Changing Financial Sector Interconnectivities and their impact on regulatory frameworks

Abstract

This paper explores the changing interactions and interconnections between different sectors of the financial services industry. It focuses on how regulatory frameworks and risk management modelling toolsets across the industry are likely to adapt to these changes. It suggests that current financial services regulatory developments can be grouped into three broad strands driven by: (a) increased focus on systemic risk following the recent financial crisis; (b) increased scepticism amongst regulators and governments that different parts of the financial services industry are inherently different; and (c) continuing societal change driven by IT and other technological developments and by how societies interpret 'fairness'.

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1. Introduction

1.1 This paper explores the interconnections between different sectors of the financial services industry. It focuses on how regulatory frameworks and modelling toolsets across the industry are likely to adapt to changes in these interconnections through time. It is deliberately wide-ranging with a focus that includes banks, insurers, asset managers (and the funds that they create for others) and pension funds as well as on the financial infrastructure on which these players depend. It has a bias towards developments most relevant in Europe.

1.2 The financial services industry is an industry that has seen many changes over the last few decades. Change seems set to continue in the future. This is as true of the way in which it is regulated as it is of the products it offers and the tools and techniques it uses to risk manage these products. In this note we explore a range of issues that seem likely to influence this landscape over the next few years. Topics explored include:

(a) Similarities and differences between different industry participants, including banks, insurers, asset managers, market 'utilities' and pension funds (Section 2)
(b) Attitudes towards systemic risk and macro-prudential policy and how these can be expected to have a major impact on regulation in the next few years (Section 3)
(c) The technological and societal environment, including cyber risk, impact on trends introduced in Section 3 and impact on how analysis of systemic risk might be carried out (Section 4)
(d) Other regulatory drivers and trends, highlighting the underlying rationales behind a range of current EU regulatory initiatives (Section 5)

1.3 The paper also contains three Appendices. These consider in more detail (A) a conceptual framework for capital adequacy across the financial community; (B) mandatory central clearing of some types of derivative (EMIR, Dodd-Frank etc.) and (C) resolution planning.

1.4 Some of the topics highlighted in this paper were explored at a workshop at the Risk and Regulation Forum in Barcelona in late September 2014 and at a subsequent Actuarial Association of Europe meeting in early October 2014. The author would like to thank the participants at these meetings for their valuable input on an earlier draft of this paper. A link to the associated presentation for the RRF Forum is available here.

2. Similarities and differences between different industry participants

Banks and insurers

2.1 One obvious place to begin analysing changing interactions between different parts of the financial services industry is to consider the business models applicable to different industry sectors. Table 1 does this for banks and insurers.

Table 1: Typical bank and insurer business models

	Banks	**Insurers**
Monetary role industry mainly fulfils	A means of payment in exchange for goods and services	A store of value, permitting deferred consumption and smoothing
Other roles	Financial services	Risk pooling
Comparative advantage	Screen and finance short-term projects	(as investors) invest long-term and gain from illiquidity premium
Core business activities	Largely asset-driven, often supported by leveraged balance sheets	Mainly liability-driven, less leveraged and often less exposed to 'runs'
Exposure to systemic risk from any one firm?	Higher	Lower
Risk that safety net costs fall on government?	Higher (more 'essential' to current economic activity)	Lower

2.2 Impavido et al. (2011) expand on this table to draw out other differences between these two types of firm. These differences include their typically different funding bases, capital levels and accounting bases and the extent to which each is typically constrained by explicit ('Pillar 1') regulatory capital requirements.

2.3 However, the differences between banks and insurers in Table 1 can be overplayed:

(a) Some essentially economically equivalent investment/savings products can in effect be provided by either type of firm, e.g. investment bonds, term deposits offered by banks and term-certain annuities offered by insurers.

(b) Likewise some forms of protection products can in effect be provided by either type of firm. For example, investment guarantees and options written by investment banks can have similar economic characteristics to variable annuity options written by insurers. Trade finance offered by banks may look similar in substance to surety bonds offered by non-life insurers.

(c) Both types of firm are active in investment markets. Both may write or buy credit default swaps.

(d) Both may be subsidiaries of each other (or of holding companies spanning both sectors). This means that each is exposed to group or contagion risks deriving from the other sector.

2.4 What is clear is that regulators and politicians have become more cautious of late about automatically assuming that firms in different sectors are fundamentally different. The regulatory mind-set that is arguably most in the ascendancy at the moment involves focusing on systemic risk. We explore this topic further in Section 3. The financial crisis may be most directly associated in the public mind with the default of Lehman Brothers. However, at about the same time as Lehman defaulted the US Government stepped in to rescue an insurer, AIG, and some money market funds (MMFs).

2.5 The increased focus on systemic risk can be seen in the way in which many countries now organise their (financial sector) regulatory structures. For example, the UK has a Prudential Regulation Authority (the PRA, part of the Bank of England) that supervises the capital requirements of banks and insurers. It also has a Financial Conduct Authority (the FCA) that supervises firm behaviours. However, arguably at the top of the tree is its Financial Policy Committee, which is able to give guidance to both the PRA and the FCA, see e.g. PRA (2012).

Other financial market participants

2.6 When we move beyond the confines of banking and insurance to other financial services entities, we see a similar perceived blurring of business boundaries:

(a) Of the major types of financial services firms, traditional asset managers perhaps have a business model least like either traditional banking or insurance. Such asset managers typically act as agents rather than principals. They typically have very modest capital bases relative to the sizes of their assets under management (AUM). They will often charge ad valorem fees on assets they manage but do not have on their own balance sheet. This means that their main direct risks are typically mainly operational in nature (e.g. the risk of investing their clients' money in a manner that is outside the brief given to them by their clients).

However, they may manage assets on behalf banks or insurers. Their products may compete directly against products offered by savings-orientated life insurers.

Indirectly, they may have significant market risk exposures (particularly relative to the size of their balance sheets) due to the exposure of their future fee revenue streams to changes in the market values of their AUM. They may be owned by financial conglomerates or dependent for much of their business from banking or insurance associates.

(b) Hedge fund managers (and some other specialist asset managers) conceptually have business models similar to those of traditional asset managers (but often with a greater proportion of revenue coming from performance related fees).

However, they may have turnover levels more closely aligned to those of investment bank proprietary trading desks (to the extent that investment banks still carry out such activities!). They may have recruited extensively from or have been founded by staff from such trading desks. They are also increasingly being seen as potential providers of market liquidity as banks retreat from this activity.

(c) Exchanges and clearing houses or central counterparties (CCPs) facilitate market transactions carried out between other market participants. They appear to play a quite different role to banks, insurers and asset managers.

However, the shift towards central clearing of derivatives, see Appendix C, has highlighted many similarities between such organisations' business models and those of some parts of the firms that use their services. One lesson we can draw from modern business trends is that established business relationships can be destroyed by adoption of disruptive new technologies and business processes, see Section 4. Exchanges used to be mainly specific to individual jurisdictions. However, most have now shifted to for-profit business models and have become increasingly global in nature, just like most of the larger firms using them. A core role of exchanges is to facilitate access to market liquidity. They are not, however, the only players who perform this function and so can be disintermediated by (or can disintermediate) others.

2.7 In many parts of the financial services industry much of a firm's value relates to its human capital. Here too there are signs of increasing blurring of applicable staff skillsets across different parts of the financial sector. The permeation of ideas and approaches across the industry has made it easier for individuals to move between different types of firm. This arguably facilitates other types of harmonisation across the financial services industry.

2.8 The increasing tendency to view firms (and other entities) across the financial services sectors as forming a single overarching 'industry' has other self-reinforcing aspects. For example:

(a) Firms' business models (and/or owners) may change through time. This increases demand for staff who understand business models adopted in other parts of the industry and reinforces the effects noted in Section 2.7.

(b) The greater the extent to which firms in different sectors are perceived to be inherently similar, the greater the incentive and rationale for adopting similar regulatory frameworks for them. Also greater is the incentive for adopting 'unitary' regulators or supervisors whose remit spans different industry sectors. Adoption of unitary regulation in turn promotes similar behaviour patterns across the affected

sectors (hopefully desirable behaviours!). It also encourages journalists, politicians and other commentators to view such entities as similar.

(c) Academics and other thought leaders can be increasingly expected to seek common strands between sectors. The entire financial services industry in some sense derives from the invention of money and the uses societies have made of this invention. It is therefore highly likely that when we seek such common strands there will be some to be found.

(d) It increases the tendency of disciplines such as risk management to disseminate techniques and ideas across the relevant sectors. For example, if an approach to market or credit risk is perceived to be useful in one sector then it is likely to be perceived to be useful in other sectors. Consulting and software firms supporting such activities have a natural incentive to market their services as widely as possible.

2.9 Perhaps the most obvious part of the financial services industry that fits less well into the above picture is the defined benefit (DB) sector (and perhaps also the related 'collective' defined contribution (CDC) pensions sector). Countries in which this sector is most pronounced include USA, UK and (for CDC) the Netherlands. This part of the wider financial community is less harmonised across jurisdictions (and with other parts of the financial services industry) than most other parts of the industry.

Current capital adequacy frameworks used in this sector do not fit easily with approaches seen elsewhere in the industry. For example, in the UK there is a heavy reliance on future contributions from sponsors to meet promises already made and in the Netherlands there is heavy reliance on conditional benefit structures.

Even the assertion that the pensions sector is 'part of' the financial services industry is anathema to some, who view such pension arrangements as primarily driven by how labour arrangements are (or ought to be) structured in the relevant locality. We discuss the possible outlier status of the DB (and CDC) pensions industry further in parts of Sections 3, 4, 5 and 6.

3. Attitudes towards systemic risk and macro-prudential policy

3.1 We noted in Section 2 that a particularly important driver of regulatory change at the present time is increased regulatory and governmental focus on systemic risk. Politicians and regulators worry about systemic risk because they have seen the system-wide impact of the recent financial crisis (by which we mean the 2007-09 Credit Crisis). They do not want to see a repeat any time soon. Maybe they also remember how political revolutions (which they have little interest in fostering) have often been triggered by financial crises. In central banking circles this increased focus on systemic risk is associated with (although not identical to) an increased focus on 'macro-prudential policy'.

3.2 Perhaps as important, from our perspective, is that politicians and regulators appear to view with increased suspicion the idea that different components of the financial sector are necessarily disjoint when it comes to potential to create, amplify or transmit systemic risk. They worry that any type of firm can contribute to systemic risk.

Global Systemically Important Financial Institutions

3.3 We see this in the decision to classify both some insurers and some banks as global systemically important financial institutions (G-SIFIs). Around 10 insurers have already been classified as global systemically important insurers (G-SIIs) and around 30 banks as global systemically important banks (G-SIBs). G-SIIs and G-SIBs are considered potentially 'too big to fail' (TBTF) based on size, interconnectedness, complexity, lack of substitutability, global scope (for banks) as well as volume of non-traditional and non-insurance activities (for insurers).

3.4 The global insurance industry has generally sought to refute the argument that insurers can create systemic risk, see e.g. CEA (2010), Geneva Association (2010). More nuanced are commentators such as Cummins, J.D. (2013) and Cummins and Weiss (2014) who conclude that:

> "*the core activities of U.S. insurers do not pose systemic risk. However, life insurers are vulnerable to intrasector crises, and both life and property–casualty insurers are vulnerable to reinsurance crises. Noncore activities such as financial guarantees and derivatives trading may cause systemic risk, and interconnectedness among financial institutions has grown significantly in recent years. To reduce systemic risk from noncore activities, regulators need to continue efforts to strengthen mechanisms for insurance group supervision.*"

As we shall see below, regulators remain worried that the non-core activities of insurers might still create or at least transmit systemic risk. More generally, they remain worried that insurers (and other non-banks) might increasingly carry out activities that are banking-like in nature. For example, the Bank of England in its June 2014 Financial Stability Report, Bank of England (2014a), noted that:

> *"[Over the previous 6 months] Non-bank lenders also provided increasing amounts of credit to a number of UK sectors. In the CRE [Commercial Real Estate] sector, data from the De Montfort survey suggested that non-banks originated nearly a quarter of all loans during 2013 H2. Some non-bank lenders are also important providers of household credit. For example, finance companies provided finance for around 75% of new car purchases in 2013.*
>
> *Lending by insurance companies and pension funds grew further during 2013. Loans to UK businesses from these companies rose to around £35 billion at end-2013 (Chart 1.24). That was equivalent to 8% of outstanding loans to UK businesses, compared with 4% in 2009. In the past, life insurers have obtained part of their funding by selling annuities to individuals who were investing savings accumulated through defined contribution pension schemes. Changes to the rules governing pension investments, announced in March, allow retirees to use their pension savings more flexibly. That, in turn, could reduce this source of funding for life insurers' lending.*"

An alternative view is that insurers are extending such lending because they have annuity liabilities which they need to match, i.e. if flow of annuity business declines then so might their willingness to lend to such parties.

Groups that are primarily insurance focused can often have banking subsidiaries and vice-versa. Taking this one step further we can conceive of business models that deliberately seek to offer insurance and banking products alongside each other. This is the concept of

'bankassurance'. It was much talked about c. 10 years ago. It is prevalent in some jurisdictions but globally it has somewhat fallen out of fashion as a business model. But who is to say that it won't come back into fashion sometime in the future?

3.5 Like leading global insurers did before them, leading global asset managers are pushing back on the notion that asset managers can pose, create or amplify systemic risk. This is despite some types of asset management products having had a problematic financial crisis and despite the enormous funds under management that the industry controls. Focus on this possibility has been heightened by the Financial Stability Board (FSB) issuing a consultation paper, FSB (2014a), setting out possible assessment methodologies for identifying non-bank non-insurer (NBNI) G-SIFIs. The FSB based its proposals on the following principles:

> *"(i) The overarching objective in developing the methodologies is to identify NBNI financial entities whose distress or disorderly failure, because of their size, complexity and systemic interconnectedness, would cause significant disruption to the global financial system and economic activity across jurisdictions.*
>
> *(ii) The general framework for the methodologies should be broadly consistent with methodologies for identifying G-SIBs and G-SIIs, i.e. an indicator-based measurement approach where multiple indicators are selected to reflect the different aspects of what generates negative externalities and makes the distress or disorderly failure of a financial entity critical for the stability of the financial system (i.e. "impact factors" such as size, interconnectedness, and complexity)."*

The FSB's consultation paper deliberately aims to be comprehensive, covering proposed methodologies for (i) finance companies, (ii) market intermediaries (securities broker-dealers) and (iii) investment funds (including hedge funds). It also includes a 'backstop' methodology applying to all other NBNI financial entities (or entity types) to be used to identify any potential NBNI G-SIFIs not otherwise captured under (i) to (iii). The paper does not propose any specific entities for designation. Neither does it propose any specific policy measures that would apply to NBNI G-SIFIs. Excluded from the FSB's consultation paper are financial market infrastructures (FMIs). This is because under the CPSS-IOSCO *Principles for Financial market Infrastructures*, see CPSS-IOSCO (2012), there is a presumption that all FMIs, as defined in the principles, are systemically important or critical, at least in the jurisdiction in which they are located.

