is also necessary in relation to CCPs. Given the systemically important nature of post-GFC CCPs and the potentially disastrous effects the collapse of a CCP would have on financial stability, further research is required to answer questions that this thesis has not been able to explore or answer including the optimal nature and scope of CCP recovery and resolution. In addition, given the fact that the precise nature of CCP governance in the US has also not been concretely formulated at this time, this thesis's analysis of CCP corporate governance has necessarily been limited in its scope. Consequently, further research into CCP governance will be of interest and extremely beneficial in the future. This further research could for instance explore whether local corporate law could be adequate in the governance of CCPs. Additionally, given this thesis's criticisms of current regulatory prescriptions on CCP financial resources, further research into possibly viable alternatives will be beneficial.

¹³⁹ Perry Mehrling, 'Essential Hybridity: A Money View of FX' (2013) 41 *Journal of Comparative Economics* 355.

¹⁴⁰ Robert Leonard, Von Neumann, *Morgenstern, and the Creation of Game Theory* (Cambridge University Press 2012).

¹⁴¹ Stephen H Kellert, *In the Wake of Chaos: Unpredictable Order in Dynamical Systems* (University of Chicago Press 1993); Geoff Boeing, 'Visual Analysis of Nonlinear Dynamical Systems: Chaos, Fractals, Self-Similarity and the Limits of Prediction' (2016) 4 *Systems* 37.

Third, as the implementation of the reporting obligation is still at its nascent stage, there is a paucity of information on the effectiveness of this reform, that is, there is little research analysing the coherence and utility of information reported to TRs, as well as the utility of this information for systemic risk detection and mitigation purposes for regulators. Consequently, on the one hand, quantitative research investigating the efficacy of data reported to TRs is necessary for the practical evaluation of the effectiveness of these reforms. On the other hand, research could be undertaken through qualitative studies on the manner in which financial market participants use TR data that is made available to the public, and what the implications of the results of said study are for financial stability.

Fourth, the implementation of the centralised trading requirement is still in its infancy and consequently, this thesis has not been able to explore this reform's effects on OTC-DM market microstructure, and the implications any changes in microstructure may have on the detection and mitigation of systemic risk in OTC-DMs. Future research on this area will consequently prove useful. In addition, quantitative research is required into the effects these reforms may have on market liquidity in environments of financial stress, and broadly, the effects of this reform on financial stability as a whole.

Fifth, this thesis has briefly discussed financial technology and its possible applicability to, and effects on OTC-DMs. Given the fact that technology is a major source of innovation and complexity, further research into the possibly advantageous or disadvantageous effects financial technology may have on the stability of financial markets generally, and OTC-DMs specifically is necessary. Of particular interest in this regard are high frequency and algorithmic trading which this thesis briefly touched on in Chapter 6. This thesis has noted that these technologies may have potentially deleterious effects on financial markets, and future research on the possible advantages or disadvantages of these technologies from a systemic risk perspective is necessary. Closely connected to these technologies are artificial intelligence, cloud computing, and quantum computing which may intensify any potential advantages or disadvantages provided by high frequency and algorithmic trading, as well as present new sources of systemic risk. Resultantly, a comprehensive evaluation of these financial technology developments would have significant academic and practical

benefits. Another interesting financial technology is blockchain, which this thesis has briefly touched on in this chapter. This thesis has briefly noted the potential applications this technology may have in over-the-counter derivative markets. However, this thesis's analysis has been limited due to word count constraints. Resultantly a more detailed analysis of the potential applicability, efficiencies, and perils of this technology in OTC-DMs is necessary.

Finally, this thesis has made a number of recommendations for reforms in OTC-DMs. For instance, this thesis has proposed a financial transactions tax on speculative derivatives, a system of global regulatory cooperation, the institutionalisation of lender and liquidity provider of last resort assistance, and regulatory flexibility among many others. These have been proposed in light of conclusions drawn from this thesis's analysis. Further research can explore how those can be implemented in particular jurisdictions. In addition, of course, research into other potential solutions to lacunae in current OTC-DM reforms may also contribute to academic and policy debates on the manner in which systemic risk can be constrained in OTC-DMs.

7.5 Concluding Remarks

This chapter has consolidated several insights gleaned by this thesis and has noted five general non-exhaustive themes in pre-GFC OTC-DM reforms flowing for the thesis's analysis. These are an increased emphasis on the use of information in the mitigation of systemic risk, a consequent significant reliance on the tools of MFT, the treatment of derivatives as ordinary securities, hybridity in regulatory approaches, and regulatory fragmentation. Having identified these themes and their attendant regulatory challenges, this thesis has tendered a number of normative recommendations in its attempt to articulate a way forward. These include the curbing of speculation in derivatives through the use of a financial transactions tax, global regulatory cooperation, the institutionalisation of lender of last resort assistance, the potential and perils of blockchain technology, and regulatory flexibility. Finally, this chapter has outlined the author's future regulatory agenda.

To conclude, OTC-DMs have been radically transformed in the aftermath of the GFC. While these reforms go some way in reducing the stranglehold MFT has

had on regulators in both the US and EU, this thesis has shown that their ability to enable the orderly functioning of markets in periods of turmoil may be suboptimal. These deficiencies are attributable to endogenous risk, a product of the fundamental uncertainty, imperfect knowledge and irrationality that call financial markets home. This calls into question regulatory ability to detect and mitigate systemic risk under current reforms to OTC-DMs and highlights the need for a shift from a regulatory approach centred on the currently prevailing orthodoxy of MFT, to an approach, which at least considers the insights revealed by an analysis of alternative theories of finance. This thesis's consideration of insights from alternative theories of finance highlights several lacunae in the MFT approach. Consequently, it is obvious from this thesis's analysis that while regulators have done some good in addressing the issues that plagued OTC-DMs prior to the financial crisis – particularly from an MFT perspective, these measures, especially the CCP prescription may turn out to be more harm than good from the perspective of alternative theories of finance. Resultantly, this thesis concludes that regulators still have some way to go in ensuring financial stability.

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