Asset managers have in particular pushed back on the notion that "size" might in isolation provide much of an indication of systemic risk. The most obvious manifestation of this argument would be a very large index fund, investing in, say, the S&P 500 index. Volumes traded in securities underlying this index are in aggregate very large. It is difficult to envisage circumstances in which the trading behaviour of such a fund might create systemic risk, as long as the index fund is being managed appropriately versus its underlying index. At the time of writing this has resulted in the FSB restructuring the weight given to size in its proposals.

Impact to a sector of having some G-SIFIs within it

3.6 The global asset management industry (amongst others) is right to be interested in the whether some non-bank non-insurer entities will be classified as G-SIFIs. The longer-term

implications for the insurance industry of some insurers being classified as G-SIIs are only now becoming apparent. In particular, the existence of some G-SIIs is leading to the development by the International Association of Insurance Supervisors (IAIS) of an international insurance capital standard (ICS).

3.7 One might have been forgiven a year or two back in an EU context for ignoring potential longer-term developments in global insurance capital requirements. Even an EU-wide insurance capital standard in the form of Solvency II then seemed in the balance. But now implementation Solvency II is steaming ahead. This is allowing greater focus on what might come afterwards. Even in 2011, Varnell and Cantle (2011) presciently argued that:

> "*Even as Solvency II is being finalised and delivered and firms work to implement Solvency II with maximum efficiency, future revisions to Solvency II are certain. Since Solvency II has its roots in Basel II, Solvency II will be revised once regulators have fully considered the 2008-2012 financial crisis and determined the role that insurers should play in the global financial system*".

3.8 Once the view is reached that some insurers are G-SIFIs then the following, difficult to fault, chain of argument kicks in. It implies (potentially major) changes in global insurance capital requirements:

(a) If some entities in a particular financial services sector are deemed globally systemically important then we might expect their regulatory capital framework to require them to hold more capital than less systemically important entities. Not all systemic risks might be mitigated by extra capital, but in many cases they will be.

(b) To be able to demonstrate that a G-SIFI actually holds extra capital, we need to be able to identify how much capital it should hold if it wasn't a G-SIFI and separately to identify how much extra it should hold because it is a G-SIFI. The former requires the identification of a suitable (globally consistent) baseline onto which a capital add-on for G-SIFIs can be applied.

(c) To identify such a baseline you need some form of comparable capital standard that applies across jurisdictions for the sector in question. Thus you need a global standard, rather than e.g. one applying in the EU (Solvency II) and a potentially inconsistent one applying in the USA.

This is the backdrop to the proposed new ICS that the IAIS has started to explore. The IAIS is committed to developing the ICS over the next c. 4 years. The ICS is targeted to apply to the 50 or so insurers that are deemed to be internationally active as well as to the subset that are G-SIIs. However, many commentators expect that the standards will in due course percolate more widely across the insurance sector, just as the Basel Accords have done in the banking sector. The ICS is expected to be more risk sensitive than the (interim) Basic Capital Requirements (BCR) that IAIS has been developing, see IAIS (2013a) and IAIS (2014). Both the ICS and the BCR within the wider backdrop of COMFRAME, the common supervisory framework the IAIS has been developing which is currently undergoing field testing.

3.9 Another likely consequence of an added focus on systemic risk is greater longer-term harmonisation of capital requirements across sectors within the financial services industry.

The direction of travel is apparent from the principles being adopted to identify what might constitute a systemically important NBNI institution as set out in FSB (2014a). These principles have been deliberately chosen to be broadly consistent with the corresponding principles for banks, see BCBS (2013), and insurers, see IAIS (2013).

Perhaps more importantly, the existence of G-SIFIs in more than one sector inevitably increases focus on how to handle G-SIFIs that span multiple sectors. At present, global banking capital standards largely circumvent the problem of how to handle insurance (or other non-banking) subsidiaries. However, the IAIS has worked out that it will need to ponder the opposite problem, i.e. how to include banking subsidiaries in its ICS. Presumably in due course such deliberations will percolate back into banking regulatory thought. The need for a comparable base line as per Section 3.8 applies whether or not groups include both banks and insurers. Banks' interactions with affiliated shadow banks are also gaining more attention, see Section 5.

3.10 We can also expect the added focus on systemic risk to have wider economic and business repercussions. As noted above, we have seen a repositioning of the balance of powers and responsibilities within the regulatory community. Central banks and overall economic perspectives have gained greater ascendancy.

Central bankers recognise that this change has some major longer term ramifications. For example, Haldane (2014) notes that:

> "*Macro-prudential policy is gaining ground every bit as quickly as central bank independence did in the 1990s. It has quite radical implications. Pre-crisis credit cycles were allowed to operate largely unconstrained. Macro-prudential policy overturns that orthodoxy, with policy instead leaning against the credit cycle to moderate its fluctuations, both during the upswing and the downswing. It, too, is a big step forward."*

He thinks that a likely consequence of the crisis, and the resulting regulatory response that has seen a clampdown on bank capital and liquidity rules, is that the financial system "*will reinvent itself*" with financial activity and risks migrating "*outside of the banking system*". He is hopeful that the financial system and economy may become less prone to the low-frequency, high-cost banking crises seen in the past. However, he thinks that the financial system could "*exhibit a new strain of systemic risk – a greater number of higher-frequency, higher-amplitude cyclical fluctuations in asset prices and financial activity, now originating on the balance sheets of mutual funds, insurance companies and pension funds*" which could in turn be transmitted to, and mirrored, in greater cyclical instabilities in the wider economy. He thinks it:

> *"… likely that regulatory policy would need to be in a constant state of alert for risks emerging in the financial shadows, which could trip up regulators and the financial system. In other words, regulatory fine-tuning could become the rule, not the exception"*

3.11 Largely absent from such discussions to date have been the systemic risks, if any, posed by pension funds, although they are referred to in passing by Haldane (2014), see above. Presumably most of those in the pension fund industry would argue that pension funds are even less likely to contribute to systemic risk than insurers. However insurers didn't win this argument with the regulators. It is therefore not clear whether pension funds will do so

either. The very largest global (DB) pension funds are mainly sovereign funds, see e.g. Towers Watson (2013). It is tricky to see how in practice sovereign funds might be brought within the scope of macro-prudential supervisory principles without opening up sizeable political debates. However, there are a handful of private sector funds and somewhat more local government funds that might be large enough to fall within the scope of some of the tests proposed by FSB (2014a).

Impact on risk modelling

3.12 The increased focus on systemic risk is important enough as a driver of regulatory thought at the current time to be influencing not just high level principles but also basic risk modelling approaches. Its influence here includes:

(a) Likely greater emphasis on Expected Shortfall (ES) relative to Value-at-Risk (VaR);

(b) Greater emphasis on mathematically simpler approaches to analysing risk such as stress testing relative to more complex statistical VaR-like or ES-like modelling; and

(c) Greater emphasis on reverse stress testing

3.13 Despite industry pushback, BCBS in its fundamental review of the trading book, see BCBS (2012) has continued to promote the adoption of risk measures that it sees as better able to capture 'tail risk' than VaR. It notes that:

> *"A number of weaknesses have been identified with using value-at-risk (VaR) for determining regulatory capital requirements, including its inability to capture "tail risk". For this reason, the Committee has considered alternative risk metrics, in particular expected shortfall (ES). ES measures the riskiness of a position by considering both the size and the likelihood of losses above a certain confidence level. In other words, it is the expected value of those losses beyond a given confidence level. The Committee recognises that moving to ES could entail certain operational challenges; nonetheless it believes that these are outweighed by the benefits of replacing VaR with a measure that better captures tail risk. Accordingly, the Committee is proposing the use of ES for the internal models-based approach and also intends to determine risk weights for the standardised approach using an ES methodology."*

3.14 In this context ES can be viewed as largely the same concept as Tail Value-at-risk (TVaR), also called Conditional Value-at-Risk (CVaR), and Conditional Tail Expectation (CTE). The main difference is that in an academic context ES would typically be viewed as a specific fraction of TVaR, CVaR or CTE given some suitably chosen trigger level and confidence level.

The BCBS proposal can be directly linked to worries about systemic risk. VaR (when applied to a firm's entire balance sheet) is relatively shareholder friendly and not so focused on the interests of customers and regulators, see e.g. Kemp (2009a). When used for setting capital requirements (and if the firm's capital resources equal the VaR), VaR becomes a measure of how much the firm needs to lose before shareholders are wiped out. It fails to capture the quantum of additional losses other stakeholders such as customers and governments might then suffer. These correspond to tail risks that shareholders no longer care about in such a situation (because they have already been wiped out). However in such a situation these tail risks come to the forefront of the minds of the remaining stakeholders. ES does conceptually

capture the quantum of such risks better and is thus more attuned with the conceptual capital adequacy framework set out in Appendix A.

We might therefore expect the use of ES (or some variant) eventually to percolate into capital adequacy computations for other parts of the financial services industry. This is likely to happen faster with sectors that regulators have decided can pose or transmit systemic risks or which contain systemically important financial institutions (SIFIs).

3.15 The association between systemic risk and tail risk also implicitly favours greater attention on stress testing. Only in extreme circumstances is systemic risk likely to kick in, i.e. only in circumstances where robust statistical risk modelling becomes particularly challenging. To mitigate against model risk, regulators have been increasingly promoting use of (less statistical) risk modelling approaches such as stress testing and placing not quite so much reliance on potentially less robust statistically based measures such as VaR.

3.16 Alongside the increased focus on stress testing there is an increased focus on reverse stress testing. This involves identifying scenarios perceived capable of destroying a firm's business model, however implausible they might be, and then seeking to identify how to mitigate such risks. The idea was initially proposed by CRMPG-III (2008) as a tool for mitigating systemic risk. It was proposed in August 2008, i.e. shortly before Lehman defaulted. It has since become widely required across most of the financial services industry (whether or not the firm in question is large enough to be perceived to create, amplify or transmit systemic risk).

4. The technological and societal environment

4.1 No discussion on interconnectivity would be complete without some reference to more general trends in interconnectivity across society as a whole. Perhaps the most obvious of these are ones promulgated by modern information technology (IT) tools such as the internet and social media. Indeed there is entire branch of risk management, namely 'cyber risk' linked to this topic.

Cyber risk

4.2 The relative importance of cyber risk to the risk management community can perhaps be gauged by identifying the proportion of entries on this topic in cross-practice risk management knowledge databases. For example, the RIMS Risk Knowledge database contained 570 entries (articles, white papers, webinars etc.) as at 2 September 2014 split as per Table 2. Roughly 7% of entries were focused on cyber risk at that time. This is not an insignificant proportion bearing in mind that most of the categories with more entries were more general in scope (e.g. "Risk Management (General)", "Global" and "General Management").

Table 2: RIMS Knowledge Base Coverage: number of entries by category as at 2 Sep 2014

Topic	Number	Topic	Number
Business interruption	29	Global	202
Captives	8	Insurance	108
Claims	18	Legal	19
Cyber Risk	41	Legislative	2
Data Migration	1	Research	11
Emerging Risks	18	Risk Management (General)	203
Enterprise Risk Management (ERM)	62	Strategic Risk Management (SRM)	18
Finance	33	Techniques and Tools	11
General Management	144	Workers Compensation	8
Sum of the above figures	936		
Total after excluding duplicates	570		

4.3 The rationale for this interest in cyber risk is summarised by e.g. Rudolph (2012):

> *"Extraordinary online business benefits have revolutionized business and, as digital interconnectedness continues growing daily around the globe, so too do the implications of its power. Managing assets and financial risk in business today relies heavily on the speed and ubiquity of computer connections and networks globally. As Microsoft founder Bill Gates noted, "Information technology and business are becoming inextricably interwoven. I don't think anybody can talk meaningfully about one without the talking about the other."*
>
> *But, for the nation's risk managers, it is clear that cyber-risk has become the revolution's menacing dark side. Increasingly, headlines spotlight massive credit card privacy breaches, allegations of sovereign espionage, and "hacktivists" penetrating the firewalls at the Department of Justice and other federal agencies, sending shudders through risk officers charged with protecting corporate assets, regardless of whether those assets are intellectual property, financial transactions, customer data, supply chains or infrastructure."*

4.4 Of course, the RIMS Knowledge Base database may not be representative for our purposes. Only 0.3% of its entries focused on legislation according to Table 2. Given the practical importance of legislation (Basel III, Solvency II, MiFID, EMIR, AIFMD etc.) to risk managers in the financial sector we might conclude that it is not primarily targeted towards such risk managers. The corresponding Nematrian knowledge base, i.e. its reference library Nematrian (2014a), i.e. www.nematrian.com/references.aspx, is more targeted towards the financial services industry. It currently gives significantly less emphasis to cyber risk and more emphasis to legislation.

4.5 So, how important is cyber risk to risk managers in the financial sector? Reasons for assuming that it is important include:

(a) IT is an increasingly important and complex component of much economic activity, including activity within the financial services sector. High street banks are increasingly relying on telephone, mobile and internet banking and closing down physical high street branches. They also appear to be exploring ways of changing

themselves into more explicitly IT orientated businesses, see e.g. Financial Times (2014).

(b) Some sectors of the financial industry are very heavily reliant on IT. Indeed, some commentators argue that many leading investment banks and financial infrastructure players might as well be IT companies with a financial services spin given the relative size and importance of their IT activities.

(c) Business activities that create value by leveraging network effects are inherently sensitive to downside if these networks are disrupted or trust in them is compromised. Core components of the financial sector, e.g. stockmarkets, are useful to their participants precisely because they leverage network effects. The financial community should, therefore, be peculiarly sensitive to such disruptions.

(d) We have become so used to continuous access to modern technology that even short outages or failures can have severe reputational consequences.

4.6 Conversely, others might argue that there is a danger of overreaction because:

(a) For all the claimed importance of IT to the financial services sector, ultimately its core business activities are not explicitly IT in nature, see Section 2.

(b) When things 'go wrong' authorities and/or Courts ultimately have the power to cancel or unravel inappropriate trades. Ultimately financial service activity involves changing ownership apportionment of other more tangible contributors to economic cash flows. This ownership ultimately depends not on IT per se but on legal jurisprudence, legislative decisions and future economic developments. In other words, there are lots of other sources of financial risk. Some of these, like wars, can be expected to propagate through the financial system whether or not the system makes any use of IT.

(c) The same tendency to reinvent financial sector business models into ones with a more explicit IT focus was evident in the dot com boom. It mostly unravelled in the subsequent dot com bust.

(d) This is not a 'new' threat as such. The financial community already expends a significant effort to mitigate its potential impact.

(e) Behavioural finance argues that we all exhibit behavioural biases such as the 'framing' bias. We are all heavily influenced by what everyone else views as important. Within modern culture (e.g. films, books, TV shows etc.) there is a strong dystopian strand, e.g. action movies where the world is saved from disaster. 'Disaster' in such movies is increasingly likely to include an IT element. Perhaps we are merely projecting these fears into our working environment. Over-focus on 'cyber security' may be just as ineffective at adding value to society as a whole as over-focus on the Year 2000 Bug during the dot com boom and bust.

4.7 On balance it does seem likely that there are some important cyber security issues for the financial community to address. Regulators such as the UK's Prudential Regulatory Authority certainly seem to think so, particularly for those parts of the financial sector that are 'systemically important'. This is here typically equated with importance in relation to the

operational network that forms the financial system as we currently know it. For example Gracie (2014) indicated that:

> *"But cyber presents new challenges. It is not a game against nature. Unlike other causes of operational disruption like fires and floods, we know there are agents out there – criminals, terrorist organisations or state sponsored actors – that have the will, if not necessarily the means, to attack the system. Motivations vary. More often than not they are economic – to defraud banks or their customers or to extract information. But we have seen cases where the motivation is to damage the system, either to destroy data or cause non-availability of systems or both. The capabilities of these actors, and thus the nature of the threat, are rapidly evolving – barriers to entry are low in cyber space and attacks are readily scalable. Low level attacks are now not isolated events but continuous. Unlike physical attacks that are localised, these attacks are international and know no boundaries. Cyber defence as a result has become not a matter of designing a hard perimeter that can repel attacks but detecting where networks have been penetrated and responding effectively where this occurs. As it changes and multiplies cyber is elusive, hard to define and to measure. But it is clear that the risk is on the rise and a growing cause of concern to industry and authorities alike. In 2013 the Bank of England's Systemic Risk survey reported a 10% increase in concerns regarding operational risk (the highest level it has been since the survey began). The risk was cited by 24% of respondents. The threat of 'cyber' attacks was the most commonly mentioned specific risk in this category."*

Gracie argued that the financial community is likely to need to go beyond existing cyber security standards more generally applicable to business as a whole, e.g. the "Ten Steps to Cyber Security" promoted by GCHQ (2012). In his speech he introduced a new framework, CBEST. It focuses on particular IT vulnerabilities within the financial services sector, see Bank of England (2014), and introduces accreditation requirements for commercial cyber threat intelligence providers. Firms or financial market infrastructures (FMIs) that have been identified as being 'core' will be expected to follow appropriate processes as laid out in CBEST to test their cyber security.

Entrepreneurialism versus conservatism

4.8 Many commentators perceive much of the overall value added from society from IT as having come from relatively entrepreneurial and experimental approaches to business, as the debate about 'net neutrality' highlights. Our debate can also be framed as partly a discussion about where along the spectrum between gung-ho entrepreneurialism and stifling conservatism we want the financial services industry (or at least our bit of it) to be positioned.

Established business models have since the earliest of times been susceptible to disruption from new entrants. More recently these disruptions have increasingly included a strong IT element. In recent years entire industries such as the music and book industries have been reshaped by IT companies such as Apple and Amazon. Perhaps the business risk elements of firms' risk profiles are particularly sensitive to IT trends even if other elements of their overall risk profile (such as market and credit risk) are less obviously impacted. Some commentators argue that the financial services industry is heavily regulated, which introduces high barriers to entry (at least for firms proposing radically different business

models). But other industries have been disrupted even though they seemed at the time to face (other) high barriers to entry.

Probably regulators and governments want the financial sector to be *both* entrepreneurial (as long as the entrepreneurship is customer focused) and strongly focused on mitigating cyber risk (and systemic risk). If it is achievable then this would be the best of both worlds, providing the maximum benefit to society and sustaining the maximum trust in money as a medium of exchange.

Interconnectivity and knowledge sharing

4.9 Cyber security is not the only way in which networking and associated interconnectivity is likely to influence the financial sector. In the above discussion we have focused primarily on the infrastructure on which IT software (and hardware) operates. Arguably even more important may be networking effects linked to what the software (and hardware) is designed to accomplish.

Adopting a long term perspective, we might view human history since the Stone Age as involving incremental accrual and dissemination of technological knowledge and expertise. At least that is the optimistic perspective. The pessimistic alternative is that ecological exhaustion, natural disaster, plague, major war or other catastrophe is waiting just round the corner to trip up our ultra-highly specialised and interdependent society, taking us back to the Stone Age. Either way, within this broader context, modern information technology is just the latest tool (albeit a particularly effective one) that we have developed as a species to be 'hyper-social' and to share ideas and technology with each other. Following this line of thought, a propensity towards networking, interconnectivity and knowledge sharing can be argued to be in the DNA of the human race. It can thus be expected to have a pervasive influence on how we act and think, in risk management as in other areas of life.

4.10 Many aspects of regulation can be viewed through this lens. For example, at a high level, regulators and politicians favour adoption of common regulatory structures, such as the three Pillar framework underpinning both Basel III and Solvency II. Kemp (2005) noted that this trend is amplified if the relevant regulators are 'unitary', i.e. regulate the whole (or large parts of) the financial industry. Adoption of common regulatory approaches is also facilitated by sharing of ideas and contacts within and across organisations. These networking activities can help build consensus on how regulation 'ought' to be structured and implemented. Introduction of modern financial industry regulatory frameworks (e.g. Solvency II) require huge commitments of resources from both regulators and industry. Successful implementation (for most interpretations of the term 'successful') requires broad agreement across multiple constituencies.

Why, also, do these regulatory frameworks include a third pillar that focuses on market transparency? The accepted view is that sharing of (some) knowledge across markets about the financial state of individual market participants is inherently desirable. It promotes trust between market participants. It is only by adoption of information sharing protocols, i.e. a 'network', that such dissemination can actually take place.

4.11 Equally relevant are impacts more directly associated with advances in IT. The computational aspects of risk measurement have changed dramatically over the last 20-30 years. The calculations involved have become much more sophisticated and detailed, as the computing power firms have been able to apply to such tasks has expanded. The more

general growth in computing power (of which the financial services industry is only one of many beneficiaries) has been facilitated by sharing of software approaches and hardware manufacturing techniques. Modern economic and academic activity has facilitated these developments. All of these contributors have in turn been helped by accumulation of human, physical and intellectual capital across society as a whole. Hopefully the financial services industry has played a part in fostering this accumulation.

Extending this line of logic, we might view the economy as a whole as one particularly large network involving a particularly large number of participants. The economic growth most of us have benefited from over the last few decades might then be viewed as a particularly compelling example of network benefits. Such a view is, of course, core to the concept that the economy can be disrupted by 'systemic' risks.

4.12 Suppose we try to assess how much this societal accumulation of economic, academic and technological wealth has changed risk measurement and management over the last say 10-20 years. It is difficult when doing so to avoid being strongly influenced by our own preconceptions.

Advocates might point to risk management having become more clearly an explicit business discipline. They might point to increased application of the concept of Enterprise Risk Management. Many more firms now have a Chief Risk Officer or equivalent, a risk management function and an associated risk management framework, partly as a response to regulatory pressures such as FSA (2010).

However, cynics might view such changes as primarily an as yet untested response to the recent financial crisis. They might point out that these changes have not yet really to be tested in anger through other challenging conditions. Roll the clock back 7 years. A common prevailing view was that enhancements in risk management disciplines that were then taking place (such as developments in derivatives and other financial markets) were ushering in a new paradigm. This was perceived to be creating wider (and by implication better) sharing of risk across the economy, benefitting everyone. Are today's approaches to risk management intrinsically more robust than the potentially discredited approaches of yesteryear?

Wider IT developments

4.13 Other IT related issues with the potential to influence regulatory framework development and risk management toolsets include:

(a) *Steady advances in available computing power*

We have become used to steady advances in central processor unit (CPU) power and memory resources as epitomised by Moore's Law. Researchers point out that these advances will inevitably eventually slow down. Scientists and engineers have in the past been able to circumvent what were perceived to be major challenges to Moore's Law, but for how long this will continue is debatable. Some commentators point to potential exponential leaps in computing power, commonly highlighting the possible development of quantum computers. This is despite other commentators such as Markov (2014) noting that for many real-life computational tasks quantum computers offer relatively little theoretical scope for speed enhancement. Perhaps the biggest impact of quantum computers if they can be commercialised is that they

appear likely to offer potentially significant speed enhancements over traditional computers in the factorisation of very large integers. The current difficulty of this mathematical problem underpins most existing cyber security protocols, bringing us back to the discussion on cyber risks earlier in this Section.

There is no doubt that advances in CPU power and memory have had a major influence on risk management toolsets and activities and arguably therefore also on underlying regulatory frameworks. For example, the Standard Formula SCR under Solvency II involves application of multiple stress tests to a firm's balance sheet. The effort involved for complex firms is considerable, relative to what would have been practical 10-20 years ago. Creating internal models with the level of credibility now required to get supervisory approval (especially given the hurdle now set by standard formulae) would have been difficult or impossible then. The same comments apply to the banking industry. The amount of information that firms are being required to publish (and the extent to which this information will need to be made IT-readable) is in the process of increasing dramatically.

(b) *The challenge of 'hard' (computational) problems*

Conversely, some might question whether all these advances have really much enhanced our ability to manage the risks of big financial institutions. We have a lot more information to hand. However, it is much harder to create competitive advantage from collating it. Everyone else is also seeking to enhance management and risk information. Following this line of reasoning, we might expect some upper limit to apply to the amount of effort regulated firms can reasonably apply to risk management. There still has to be a core business generating revenues to be able to afford to invest in such technology!

This issue is linked to how intrinsically easy or difficult it is to answer questions of the sort underlying risk management. Ultimately, most risk management involves extrapolating behaviour into the future. Extrapolation is an inherently challenging mathematical problem, as noted by Press et al. (2007). This is because we don't know for sure whether the data we base our extrapolation on will be representative of the future. Economists might reach much the same conclusions by referring to the seminal work of Knight (1921). He noted that most business activities are inherently uncertain, rather than merely being 'risky' in a statistically measurable sense. Hence we use the term 'Knightian uncertainty'. Indeed in his view one of the core attributes of an entrepreneur is a willingness to take on such uncertainties. Something that is fully Knightian uncertain is inherently not mathematically measurable. No amount of computing power can be expected to fully answer questions we might have about such uncertainties.

Take, for example, credit risk modelling. Three common ways in which portfolio credit risk is modelled involve ratings-based models, equity-based models or mixture models, see e.g. Nematrian (2014b). However, all of these approaches require assumptions about correlations between different issuers if they are to allow for diversification effects. Often these correlations are in practice derived from correlations between the stock returns on the equities of the different issuers (to the extent that these are available). It is well known that such correlations are not very stable through time. Any modelling built on top of these assumptions still faces

the inherent difficulty of estimating what these correlations will be in the future (rather than merely what they have been in the past).

4.14 Firms wanting to achieve competitive advantage from risk management technology might perhaps be better advised to attempt to short-cut barriers we might otherwise expect apply to numerical computations.

For example, a common way of deriving risk management sensitivities is to 'bump and revalue' the balance sheet by applying small shocks consecutively to each input value driving the end valuation. However, suppose balance sheet values can be derived primarily in an algebraic rather than a numerical manner (e.g. with the value of derivative positions expressed in terms of mathematical functions which only at the end of the process are then converted into numerical values). Then a theoretically much quicker way of calculating the sensitivities (and of calibrating the valuation to market prices) can be to derive the sensitivities algebraically. This is the basis of adjoint algorithmic differentiation, a branch of computational finance, see e.g. Homescu (2011).

However, such refinements are not necessarily easy to incorporate within existing risk management systems. Risk management is subject to the same sorts of trade-offs between seeking returns on past investment and making new investments for the future that any other business activity faces.

Another trend we see here is the development of 'proxy' models, see e.g. Cocke et al. (2014). These model the behaviour of other more complicated models to make it easier to apply risk management disciplines in near real time. We only need such models because the underlying models which they proxy take so long to run. But the use of proxy models seems to have increased of late. This presumably indicates that growth in complexity of modelling requirements being imposed by changing regulatory frameworks is outstripping improvements in CPU power and memory resources.

4.15 Some computer scientists are more positive about the ability of firms to harness growing computing power to further business goals. This underlies the current enthusiasm for 'Big Data'. Firms such as Google and Amazon constantly monitor our electronic 'footprint'. They collect so much of it that they can in effect analyse what 'everyone' does, rather than having to extrapolate from the behaviour of small and possibly unrepresentative samples of customers.

There is little doubt that Big Data will be an important strand in how some firms' business models develop, perhaps tempered by constraints imposed by regulators. However, it does not necessarily have so much to offer for some (more second line) risk management purposes. Extrapolation remains an intrinsically challenging endeavour, however big the dataset.

4.16 Take, for example, the use of *telematics* in the insurance industry, e.g. the use of data collected in real time as a car is being driven by the insured driver. The thesis is that this information can help the insurer identify whether a driver is a higher or a lower risk. The insurer should then be able to adjust premiums accordingly. If telematics turns out to be sufficiently good at differentiating between customers then it is likely to become widely adopted (as long as societal norms do not consider it 'unfair', see later).

If our risk management focus is on optimal customer selection and contract pricing (a 'front line' or 'front office' activity) then such developments have the potential to lead to significant changes in business models. If instead our focus is more on risk management as a 'second line' activity (i.e. the sorts of activities that risk management departments and control functions more typically get in involved with) then our focus might be more on the risk of inappropriate customer analysis leading to wrong pricing or business decisions. This can happen whether or not the analysis includes any element of Big Data.

4.17 Advances in computer hardware and software allow us to do many clever things more quickly. However they come with a potential downside, in the form of reduced privacy, see e.g. Mayer-Schönberger and Cukier (2013). The extent to which people view privacy as important or concentrate on particular aspects can vary by society. However, there is little doubt that public concerns in this area have been heightened by discovering that agencies such the U.S. National Security Agency have been undertaking mass electronic spy programs.

Concerns over privacy can perhaps explain the relatively slow take-up of 'cloud' computing by financial services firms. Cloud computing involves execution of computer software steps largely 'in the cloud', i.e. on remote servers usually owned by or rented out from third parties. Financial services firms wanting to make extensive use of such techniques will typically need to transfer (potentially sensitive) data on individual customers to the cloud infrastructure. They may be more sensitive than other potential cloud users about privacy issues because of regulatory requirements imposed on them regarding the use of such data.

The individual versus the group

4.18 Important though they are, developments in IT are just one of many ways in which society is developing. Several other societal developments also have the potential to alter regulatory frameworks and risk management mind-sets significantly. Perhaps the most important of these is the notion of what constitutes 'fairness', including the interplay between 'equality' and 'fairness'.

To some, these two terms might be considered essentially synonymous. However, a quick review of the debate on unisex annuity rates suggests otherwise. The EU Gender Directive now bars EU insurers from setting annuity rates that differ between men and women. The overall effect has been to increase the price of an annuity for men and to reduce it for women, because women on average live longer than men. The EU Gender Directive explicitly provides 'equality' between men and woman in this respect, but whether this is 'fair' is more debatable. It is 'fair' in one respect, i.e. here achieving equality between sexes. However it is 'unfair' in another respect. It deliberately prohibits the use of a risk factor (i.e. gender), even though this risk factor is generally considered to have scientific basis as a means of differentiating between risks. This prohibition results in financial detriment for some members of society relative to what would otherwise have prevailed.

Conceptually the same sorts of issues arise in lots of other ways relevant to the financial services industry. Sometimes they are strongly linked to privacy issues. If I am exposed to some health condition and this information becomes freely available to health insurers then might this stop me being able to get insurance cover? What information should a bank be allowed to collect when deciding on whether to make a loan to me (or my employer)?

Teasing out what constitutes 'fairness' is particularly important for the financial services industry as there is often a regulatory requirement (at least in the UK) to adopt behaviours

that involve 'treating customers fairly' (TCF). When providing a financial product or service to a customer it is clearly possible to adhere to TCF whilst still making a reasonable profit. However, the more 'excessive' the profit can be construed to be, the more debatable the product or service becomes regarding TCF. At what point is the boundary reached? And how might the definition of 'reasonable' or 'fair' change through time?

4.19 Balancing the interests of different parties is arguably particularly relevant to the issue of disclosure of information. This is at the heart of Pillar 3 of modern regulatory frameworks.

The general regulatory view is that there is an information asymmetry between the firm and its customers, between the firm and third-parties and between the firm and its regulators which should be rectified by requiring the firm to make available information it might not otherwise provide. For example, firms have to provide extensive Pillar 3 disclosures, both quantitative and qualitative.

But provision of too much information might offer competitive advantage to others. Would this be in line with 'fairness' (to the firm itself)? For example, under Solvency II insurers will from time to time need to provide line by line information on their individual asset holdings, including market values. But suppose the holding is not very liquid. At what level of illiquidity might such market value data become a potential millstone if the firm wanted to sell the asset? Provision of information can also be costly, and the industry is always quick to argue that such costs are ultimately borne by customers. What is the correct balance between these competing arguments? How might it change through time? How should proportionality be (fairly) interpreted in such a context?

4.20 Added focus on 'fairness' also tends to increase focus on 'fair' values, also called 'market consistent' values in the insurance world. Kemp (2009) defines the market consistent value of an asset or liability to mean its market value, if it is readily traded on a market at the point in time that the valuation is struck, or in all other situations a reasoned best estimate of what its market value would have been had such a market then existed. Formal accounting definitions of 'fair value' have similar features.

Whilst some might claim that referring to such values as 'fair' can be misleading, the terminology does, as Kemp (2009) notes, still encapsulate an important truth. If the aim of a valuation is to provide equity between different parties (which in many cases it is, implicitly or explicitly) then those carrying out the valuation ignore such values at their peril. For example, in court sanctioned work on insurance company restructurings there may be an explicit need for the outcome to be equitable between different policyholder interests. Suppose we were to use demonstrably off-market values in such work. Then one or other party interested in the valuation might object that they were being short-changed relative to the other party. They might argue that we had inappropriately favoured the other party by ascribing a subjective (and by implication 'wrong') value to the asset or liability.

Even clearer is the situation where we are trying to value units in a collective investment scheme with many different investors. It would be very uncommon to use other than market values (if they are available) to identify transaction prices at which one investor can sell to another. Any other approach would be viewed as favouring one client over another.

4.21 Of course, there are many possible actual interpretations of the fair or market consistent value concept. Some of these interpretations are imposed by regulation or Directive (e.g. the meaning ascribed to this term under Solvency II). Firms may argue against a particular

interpretation, e.g. by arguing that the valuation purpose in question does not involve multiple parties. They may then argue that other criteria should be given more weight.

For example, a significant topic of debate in the insurance industry has been the way in which assets matching illiquid liabilities should be valued. Many argue that it should be possible to value the two in tandem in a manner that eliminates or reduces market value related volatility (that might otherwise arise if each side of the balance sheet were valued separately according to 'pure' market consistent principles). The 'matching adjustment' under Solvency II adopts this approach but for a smaller range of insurance liabilities than the EU insurance industry had hoped. The theoretical justification is that as the liabilities involved are illiquid, the need for 'pure' market consistent valuation is reduced. Policyholders cannot in practice trade between themselves. There is inherent inequity between the firm and its policyholders in aggregate (as the firm is seeking to profit from supplying a service to its policyholders). It is argued by some that this reduces the theoretical applicability of 'fair' values.

The potential flaw in this reasoning is that there are other parties involved. The existence of multiple conflicting interests becomes clearer if we decompose the full economic balance sheet of the firm into parts attributable to every stakeholder as per Appendix A. In particular, we discover that the government (or government coordinated and possibly subsidised protection arrangements) has a stake in the balance sheet, especially for systemically important firms. This stake is not typically apparent in traditional balance sheet analysis.

Of course, once we start down this line of reasoning, we rapidly run into other debates. For example, should valuations to be modified to exhibit counter-cyclical features and if so how and to what extent? One reason why the EU Commission appears to have agreed to the matching adjustment in Solvency II is because it is also seeking to promote long term investment (e.g. infrastructure investment). It may have thought that too 'pure' a stance on market consistency might not have promoted this goal.

However, the mere fact that there is this line of debate predisposes regulators and governments to be more cautious about diverging from 'fair' valuations than the industry might like. This is particularly so if regulators and governments have concluded that systemic risk may be involved.

4.22 We have also seen a greater desire for prescription in advance on how 'fairness' should be interpreted. For example, insurers in the UK offering with-profits (i.e. participating) policies are now required to set out in advance how they expect to run the funds backing these contracts. Those parts of the financial sector most involved in (long term) savings arrangements are probably the most likely to be caught up in this particular trend. Many of the conduct of business rules applied to asset managers can be viewed from this perspective. Banks have also come under greater pressure to be seen to treat different parts of society 'fairly' in relation to their lending activities.

Pension funds: the interaction between labour law and prudential regulation

4.23 Perhaps DB pensions (and CDC pensions) are not as much outliers in relation to 'fairness' as touchstones that highlight the contradictory factors influencing societal expectations. Under EU law, there is an uneasy balance between labour law (which is generally reserved to member states) and prudential regulation (which, being related to the single market, is more

the remit of the EU centre). Some in the pension industry would not view pensions as a part of the financial services industry at all, or at most only an oblique component. Rather, they might see it as a (major) customer of the financial services industry. These individuals would focus on the social aspects of pensions, e.g. how it achieves intergenerational transfer of wealth and other less individualistic social goals. Most pension-based government social security programs specifically focus on these sorts of goals. Welfare programmes generally explicitly aim not to distribute resources according to some hypothetical market-value based notion of fairness. Instead they aim to provide safety nets for those members of society to whom fate has dealt a disappointing hand.

And yet, in many respects pension promises often look and feel reasonably like some types of insurance promise. Sometimes there is nearly direct competition between pensions and insurance (and asset managers), especially in the defined contribution (DC) arena.

DB (and many CDC) pension schemes lie somewhere in between the two extremes of (i) social security programmes and (ii) 'pure' DC arrangements. A DB scheme that provides benefits linked to, say, salary shortly before retirement does not aim to mirror the more individualistic approach implicit in a DC arrangement. But it is a financial vehicle nevertheless. There is scope for the promises that it has offered to fail to be met. We shall see in Section 5 that much of financial regulation is about trying to ensure promises are met.

4.24 The interplay between these issues came to the fore in the recent proposals by EIOPA and the EU Commission for a new EU Directive for institutions for occupational retirement provision (IORPs), known colloquially as IORP II. The Directive was initially formulated as a response to the relatively small number of cross-border pension schemes that exist in the EU and to cater for some pension arrangements that were regulated like insurers and were due to see their regulatory framework change with the introduction of Solvency II. By far the most contentious part of the original IORP II proposal was a suggestion for new capital requirements that borrowed ideas from Solvency II. These were attacked as being too insurance-centric or just unworkable. Detractors (especially in the UK) argued that many schemes would be deemed insolvent if the initial proposals were implemented. These parts of the proposal have been dropped. However a new IORP II Directive is still being worked up, concentrating more on governance disciplines, including enhanced risk management processes.

Arguably this compromise implicitly recognises that regulatory thought from other areas of the financial services industry does have some potential relevance to (DB) pensions. Other examples of this line of thought are referred to elsewhere in this paper. As we have noted previously, regulators and governments have become increasingly sceptical of the argument that different parts of the financial services industry are inherently different.

From a technical perspective, many of the issues relating to capital adequacy that the DB pensions industry objected to relate to how to take credit for benefit security mechanisms largely absent elsewhere in the financial sector. These include the ability to access future contributions from sponsors and, in many member states, the existence of state-wide pension protection arrangements. If workable solutions can be found on how to incorporate such elements into economic (or 'holistic') balance sheets then maybe IORP capital adequacy standards will become more harmonised across Europe and with other parts of the financial services industry. Pressure to do so will increase if central banks come to the conclusion that some of these institutions pose systemic risks.

The logistical challenges of analysing systemic risk

4.25 Advances in computer hardware and software can perhaps create the most change in areas where collation, dissemination and utilisation of information is most complex or of most value to the task at hand.

Analysing and responding to systemic risk in the finance sector is perhaps just such a task. Doing it well involves an enormous logistical challenge. Lots of information provided by lots of different organisations needs to be collated into a single overarching picture that illuminates the risks and interconnectivities involved.

It would in principle be possible to instruct firms to provide information in a single standardised machine-readable format. Indeed, regulators are increasingly requiring firms to report using specific formats, such as eXtensible Business Reporting Language (XBRL). However, even after agreeing on a suitable machine readable format there is still the need to identify:

(a) What data should be provided, at what frequency, by whom and to whon;
(b) What is actually meant by a particular piece of data. This generally requires a 'taxonomy', i.e. some sort of classification of the data, and an 'ontology', i.e. a formal logic that applies to the taxonomy (e.g. that one sort of data has some specific relationship to another sort of data);
(c) How to pay for the potentially considerable effort involved in producing and then collating the data and how to incentivise firms (and supervisors) to deliver and then make best use of the data within suitable time frames.

Moreover, business life is not static. What is appropriate now may not stay appropriate in the future. Financial markets have been very innovative over the last few decades. Some of these innovations have been fingered as contributing to past systemic risk episodes. Tools and techniques for analysing and responding to systemic risk information are also likely to evolve through time.

4.26 We can illustrate some of these challenges by considering the amount of effort needed merely to handle one particularly long established derivative type, the interest rate swap. The interest rate swaps market has grown hugely over the last few decades but suppose it was only now just starting to be seen as having a systemic risk angle. If we hadn't previously included any interest rate swaps in data collated from firms for systemic risk purposes then we would need to include in our data taxonomy and ontology the notion of an 'interest rate swap'. We would also need to include the notion of a 'cash flow leg' and how it is associated with an 'interest rate swap', since a swap involves swapping floating for fixed rate legs. We would also need some way of differentiating between fixed and floating legs. Nowadays there are different sorts of interest rate swaps with different underlying reference rates (e.g. LIBOR versus OIS), so these would also have to be defined and captured. Indeed, as we note later there is some enthusiasm to shift from LIBOR to OIS but what impact this might have on existing contracts is unclear. And all of this is before we even get to the task of specifying what the cash flows on the fixed rate leg might, when they might occur and in what currencies etc.

Moreover, systemic risk is in large part about how firms are connected with each other. So, the overall data framework would also need to capture counterparty data and the structure of the collateralisation framework applicable to any given swap. One important innovation

in derivative pricing since c. 2008 has been the closer attention paid to collateralisation arrangements. Optionality in what collateral can be posted alters the economics of the overall contract although not the underlying cash flows. We might therefore, in an ideal world, be interested in capturing information on collateralisation protocols, in case they also have systemic risk angles.

4.27 Even something as conceptually simple as who the counterparty might be offers many practical challenges. Different firms may use different codes or names for the same organisation, e.g. "IBM" versus "International Business Machines". Many firms also consist of a range of different legal entities. Distinctions between them can be quite important in terms of how systemic risk might be transmitted. Strict 'ownership' may also not be the sole feature we are interested in from a systemic risk angle. This was highlighted during the recent financial crisis by the impact on banks of notionally off-balance sheet Structured Investment Vehicles (SIVs) that they had set up prior to the crisis and into which they placed some of their risks. At the height of the crisis these SIVs proved less unrelated to the originating bank than many banks had hoped would be the case.

Ensuring clear identification of counterparties is seen as so important to any attempt to build up a meaningful systemic risk picture that regulators are mandating the introduction of unique industry-wide Legal Entity Identifiers (LEI). But even this conceptually simple step offers a rich vein of complexity. To implement it effectively there needs to be agreed ways of creating such LEIs and assigning them to individual companies. Processes are needed to handle situations where organisations subdivide or merge. This initiative is being coordinated by the LEI Regulatory Oversight Committee. Over time we may also find further subtleties that need handling, e.g. ring-fenced funds within the same legal entity and therefore presumably carrying the same LEI but exhibiting different economic characteristics in a systemic risk situation.

4.28 Building up a clear systemic risk picture is potentially very expensive. This then raises the question of who should be incurring this cost. Of course, not having a clear picture and not then effectively managing this risk might also be very expensive. The issue is how we ensure that society is getting value-for-money from the effort incurred and how we arrange incentives so that the desired outcome actually comes to pass.

4.29 The picture that we have unfolded above can be faulted from a purely IT perspective. Focusing on data taxonomies, ontologies, flow processes and the like sounds very much like a classical 'structured database' way of doing IT. It assumes all information used should have precise meanings and data flows should be capable of being precisely tracked if needed. However, it doesn't fully reflect the current direction of travel of many IT technologies especially ones centred on the largest IT network of them all, the World Wide Web.

One of the features of the Web is that there is so much data now within it or flowing around it or being added to it that trying to capture a precise rigidly structured picture of it is essentially impossible. Instead, the best we can hope for is to develop techniques that take the 'messy' and rather unstructured data that is the backbone of the Web and draw necessarily imprecise conclusions from it.

Take for example modern Internet search engines. They often involve very large back end databases that create some structure on which the output of the search engine relies. However, overlaid on these databases are relatively heuristic techniques that aim to return information that as is as relevant as possible. There is no exact definition of 'relevance' that

applies in all circumstances. It differs between users. It also differs for any given user depending on what he or she wants at any specific point in time. So the search engine necessarily can only guess at what might be most relevant. Its guesses are coloured by what seems to have been found helpful by previous users and/or is expected on intrinsic grounds by the search engine provider to be helpful to the user. Sometimes search engines hone in on information the user finds helpful very quickly. At other times, they can be frustratingly ineffective at doing so.

The key point is that there is a trade-off between precise manipulation of 'pure' data and imprecise manipulation of 'messy' data. The former might be more desirable from an accuracy perspective, but the latter may cost much less to do. How much of the former versus the latter should analysis of systemic risk aim to encapsulate?

4.30 It is interesting in this context that Fouque and Langsam (2013) devote the first few chapters of their *Handbook of Systemic Risk* to the IT and other organisational challenges of carrying out systemic risk analysis. Most risk managers within most financial organisations can relate to the very substantial amount of effort needed to create risk analytics that are sufficiently robust to form the basis for robust decision making. Why should systemic risk be any different, except to the extent that the picture needed is even more wide-ranging and therefore presumably even more challenging to paint effectively?

5. Other regulatory drivers and trends

The purpose of regulation

5.1 How we think that the above trends will play out is inevitably heavily influenced by our views on the purpose of regulation (and what we think others think!). As Kemp and Varnell (2010) noted, even the purpose of regulation is a matter of debate.

5.2 At the very highest level, we have the issue of the extent to which society should or is seeking to adopt a 'command' (or 'collective') as opposed to a 'market' economy. For those favouring a 'command' approach, regulation may be viewed as just another means of ensuring that the right 'commands' get implemented in practice. Regulations might aim to prohibit or limit activities that those in power view as undesirable.

Classically, this topic might have been viewed through a Cold War perspective, with collective Soviet-style command economies deemed to be pitted against highly capitalist economies in which resources were exclusively apportioned according to market forces. In reality there are many shades in between (and there were even at the height of the Cold War). In nearly every major developed economy some sectors are nearly exclusively government controlled, e.g. the army and police force, and others are nearly exclusively in the private sector, e.g. retailing. For the latter types of sector, regulation is seen principally as a means of tempering some of the excesses or undesirable social consequences that exclusive focus on market forces might otherwise bring. For example, regulations may impose minimum standards of hygiene on restaurants etc., to limit public health risks.

5.3 Quite where financial regulation fits into this spectrum is a matter of debate. Traditionally, within the capitalist West, a relatively laissez-faire approach has been seen as appropriate. This was consistent with the Anglo-Saxon capitalism that seemed prior to the crisis to have been in the ascendancy. However, the financial crisis led to a crisis of confidence in these

economic norms, and by implication in the ways in which such economies handled their financial systems.

This was perhaps most evident in the perceived incongruity of Hank Paulson prostrating himself before Congress seeking the authority (and money) from Congress to prop up the financial system in a country perceived as averse to government bail-outs of any sort. In any case, with the benefit of hindsight, we can see that even the previous Anglo-Saxon laissez-faire approaches had elements of 'instructing' the economy to work in a particular manner. For example, it can be argued that successive UK governments strongly promoted London as an international financial centre. This included adopting a relatively light touch regulatory framework prior to the financial crisis because it was thought likely to foster innovation.

5.4 One step down, we might subdivide the purpose of regulation in the financial community into two broad strands, both of which in isolation also offer plenty of opportunity for debate:

(a) What level of capital (and of what type) do we want financial entities to hold, individually and in aggregate, to limit the potential loss to customers or drain on the public purse if the entity fails? (i.e. 'prudential' regulation)

(b) What sorts of behaviours do we want to encourage/discourage financial entities to adopt within their own businesses/structures and in relation to how they interact with their customers? (i.e. 'conduct' regulation)

5.5 In such debates it often helps to take stock of views we might previously have held. This can help us work out if there are new factors that might be taking us on a changed trajectory. Kemp and Varnell (2010) explored regulatory ideas that had been proposed early on in the financial crisis. They split these ideas into ones relating to explicit quantitative capital requirements and ones relating to more qualitative governance or business structure issues.

5.6 In terms of quantitative capital requirements, banking was seen to be at the epicentre of the financial crisis. It could therefore be expected to be the most affected sector in the short term. This sector was the one that Kemp and Varnell (2010) focused on in this respect. Looking forward, the regulatory perspective in relation to insurers and systemic risk has become clearer (if not in the way that the insurance industry would have liked). It looks as if the insurance sector will experience more radical change in this area than was probably expected by most commentators four years ago.

Kemp and Varnell (2010) also noted that nearly all of the ideas proposed in relation to banking capital adequacy could be summarised as involving "more capital and more of the 'right' sort of capital". Increasing an entity's capital base should reduce the likelihood of default and hence customer loss. It should therefore reduce the potential cost to governments of stepping in to carry the burden of these losses. For example, BCBS (2009), the Basel Committee's Consultative Document on "Strengthening the resilience of the banking sector", which ultimately led to Basel III, had the following main strands:

(i) Improve quality, consistency and transparency of capital base
(ii) Strengthen risk coverage of the capital framework
(iii) Introduce leverage ratio limits to supplement existing risk-based framework
(iv) Introduce counter-cyclical capital buffers (including contingent capital arrangements)

(v) Introduce enhanced liquidity standards. This and (iii) have led to the introduction of the liquidity coverage ratio (LCR) and the Net Stable Funding Ratio (NSFR)

Generally speaking, commentators didn't think that insurers were typically undercapitalised. Insurers haven't faced the same pressure as banks to increase their capital bases. Of course this hasn't stopped regulatory change in relation to insurer capital adequacy from arriving in the EU in the form of Solvency II. However, we can view Solvency II as more part of the wider European 'journey' (i.e. promotion of the single market …) than a mechanism designed to increase insurers' capital adequacy.

5.7 Cross-over to date has been more noticeable in relation to qualitative governance or business structure issues. Kemp and Varnell (2010) noted that regulators are quick to argue that additional capital is not necessarily the most practical or even the most appropriate way to protect customers against risk. Instead they often seek to place a strong emphasis on firm behaviour, including governance practices, organisational structures and corporate culture. Proposals more along these lines included:

(a) *Restricting the size of systemically important organisations*. Direct intervention in relation to this goal has been limited, although it could be argued that some of the changes to the banking sector have indirectly facilitated this outcome, e.g. by making leverage more expensive or banning some types of activity, see (b). Governments also appear more mindful of the risks of having an out-sized banking sector relative to the size of their economy as a whole. These ideas have to date had relatively little impact on other parts of the financial services industry. However, this may be because the idea that other sectors (other than shadow banking) might pose systemic risks has only more recently gained some traction, see Section 3.

(b) *Limiting the types of activity that regulated entities can undertake (especially if they are able to access deposits benefiting from implicit or explicit government deposit protection guarantees)*. This idea has gained more traction, e.g. with introduction of restrictions on bank proprietary trading and with the proposed ring-fencing in some countries of retail from institutional banking activity.

(c) *Facilitating changes to market structures perceived likely to reduce systemic risks*. The most obvious example is the requirement to trade particular types of instruments through centralised exchanges and central clearing rather than over-the-counter (OTC), see Appendix B.

(d) *Limiting the scope of others to profit from a firm's weakness and hence to increase the cost to the government of bailing it out*. This initially led to bans on short-selling but these mostly proved problematic to implement or unworkable. However, to some extent similar effects have arisen naturally through market forces. Arbitrageurs are facing significantly higher funding costs because of added capital requirements imposed on banks, see e.g. Devasabai (2014).

(e) *Improving resolvability of firms in difficulties*. This has become a major strand in regulatory thought, see Appendix C.

(f) *Improving liquidity risk management processes*. Such changes have proved relatively uncontentious given the extent to which the recent financial crisis has been seen as a liquidity crisis rather than merely a credit crisis. The banks that failed during the

crisis disproportionately relied on wholesale money markets for their funding. It was when these funding sources dried up that they ran into problems. They were then unable to use other assets they possessed to source the liquidity that they needed in order to continue as going concerns.

(g) *Improving overall risk management processes and governance disciplines*. This has gained widespread traction. It ties in with the increasing emphasis being placed on 'enterprise' risk management (or 'entity-wide' equivalents for institutions like pension funds that do not necessarily see themselves as 'enterprises' per se).

5.8 When trying to identify how such ideas flow through to other parts of the financial services industry it is worth bearing in mind that the intrinsic purposes of regulation may not be identical across different sectors. Kemp (2009) explores further the differing purposes of regulation that apply to banks as opposed to longer-term investing institutions such as insurers and pension funds. He in effect reiterates points already noted in Figure 1. We have already argued that banks major on the use of money as a 'medium of exchange' whilst insurers and pension funds are more aligned with the use of money as a 'store of value'. We should therefore expect banking regulation to be particularly geared towards soundness of money. In contrast, insurance/asset management/pension fund regulation may be expected to focus more on ensuring that the providers in question honour their promises about how they are going to behave to their customers.

5.9 Some policy prescriptions referred to in Section 5.7 are only obliquely relevant to this latter regulatory objective for non-banks. However, some have wider applicability. These include:

(a) *The desire for improved risk management disciplines*. This trend seems strong and is already gathering pace within insurers and pension funds. For example (in the UK), enhancements to risk disciplines, risk functions and risk management processes mandated by e.g. HM Treasury (2009) have been applied across nearly all areas regulated by the PRA or the FCA rather than just to banks.

(b) *The desire for improved resolution planning and better reverse stress testing disciplines*, see Appendix C

5.10 So far in this Section we have concentrated on banks and insurers. However, regulators have been busy making changes to regulatory frameworks affecting other parts of the financial services industry. They have been particularly busy in relation to regulation of its infrastructure (and hence how its participants do business with each other). We describe below the most important of these changes. We concentrate on developments in the EU. Similar trends are observable in other countries, e.g. via the Dodd-Frank Wall Street Reform and Consumer Protection Act ('Dodd-Frank') in the USA. This is because many of the changes are responding to commitments agreed internationally by G20 governments.

Major EU initiatives currently affecting financial market infrastructure

5.11 Major EU-level Directives and other initiatives affecting financial market infrastructure at the time of writing (September 2014) include the following. We have endeavoured to list them in probable decreasing order of linkage to lessons directly arising out of the recent financial crisis:

(a) The European Market Infrastructure Regulation (EMIR), see e.g. FCA (2014a);

(b) The Markets in Financial Instruments Directive II (MiFID II) and the associated Markets in Financial Instruments Regulation (MiFIR), see e.g. FCA (2014b);
(c) The Alternative Investment Fund Managers Directive (AIFMD), see e.g. A&L Goodbody (2013); and
(d) The Undertakings for Collective Investments in Transferable Securities Directive V (UCITS V), see e.g. A&L Goodbody (2014).

We have excluded from this list:

(i) Developments such as the US Foreign Account Tax Compliance Act (FATCA). This is having a significant effect on financial market infrastructure (especially the categorisation of investors and/or reporting on them) but its introduction is not primarily driven by systemic risk concerns. For the same reason we have not discussed more general EU legislative developments such as the Fourth EU Directive to Combat Money Laundering and Terrorist Finance, the Transparency Directive, the Market Abuse Directive, the Central Securities Depositories Regulation, the Shareholder Rights Directive or the draft Data Protection Regulation; and
(ii) The Capital Requirements Directive, CRD IV, because it primarily implements Basel III requirements in the EU.

5.12 In 2009 the G20 pledged to undertake reforms aimed at increasing transparency and reducing counterparty risk in the OTC derivatives market. This is most commonly referred to worldwide as the introduction of mandatory central clearing, see Appendix C. EMIR implements most of these pledges in the EU and covers OTC derivatives, central clearing (including CCPs) and trade repositories (TRs). It applies both to financial counterparties (FCs), including banks, insurers, investment firms and fund managers and to non-financial counterparties (NFCs). NFCs cover any counterparty that is not classified as a financial counterparty, including entities not involved in financial services. Its main requirements are:

(a) *Reporting*: All counterparties with outstanding derivative contracts will need to report details of those contracts (and any new contracts they enter into) to an authorised trade repository (TR).

(b) *Clearing*: The European Securities and Markets Authority (ESMA) can impose mandatory clearing obligations for OTC derivative contracts of a particular type if an EMIR-authorised CCP exists for that type of contract.

(c) *Specific operational risk management requirements for non-cleared transactions*: All counterparties are required to comply with certain operational requirements (including timely confirmation, valuation, reconciliation, trade compression and dispute resolution).

(d) *Collateral*: Contracts not cleared through a CCP will also be subject to bilateral collateral requirements for FCs.

Some of EMIR's requirements, e.g. some of its reporting requirements and operational risk management requirements, are already in place. Others have yet to come fully into force, see Appendix C.

Non-financial counterparties will only be subject to clearing and bilateral collateral requirements if their OTC derivatives positions are large enough and are not directly reducing commercial risks or related to treasury financing activity.

EMIR includes a temporary exemption from clearing requirements for IORPs (and some other pension arrangements subject to prior approval by supervisors). Pensions industry representatives have sought to have this temporary exemption modified, made permanent or at least extended. They argue that EMIR rules may hinder their ability to match their liabilities effectively and hence to fulfil their social purpose. This is because CCPs only currently seem likely to accept cash collateral which will disrupt how such institutions currently operate.

It is unclear how successful the pensions industry will be in this endeavour. The fact that the exemption has started out as temporary is perhaps another indication that EU decision-makers view IORPs as inherently more within the remit of the wider financial services industry (and hence a FC) than outside it (and hence a NFC). Presumably this also means that EU decision-makers view IORPs as potentially involved in the sorts of debates on systemic risk which originally led to EMIR, see also the discussion at the end of Section 4.

5.13 MiFID is the framework Directive covering EU regulation of:

- Investment intermediaries providing services to clients in relation to shares, bonds, units in collective investment schemes and derivatives (collectively 'financial instruments'); and
- The organised trading of financial instruments

The primary objectives of the initial MiFID Directive (MiFID I) were to increase competition, improve investor protection and implement EU passporting. The MiFID II package introduces a range of further measures which seek to address consequences of MiFID I and issues raised by the financial crisis. It aims to deliver a safer, sounder, more transparent and more responsible financial system and to ensure a more integrated, efficient and competitive EU financial market. It includes the following requirements:

(a) *Extension of MiFID rules to additional products and services*. MiFID II will extend MiFID-like provisions to distribution to retail investors of different financial products which satisfy similar investor needs and raise comparable investor protection challenges. These include structured deposits and financial instruments issued by an investment firm.

(b) *Harmonisation of requirements applying to different types of trading venue*. MiFID II aims to ensure that all organised trading is conducted on regulated trading venues, applying identical pre and post trade requirements on every such type of venue.

(c) *Amending MIFID exemptions*. MiFID II will define more precisely what (typically own account) activities are exempt from MiFID requirements.

(d) *Upgrades to market structure framework*. Various changes are being introduced to take account of recent market developments. For example, in order to capture 'dark pool' operators and other similar trading systems (e.g. inter-broker dealing systems), a new category of trading venue called Organised Trading Facility (OTF) will be introduced for non-equity instruments (e.g. bonds, derivatives, structured products).

OTFs are similar to the Swap Execution Facilities (SEFs) introduced in the US by Dodd-Frank. Derivatives that are sufficiently liquid and eligible for clearing will need to be traded on eligible platforms instead of OTC. Eligible platforms are OTFs, MTFs (Multi-lateral Trading Facilities) or RMs (Regulated Markets). Requirements will be imposed on operators of OTFs (e.g. client orders on an OTF cannot be executed against proprietary capital). Transactions concluded on an OTF will be submitted to pre and post trade transparency provisions similar to on a RM or MTF, creating a level-paying field. The scope and obligations of systematic internalisers will be amended. Some refinements are also being introduced in relation to algorithmic and high frequency trading.

(e) *Corporate governance*. Some improvements are being introduced e.g. requiring management boards to have sufficient knowledge and skills to comprehend the risks associated with the firm's activities.

(f) *Investor protection framework*. Requirements relating to provision of investment advice and portfolio management are being enhanced.

(g) *New requirements on trading venues*, to publish e.g. annual execution quality data.

(h) *Improved small and medium enterprise (SME) regime*, to assist SMEs in obtaining financing.

MiFID II also includes increased and more efficient data consolidation requirements, heightened powers over derivative positions, more effective sanctions and more rigour in the trading of emissions allowances.

5.14 Perhaps the single most contentious aspect of MiFID II for the investment industry is Article 24. This prohibits the previously common practice of retrocessions (inducements) for discretionary asset management and 'independent' advice. By end 2016 all EU member states will be on a level playing field, unless certain countries apply more stringent rules. In the meantime, national regulators throughout Europe have already taken tough measures to either ban trail fees or strictly limit them. A number of countries, including the United Kingdom, Italy, Netherlands and Germany, already have requirements in this area that arguably go beyond MiFID II.

Within the spectrum of ideas presented in this paper, we can view such a prohibition as primarily an example of regulators attempting to address perceived information asymmetries. In this case the information asymmetries are perceived to arise from the existence of multiple participants in the value chain providing investment products to end customers. Indirectly, however, some blame for the financial crisis has been ascribed to inappropriate incentive arrangements within the financial services industry. Arguably even this change thus has some indirect link back to the recent financial crisis.

5.15 AIFMD was formally adopted in 2013. It introduced regulation of alternative investment fund managers (AIFMs) who manage one or more alternative investment funds (AIFs) in the EU and/or market them in the EU. The regulations are akin to some that already apply to UCITS fund managers. AIFMD will impose authorisation and organisational requirements on AIFMs. It includes requirements in relation to transparency, remuneration, depositaries, valuation of assets and leverage.

AIFMD also contains detailed provisions on conduct of business requirements, conflicts of interest provisions and risk management and liquidity management provisions.

AIFMD will facilitate EU 'passporting' (i.e. simpler marketing across EU jurisdictions) of AIFs to non-retail investors. This passport will not extend to retail customers, reflecting the perceived potentially sophisticated nature of AIFs and the potential lack of sophistication of retail investors.

5.16 UCITS V aligns several aspects of previous UCITS rules with newer regulation applicable to AIFMDs, see above. It amends:

(a) *Depositary and custodian responsibilities and liability*. This issue was triggered by lack of clarity over who was responsible for what when Lehman Brothers International Europe defaulted and also by the Madoff case. Lehman was a sub-custodian of some UCITS-like funds. UCITS V will e.g. require a UCITS fund to have a single depository and will clarify what responsibilities are placed on this depository including its liability in the event of loss of a financial instrument held in custody. In essence, depositories will need to make good any such loss, with only very limited ability to avoid doing so due to 'an external event beyond its reasonable control'. Only credit institutions and investment firms will be allowed to be depositaries. They will therefore need capital as per applicable regulatory frameworks in relation to the risks involved in being such a depositary.

(b) *Remuneration policies*. New requirements will be imposed on the remuneration policies of firms managing UCITS funds, including e.g. the requirement that "*the remuneration policy is consistent with and promotes sound and effective risk management and does not encourage risk-taking which is inconsistent with the risk profiles, rules or instruments of incorporation of the UCITS*".

UCITS V also introduces a more formalised whistleblowing regime and rules harmonising sanctions for breaches of UCITS obligations.

5.17 Another important recent EU regulatory development has been the Capital Requirements Directive IV (CRD IV). We do not explore CRD IV in this section since it is primarily how the EU is implementing Basel III and we have covered Basel III in more detail elsewhere. CRD IV also covers capital requirements for certain MiFID investment firms not explicitly covered by Basel III, see e.g. FCA (2014c). It also introduces a 'bonus cap' and standardised EU regulatory reporting. These reporting frameworks are referred to as COREP and FINREP and specify the information affected firms must report to supervisors in areas such as own funds, large exposures and financial information. In some member states, e.g. UK, the sole reporting format for this data will involve XBRL. XBRL is also the reporting format that will apply to insurers under Solvency II.

Shadow banking

5.18 One area of the financial services industry which is not directly included in any of the above is shadow banking. Many commentators, e.g. Impavido et al. (2011) and Haldane (2014) have noted the potential for risks to migrate from highly regulated sectors such as banking and insurance to less highly regulated sectors. They have also noted the potential for shadow banking to create, amplify or transmit systemic risk. The issue is summarised in FSB (2013):

The "shadow banking system" can broadly be described as "credit intermediation involving entities and activities (fully or partially) outside the regular banking system" or non-bank credit intermediation in short. Such intermediation, appropriately conducted, provides a valuable alternative to bank funding that supports real economic activity. But experience from the crisis demonstrates the capacity for some non-bank entities and transactions to operate on a large scale in ways that create bank-like risks to financial stability (longer-term credit extension based on short-term funding and leverage). Such risk creation may take place at an entity level but it can also form part of a complex chain of transactions, in which leverage and maturity transformation occur in stages, and in ways that create multiple forms of feedback into the regular banking system.

Like banks, a leveraged and maturity-transforming shadow banking system can be vulnerable to "runs" and generate contagion risk, thereby amplifying systemic risk. Such activity, if unattended, can also heighten procyclicality by accelerating credit supply and asset price increases during surges in confidence, while making precipitate falls in asset prices and credit more likely by creating credit channels vulnerable to sudden loss of confidence. These effects were powerfully revealed in 2007-09 in the dislocation of asset-backed commercial paper (ABCP) markets, the failure of an originate-to-distribute model employing structured investment vehicles (SIVs) and conduits, "runs" on MMFs and a sudden reappraisal of the terms on which securities lending and repos were conducted. But whereas banks are subject to a well-developed system of prudential regulation and other safeguards, the shadow banking system is typically subject to less stringent, or no, oversight arrangements.

5.19 Addressing the potential systemic risks of shadow banking is seen as a priority area for the FSB. Exactly how this might be implemented in national or regional regulatory legislation is not yet clear, however. The FSB's policy work to prevent the re-emergence of systemic risks from shadow banking has to date focused on the following areas, according to FSB (2013):

(a) *Mitigating risks in banks' interactions with shadow banking entities*. Topics here include scope of consolidation, treatment of large exposures and bank investments in the equity of such funds.

(b) *Reducing the susceptibility of MMFs to 'runs'*. This has included the FSB, IOSCO, US Securities and Exchange Commission (SEC) and European Systemic Risk Board (ESRB) coming up with a range of proposals for MMFs. These generally involve imposing capital requirements on constant (or stable) Net Asset Value (NAV) funds and/or requiring them to convert to floating NAV funds. For example, the FSB appears to prefer requiring stable / constant NAV (CNAV) funds to be converted to floating NAV funds. Where this is not possible it wants CNAV funds to be subject to rules that are "*functionally equivalent to the capital, liquidity, and other prudential requirements on banks that protect against runs on their deposits*". In contrast, the SEC seems happy to allow 'government' and 'retail' MMFs to continue using stable NAV. It defines a retail MMF as one that that "*does not permit a shareholder to redeem more than $1 million in a single business day*" and a government MMF as one that "*invests at least 80% of its total assets in cash, government securities, and/or repurchase agreements that are collateralized by government securities*", according to FSB (2013).

(c) *Improving transparency and aligning incentives in securitisation*. The FSB believes that the complex structuring and multi-step distribution chains involved in much securitisation prevalent in the run-up to the crisis generated misaligned incentives. This encouraged a rapid and largely undetected build-up of leverage and maturity mismatches.

(d) *Dampening procyclicality and other financial stability risks in securities financing transactions*. This includes a range of standards on data collection and aggregation, re-hypothecation, collateral valuation and management. It also includes policy recommendations relating to central clearing and changes in the bankruptcy law treatment of securities financing transactions. The FSB is also proposing:

(i) Minimum standards on haircuts, i.e. margins, limiting the limit the amount of financing that can be provided against a given security; and
(ii) A framework of numerical haircut floors intended to prevent the erosion of margins below minimum levels when non-banks obtain leverage through the use of securities financing transactions backed by non-government securities.

Finalised regulatory guidance on the above is set out in FSB (2014b).

(e) *Assessing and mitigating systemic risks posed by other shadow banking entities and activities*. The FSB recognises that shadow banking entities and activities take a variety of forms and evolve over time. Its policy framework therefore includes: (i) assessment based on economic functions (or activities), (ii) adoption of policy tools and (iii) information-sharing process. Presumably its policy framework will be compatible with its developing approaches to assessment of NBNI systemic risk, see Section 3.

5.20 Of course, devising regulatory frameworks that try to address systemic risk in one area of shadow banking may merely result in the activity moving elsewhere. For example, Johnson (2014) notes that money market fund investors appear to be considering switching to private unregulated CNAV vehicles if European regulators make it impractical for mainstream cash funds to retain CNAV characteristics. Regulatory policy inherently struggles with situations where regulators want one outcome but many customers want another.

Other comments

5.21 One way of interpreting all of the above is as part of a more general societal trend favouring increased emphasis on risk management. There are many other examples of this including the greater focus given to risk management in the Solvency II Directive and its associated (draft) Delegated Act, increased emphasis on risk management and systems of governance for EU pension funds in the proposed IORP II Directive and, more generally, revisions to corporate governance codes in e.g. the UK to emphasise risk management, see FRC (2014). If political leaders view enhanced risk management as intrinsically a 'good thing' then it is hard to see them wanting to ignore systemic risk in this picture.

5.22 We have focused above on regulations that focus on market structure rather than on what economic exposures are actually traded in the markets. However, there has been talk by regulators of seeking to switch the interest rate swap market away from use of LIBOR floating rates to OIS floating rates. This is in part because the latter are seen as purer

measures of risk-free rates and hence less entangled with the banking system than LIBOR rates. Most such ideas involve considerable structural challenges, which in this case include the very large back book of swaps already referenced to 3 / 6 month LIBOR rates.

5.23 The increased focus regulators and governments are placing on systemic risk is naturally resulting in firms doing likewise, not always in ways that governments may find comfortable. This was perhaps inevitable anyway in Europe given challenges the Euro has faced in recent years and the corresponding worry that sovereign risk might prove to be the next cause of a systemic risk event. An example of the new 'norm' in this regard might be the IAA's paper on stress testing and scenario analysis, i.e. IAA (2013). It includes three 'case studies', one of which, tellingly, covers sovereign default. As Reinhart and Rogoff (2009) note:

> *"Throughout history, rich and poor countries alike have been lending, borrowing, crashing – and recovering – their way through an extraordinary range of financial crises."*

Put into a longer term perspective, the particularly benign conditions prevailing before the recent financial crisis seem to have been unusual and unlikely to return any time soon.

5.24 Some commentators view the goal of creating a more secure financial system from within as potentially too ambitious. These commentators may instead promote external ways of addressing the perceived underlying issue (i.e. the implicit support that some financial market participants benefit from because they are likely in practice to get bailed out by state if they get into difficulties). One 'external' way of addressing this issue is to impose a levy or tax designed to recompense the state for the implicit subsidy the state is providing. The EU has proposed a Financial Transaction Tax applied to financial transactions between financial institutions charging 0.1% against the exchange of shares and bonds and 0.01% across derivative contracts, ostensibly partly with this policy objective in mind.

6. Concluding observations

6.1 Current financial service regulatory developments appear able to be grouped into three broad strands driven by:

(a) *Increased focus on systemic risk following the recent financial crisis*. This is already overturning some existing business models and creating opportunities for others. Outcomes of debates about what types of entity potentially create, amplify or transmit systemic risk are likely to have major implications for affected parts of the financial community for at least the next c. 3-5 years. In the longer term, presumably memories will fade (unless another systemic crisis hits) and this strand of regulatory development will abate.

(b) *Increased scepticism amongst regulators and governments that different parts of the financial services industry are inherently different*. This can be expected to lead to increasing harmonisation and cross-fertilisation of risk and regulatory techniques and practices across the industry. These trends are amplified by those in (a) but probably will continue even after those in (a) have died down.

(c) *Continuing societal change driven by IT and other technological developments and by how societies interpret 'fairness'*. Even in the absence of financial crises we can

expect regulatory frameworks to change as societies change and technology develops. Information and business asymmetries are inherent in many financial services activities. So is the desire to modify regulatory frameworks to try to limit the asymmetries that are most in the public eye at any given point in time. Some recent changes to regulatory frameworks have sought to prohibit or limit incentive structures within the industry that regulators have deemed inappropriate. In due course new types of inappropriate incentive structures will no doubt materialise.

6.2 The sector (if you agree that it is a part of the financial services industry) that seems to have been least affected to date by the above trends is the DB pensions sector (and to a lesser extent the corresponding CDC pensions sector). Some of this is due to the greater 'social' role it undertakes. Whether this will shelter it in the future from wider winds of regulatory change blowing through the rest of the financial services industry is not clear.

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Where available, links to these documents can be found at www.nematrian.com/References.aspx or by following the links set out below.

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Abbreviations

ABCP	Asset-backed commercial paper
AIF	Alternative investment fund
AIFM	Alternative investment fund manager
AIFMD	Alternative Investment Fund Managers Directive
AUM	Assets under management
BCBS	Basel Committee on Banking Supervision, BIS
BCR	(IAIS's) Basic Capital Requirements
BIS	Bank for International Settlements
CCP	Central clearing counterparty
CDC	Collective defined contribution (pensions)
CNAV	Constant (or Stable) Net Asset Value
COMFRAME	Common supervisory framework (that is being developed by IAIS)
CPSS	Committee on Payment and Settlement Systems, BIS
CPU	Central processor unit
CRD	Capital Requirements Directive
CTE	Conditional tail expectation
CVaR	Conditional Value-at-Risk
DB	Defined benefit (pensions)
DC	Defined contribution (pensions)
Dodd-Frank	Dodd-Frank Wall Street Reform and Consumer Protection Act
EMIR	European Market Infrastructure Regulation
ESRB	European Systemic Risk Board
ES	Expected shortfall
FC	Financial counterparty
FCA	(UK) Financial Conduct Authority
FMI	Financial market infrastructures
FSA	(UK) Financial Services Authority
FSB	Financial Stability Board
G-SIB	Global systemically important bank
G-SIFI	Global systemically important financial institutions
G-SII	Global systemically important insurer
IAIS	International Association of Insurance Supervisors
ICS	(IAIS's international) insurance capital standard
IORP	Institution for occupational retirement provision
IOSCO	International Organization of Securities Commissions
IT	Information technology
LCR	Liquidity Coverage Ratio (under Basel III)
LEI	Legal entity identifier
MiFID	Markets in Financial Instruments Directive
MiFIR	Markets in Financial Instruments Regulation
MMF	Money market fund
MTF	Multi-lateral trading facility
NAV	Net Asset Value
NBNI	Non-bank non-insurer
NFC	Non-financial counterparty
NSFR	Net Stable Funding Ratio (under Basel III)
OTF	Organised Trading Facility
PRA	(UK) Prudential Regulation Authority
RIMS	RIMS, the risk management society™

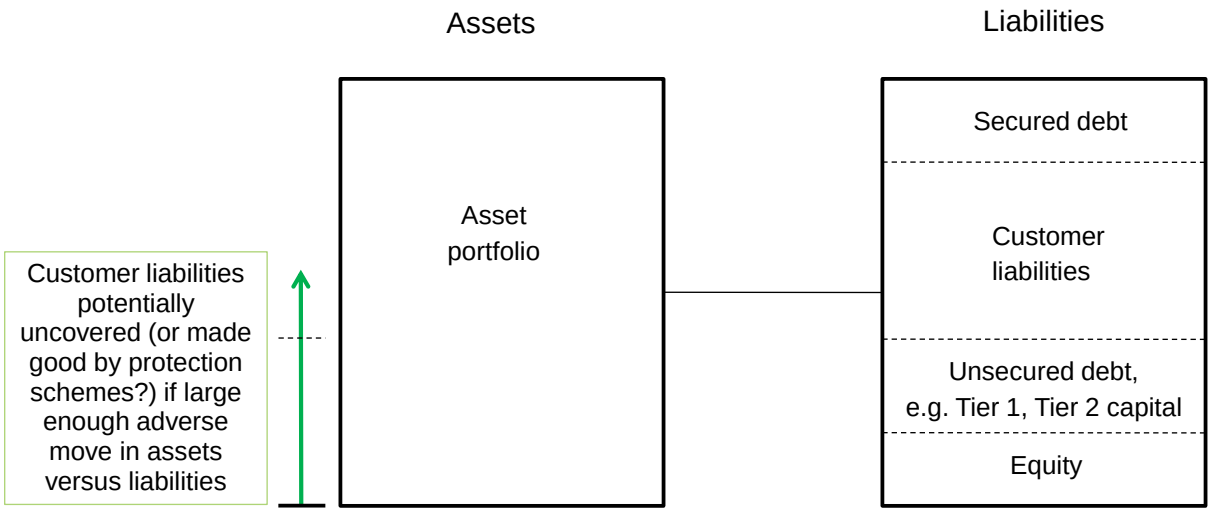
RM	Regulated Market
SEC	US Securities and Exchange Commission
SEF	Swap execution facility
SIFI	Systemically important financial institution
SIV	Structured investment vehicle
SME	Small and medium enterprise
TBTF	Too big to fail
TCF	Treating customers fairly
TR	Trade repository
TVaR	Tail Value-at-Risk
UCITS	Undertakings for Collective Investments in Transferable Securities
VaR	Value-at-Risk
XBRL	eXtensible Business Reporting Language

Appendix A
Capital adequacy: a conceptual framework

A.1 To navigate through the many issues arising when we consider capital requirements it helps to have a clear conceptual framework capable of differentiating between the different aspects of and approaches to capital adequacy. Ideally it should be capable of incorporating the subtleties that exist in practice. For example, it should ideally explain the preference regulators and others might have for firms to use one sort of capital rather than another in addition to merely having a particular quantum of capital to hand.

A.2 Such a conceptual framework is contained in Kemp and Varnell (2010), in turn based on one set out in Kemp (2009). Kemp argues that (absent future new business or capital raising) the full (or 'economic' or 'holistic') balance sheet of any financial firm or organisation can be conceptually organised as per Figure 1.

Figure 1: Schematic representation of any financial organisation's balance sheet



A.3 In this representation, 'customer liabilities' correspond to liabilities to depositors (for a bank), policyholders (for an insurance company) or beneficiaries (for a pension fund). There may be some liabilities that rank above customer liabilities (e.g. mortgages secured on particular assets). Usually, however, most non-customer providers of the organisation's capital have a priority ranking below the firm's customers. In the event of default customers will be paid in preference to these capital providers.

A.4 Stand-alone entities may only be able to replenish capital ranked below customer liabilities by raising new capital from elsewhere. The entity's ability to do so will depend heavily on the extent to which it is expected by outsiders to have access to profitable new business flows in the future.

A.5 The same representation can also be used for a DB pension fund even though such an entity does not have the same profit-focused outlook that is typical of a commercial firm. Here, the elements of the capital structure corresponding to the unsecured debt or equity shown above may refer to:

(a) 'Surplus' capital built up previously and held within the pension fund (much like the P&L account for a commercial firm); plus

(b) Implicit or explicit access that the fund may have to capital that is currently held on its sponsor's balance sheet.

Part (b) of this 'full' capital structure is usually termed the sponsor covenant and is akin to a contingent IOU that the fund may be entitled to call upon in times of trouble. If a DB pension fund has no sponsor (e.g. because the sponsor has defaulted) and therefore no sponsor covenant to fall back on (and if it has access to no other similar sort of benefit security mechanism) then its position is akin to a stand-alone entity as above. However, as it is not commercial, it is unlikely to be able to raise much capital ranking below its own beneficiaries in the event of getting into trouble.

A.6 All other things being equal, the greater the amount of capital the organisation has ranking below its own customer liabilities the better protected are its customers against the organisation running into difficulties. Only after this capital cushion is exhausted would customers start to find their liabilities not being fully honoured. A corollary is that 'solvency' is never absolute. As long as some customer liabilities exist there will always be outcomes we can envisage that are severe enough to exhaust this cushion and lead to customer liabilities not being honoured in full. For example, the organisation (or its sponsor, if the organisation is dependent on a sponsor covenant) might suffer a particularly massive fraud. It might be hit with a particularly large back tax or liability claim. It might suffer reputational damage which exhausts its future earning power. Or it might just make the wrong business decisions and end up making losses which exhaust its capital base.

A.7 Kemp's innovation is to specify the problem of how much capital an organisation should hold to be deemed 'solvent' in terms of the yield spread (versus risk-free) that would or should apply to customer liabilities were they to be traded freely in the market place. This yield spread might be equated with the fair CDS premium that a customer of the organisation would incur to eliminate exposure to the credit risk of that organisation. If defined as such the calculation might be viewed as fully 'market consistent'. More practically, it can be viewed as an approximation to this, or an assessment of what this premium might be given the actual capital adequacy framework and capital base within which the organisation operates. Such a conceptual framework highlights a large number of the subtleties that arise in theory and in practice with solvency computations, e.g.:

(a) All other things being equal, more capital provides greater protection for policyholders, but lowers returns for the capital providers (unless it leads to greater access to profitability from new business).

(b) The required target capital level depends on the extent to which assets match customer liabilities (since the greater the volatility in the difference the greater the likelihood of capital being exhausted).

(c) The merits of capital that helps in a 'gone concern' as opposed to capital that merely helps in a 'going concern' situation become easier to appreciate, thus providing a clearer theoretical justification for different capital 'tiers'.

(d) Treatment of liquidity risks becomes conceptually easier to visualise. If we invested in paper ranking pari passu with customers, how would the yield spread we would want be influenced by the liquidity characteristics of either assets or liabilities?

(e) A yield spread, being ultimately derived from a sum of outcomes over all possible scenarios includes the entire spectrum of outcomes. It therefore includes ones in which the entity has defaulted. These would otherwise be ignored if the focus is merely on limiting ruin probability to a given level (for example a 1-in-200 1 Year VaR risk measure). This has relevance to the question of whether to use ES (or TVaR) rather than VaR as the main risk measure for capital adequacy purposes, see Section 3.

(f) Given (e), the framework can also conceptually handle who bears any losses (and the sums involved) arising from entity default. It is these losses that arguably are the ones that have the most visible potential to flow through to governments and/or industry-wide protection schemes.

(g) By referring to the spread that would otherwise apply on the open market, the approach can be formulated in a market consistent manner (even if in practice other 'off market', including 'real world', assumption sets might be used instead). It can therefore also be formulated in a manner that limits scope for potential regulatory arbitrage.

(h) Issues relating to pro-cyclicality and macro-prudential supervision can be accommodated. To do so we include consideration of how we might want the target yield spread to vary through time (and between sectors) depending on economic circumstances.

(i) The appropriate treatment of 'own credit risk' in solvency computations is clarified. In effect it no longer features in the calculation, since we are now solving for a given target level of own default risk rather than trying to work out how to take account of the actual level present.

(j) The framework is sufficiently rich to allow for more subtle issues. For example, it can frame a discussion of what, if any, allowance should be incorporated in regulatory capital computations in respect of sovereign default risk (not just of other sovereigns but also of the government of the jurisdiction in which the entity is domiciled). The definition of 'risk-free' against which the spread is measured can, for example, be set before or after allowing for this risk, depending on whether it is thought that customers would expect their liabilities to carry this risk.

A.8 More fundamentally, we can think of this sort of analysis as an example of how commentators are increasingly seeking commonalities between different parts of the financial services industry. As we have noted earlier, this implicitly favours further harmonisation of capital structures and regulatory behaviours between different parts of the industry.

Appendix B
Mandatory central clearing

B.1 The proposal to introduce central clearing of standardised derivatives was one of the first ideas for change to arise out of the experience of the 2007-09 Credit Crisis. One key problem central banks and regulators faced was working out who had exposure to whom and how these exposures might affect the firms they might need to bail out. Central authorities felt that they were often operating in the dark. Even when they did have a better idea of the exposures involved they often felt that they were not practically or legally capable of resolving failing firms in a manner that avoided undue drain on the public purse. A perceived major issue here was the huge size in nominal terms of over-the-counter (OTC) derivatives and the opacity to outsiders such as regulators of the different parties to these contracts. This applied even to ones that were relatively straightforward in nature, such as traditional interest rate swaps and simpler credit default swaps.

B.2 G20 governments committed in Pittsburgh in September 2009 to require central clearing of standardised derivatives. Specifically, the G20 governments agreed 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. Noncentrally cleared contracts should be subject to higher capital requirements. We ask the FSB [Financial Stability Board] and its relevant members to assess regularly implementation and whether it is sufficient to improve transparency in the derivatives markets, mitigate systemic risk, and protect against market abuse.*"

B.3 Those in favour of such approaches argue that they should aid transparency and limit systemic risks posed by large interconnected counterparties (e.g. Lehmans and AIG). This could increase the size above which an entity becomes 'too big to fail' and hence reduce the likelihood and/or quantum of government bail-out that might thus occur. Those arguing against such approaches point to the increased risk arising with the central counterparty itself (would we merely be putting 'all our eggs into one basket'?). They may also suggest that there may be good reasons (e.g. uncompetitive pricing by central counterparties) why the earlier, more diffuse, market structure had developed.

B.4 How such proposals affect non systemic actors has also become the subject of debate. Clearing houses linked to exchanges ought to offer risk mitigation advantages in terms of collateralisation arrangements. However, the effectiveness of these arrangements depends on features like daily marking-to-market and margin transfers.

Some large non-financial organisations active in derivatives markets (who can be thought of as examples of end customers of the financial system) have lobbied against such proposals because they are worried that they might be forced to post cash margin daily. They think that this would hinder their mainstream business activities. Margin is likely to need to be posted in the form of cash because this is how the CCPs seem likely to operate. Some pension funds (and some annuity writers) have also lobbied against such proposals, because they believe that the opportunity cost of them holding extra cash assets (or being in a position to access such cash assets from third parties) in order to be able to post cash collateral will also hinder their activities.

One result of this lobbying is that different regions are implementing central clearing at different speeds. This has created challenges for business models predicated on rapid introduction of central clearing, see later.

B.5 In a world in which derivatives are traded bilaterally and if there are n market participants then in principle there may be $n(n-1)/2$ possible pairs of participants who might enter into separate derivative transactions with each other. Moreover, although it is common to net the exposures on different OTC contracts between the same two counterparties (to reduce the counterparty risk each can have to the other) such netting is not universal. When it is applied, it may only relate to specific types of trade. Any such contracts are unique to the counterparties in question, so are not explicitly fungible with contracts entered into with any other counterparties. Moreover, such contracts do not have to follow standardised formats. Capturing a complete picture of the interconnectivities between different market participants created by such contracts can therefore be very difficult.

Of course, in practice, economic factors favour some standardisation and centralisation of the majority of such transactions. Even before the crisis, the bulk of such derivative contracts had one or more global investment and/or commercial banks as a counterparty. Terms and collateralisation protocols were generally consistent with master agreements and credit support annexes promulgated by the International Swap Dealers Association (ISDA).

B.6 The picture changes in a world in which derivatives are traded on exchanges or electronic trading platforms and centrally cleared. Contracts that would previously have been bilateral are novated very quickly after execution into contracts between each market participant and the clearing house, i.e. CCP (or possibly with a market participant's central clearer who then fronts the contract with the CCP). Such an arrangement reduces very substantially the number of pairings it is possible for contracts to exhibit. It requires the contracts involved to be relatively standardised. It should make the contracts more fungible, which ought perhaps to increase liquidity. It should also make it easier to build up a map of interconnectivities (or at least to impose an ability to build up such a map if needed). All of this information should be available with minimal delay and in a standardised form by referring to the central clearing house's positional database.

B.7 These new requirements are already in place in some countries (e.g. in the USA, via Dodd-Frank) or are in the process of being implemented in others (e.g. in the EU, via EMIR). They are leading to major changes in the business models of some financial market participants. For example, EMIR introduces new requirements to improve transparency and reduce the risks associated with derivatives markets. It also establishes common organizational, conduct of business and prudential standards for CCPs and trade repositories.

B.8 The wording of the G20 agreement highlights that governments saw increased transparency as perhaps the most intrinsically important goal of a push towards central clearing.

Without central clearing it is still possible to improve transparency. For example we might require every firm entering into a bilateral transaction to provide details of the transaction in a timely manner to a central database (or requiring that at least one of the parties does so, on both parties' behalf).

However, the resulting infrastructure would not necessarily be very robust. Such an approach would potentially require large numbers of market participants to develop relevant reporting systems and protocols, even though in many cases the processing of such

transactions for such purposes would not have been a core part of their business or investment activities.

Regulators appear to have concluded that a better way to promote transparency is to require central clearing of the most actively traded derivatives. The contracts involved will then be more standardised and the records relating to each contract will be more centralised within firms who have an economic incentive to process such transactions efficiently and reliably.

B.9 More talked about from a risk management perspective, perhaps, are the risk consequences to individual market participants of requiring derivatives to be centrally cleared. At issue is that it is not clear that central clearing explicitly reduces systemic risk per se. Instead it may merely redistribute risk, including potentially centralising risk into a small number of specialist regulated counterparties, i.e. the CCPs.

For example, Pirrong (2014) notes that arguments put forward for central clearing include:

(a) By allowing more extensive netting, CCPs reduce risk exposures in the financial system.

(b) CCPs will implement rigorous collateralization (margining) of derivatives transactions. This will reduce both counterparty risk in the system and the potential for the insolvency (or illiquidity) of one major derivatives trader to cause the insolvency (or illiquidity) of other major financial institutions.

(c) Clearing will reduce the interconnectedness of the financial system, thereby reducing the potential for contagion.

However he argues that none of these views about how clearing reduces systemic risk really withstand scrutiny when we analyse the effects of clearing from a truly systemic perspective. In particular he argues that these views typically evaluate clearing and derivatives markets in isolation from the rest of the financial system and do not consider how the financial system will change in response to introduction of central clearing.

B.10 For example, netting through CCPs is typically considered to be systemically stabilising. It reduces the derivatives exposures of SIFIs such as the major global investment and commercial banks. They were previously counterparties to a high proportion of earlier bilateral trades. However, Pirrong notes that increased netting may merely redistribute risk exposures to non-financial firms away from these leading derivatives counterparties and towards other creditor types. Some of these creditors (e.g. MMFs) may themselves be systemically important. Within the financial sector, exposures to SIFIs may reduce but exposures to CCPs may increase. Moreover CCPs may themselves have default funds partly supported by SIFIs. This introduces 'wrong-way' risk. The SIFIs may be most likely to be called upon to support the CCPs during periods of severe financial turbulence when they may be most vulnerable.

B.11 Increasing collateralisation is also typically considered to be systemically stabilising because it typically reduces the amount of leverage (and hence counterparty credit risk) in derivatives transactions. However, the way it reduces counterparty credit risk in effect elevates the priority of derivatives claims on a firm in a distressed situation. Distressed firms will have to post more collateral (and typically more quickly) as the distressed situation

unfolds. So again arguably at a system-wide level it primarily results in a redistribution of risk rather than risk reduction per se. Of course, maybe ultimately redistribution is what governments want, or more specifically redistribution away from the public purse towards other market participants.

B.12 However, focusing too much on the perceived industry-level risk reduction CCPs might or might not offer perhaps misses wider systemic risk angles. FSB (2014a) specifically proposes to include OTC derivatives notional amount as an indicator of the systemic risk involved with a finance company because of its potential relevance to the resolvability of such a firm:

> *"Indicator 4-1: OTC derivatives notional amount*
> *The focus of this indicator is on the amount of OTC derivatives that are not cleared through a central counterparty. The greater the number of non-centrally cleared OTC derivative contracts a finance company enters into, the more complex a finance company's activities. This is especially so in the context of resolution of firms in bankruptcy, as highlighted in the failure of Lehman Brothers. This indicator should capture notional values of all types of derivatives (i.e. sum of foreign exchange, interest rate, equity, commodities, credit derivatives). Authorities may use total notional value of all derivatives if the breakdown of OTC derivatives contracts and centrally-cleared derivatives contracts is not available."*

B.13 It would seem, therefore, that mandating central clearing is, at its heart, an issue of transparency and resolvability, as far as governments and regulators are concerned, rather than direct industry-level risk reduction per se. There is little reason to believe that the industry would have embraced it any time soon, without a substantial amount of prodding. It offers too few attractions to too many individual industry participants. However, maybe IT developments of the sorts referred to in Section 4 might in time have led to a similar outcome.

Some improved transparency might have been feasible without increased central clearing. However, governments and regulators do not seem to believe that other approaches could have feasibly delivered the increased transparency they were seeking within a meaningful timescale. Governments seem to be finding it equally difficult to get firms to make themselves easier to resolve of their own accord, see Appendix C. Again this is probably because it is difficult to see how doing so is obviously in the interest of an individual firm's shareholders, even if it may lead to a better overall outcome for society.

B.14 So central clearing is a change that the industry is only adopting under compulsion. Where there has been a solid business case that is value-adding as far as shareholders are concerned, e.g. the desirability of eliminating duplicate offsetting positions, commercial solutions such trade compression were beginning to appear even before ,andatory central clearing was proposed. The reluctance of the industry to go further without being arm twisted by regulators and governments is a sign that most see little value added to themselves from such developments. Central clearing is of course opening up business opportunities for some at the same time as disrupting existing business models for others. However, the winners and losers at a firm level can be dependent on how the regulatory change is implemented and how quickly, see e.g. Sourbes (2014). As Knight (1921) noted, business ventures are subject to inherent uncertainties. Businesses in the financial services industry are not immune from such drivers. We should not forget that some of this uncertainty derives from uncertainties in how regulatory frameworks may develop.

Appendix C
Resolution planning

C.1 As noted in Section 3, one of the more important regulatory ideas to have come out of the recent financial crisis is 'resolvability'. This is the concept of requiring firms to make themselves easier to wind up in an orderly fashion should they run into difficulties. During the crisis, regulators often found it more difficult than they had expected to split businesses up between those parts they saw as having an ongoing future and those parts that they were prepared to allow to fail.

C.2 The outcome was a requirement that firms should set out how, if necessary, they could be wound down in an orderly fashion in the event that they became distressed. Originally these documents were colloquially called 'living wills' or more formally 'recovery and restitution plans' by e.g. Bank of England (2009). More recently, the concept has been extended to cover the sorts of governance frameworks that need to be in place for such documents to actually help in a distressed situation.

C.3 It is difficult to fault the concept of resolution planning except from the perspective of those who have to create such documents and the associated governance frameworks. From governments' and regulators' perspective, such documents and frameworks, if soundly drawn up, should simplify the process of winding down a company. The process of drawing them up might also highlight weaknesses in group structures. These weaknesses might add complexity in such situations but might be relatively simple to rectify in the meantime. Most people can identify with the complications (for others) that can arise when a person dies without a will (or with one that is defective or difficult to implement). Arguably, it is wrong to assume that companies won't die; indeed they probably on average have a higher mortality rate per annum than humans!

C.4 Conversely, firms caught by such requirements have argued that their (possibly complex) structures may actually serve a useful purpose (rather than being simply a result of unintentional accrual of business complexity through time). They may argue that unravelling these complexities in the meantime may be costly (and possibly counterproductive).

C.5 More fundamentally, as we noted at the end of Appendix B and as is apparent from a full balance sheet analysis as per Appendix A, resolution planning involves a divergence of interest between the regulated firm and the regulator. Shareholders of the regulated firm have little direct interest in making themselves simpler to resolve. In the event of a firm running into the level of difficulty envisaged by such frameworks, most shareholder value is already likely to have evaporated. Worse, firms playing the system might think that making themselves simpler to resolve could make them less likely to be deemed TBTF and hence to be bailed out by governments.

C.6 It is therefore unsurprising that banks do not appear to have made as much progress as regulators might have liked in developing credible resolution plans. Conversely, affected firms argue that at least some of this lack of progress results from regulators providing unclear guidance on what they want. Resolution planning in the USA comes under Dodd-Frank. The Federal Reserve Bank noted the following as typical of plan shortcomings in Federal Reserve (2014a) (for US firms) and Federal Reserve (2014b) (for non-US firms).

"While the shortcomings of the plans varied across the first-wave firms, the agencies have identified several common features of the plans' shortcomings. These common features include: (i) assumptions that the agencies regard as unrealistic or inadequately supported, such as assumptions about the likely behavior of customers, counterparties, investors, central clearing facilities, and regulators, and (ii) the failure to make, or even to identify, the kinds of changes in firm structure and practices that would be necessary to enhance the prospects for orderly resolution. The agencies will require that the annual plans submitted by the first-wave filers on or before July 1, 2015, demonstrate that the firms are making significant progress to address all the shortcomings identified in the letters, and are taking actions to improve their resolvability under the U.S. Bankruptcy Code. These actions include:

- *establishing a rational and less complex legal structure that would take into account the best alignment of legal entities and business lines to improve the firm's resolvability;*
- *developing a holding company structure that supports resolvability;*
- *amending, on an industry-wide and firm-specific basis, financial contracts to provide for a stay of certain early termination rights of external counterparties triggered by insolvency proceedings;*
- *ensuring the continuity of shared services that support critical operations and core business lines throughout the resolution process; and*
- *demonstrating operational capabilities for resolution preparedness, such as the ability to produce reliable information in a timely manner.*

The agencies are also committed to finding an appropriate balance between transparency and confidentiality of proprietary and supervisory information in the resolution plans. As such, the agencies will be working with these firms to explore ways to enhance public transparency of future plan submissions."

C.7 There has already been some regulatory cross-over between sectors in relation to resolution planning. For example, similar frameworks are now also expected in some jurisdictions from insurers and investment firms. More complex is to postulate how such cross-over might impact the pensions sector. Many DB pension schemes are currently underfunded on a wind-up basis. They could not easily be resolved without receiving large capital injections from their sponsors.

C.8 Related to the topic of resolution planning is the increased emphasis being placed in regulatory frameworks on the concept of reverse stress testing, see Section 3. Reverse stress testing deliberately requires firms to postulate how their business model might crumble and what might be done to mitigate the causes and consequences.