British Actuarial Journal, Vol. 16, part 2, pp. 301–319. © Institute and Faculty of Actuaries 2011
doi:10.1017/S1357321711000146
First published online 24 October 2011

Systemic risk in financial services

Abstract of the London Discussion

[Institute of Actuaries, 7 December 2009]

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This abstract relates to the following paper:
Besar, D., Booth, P., Chan, K.K., Milne, A.K.L. & Pickles, J. Systemic risk in financial services. *British Actuarial Journal*, doi:10.1017/S1357321711000110

The Vice-President (Mr S. Creedon, F.I.A.): We have this evening a tremendously topical paper by D. Besar, P. Booth, K. K. Chan, A. K. L. Milne and J. Pickles. The paper is entitled, "Systemic Risk in Financial Services". So may I invite Alistair Milne to make his presentation?

Professor A. K. L. Milne (introducing the paper): In January 2009 we started to investigate the sources of systemic risk in financial services; to consider how far they are sources of risk in insurance and pension activities, particularly from an actuarial perspective; and finally to consider some of the policy issues which remain topical.

I will talk about the motivation for our paper in terms of the current financial crisis, cover the results of our analysis, and comment on the historical record, which is not a happy one in terms of systemic risk and financial crises.

We pose a key question to enable us to discuss the issue of systemic risk, not just in banking but also within insurance and pension funds: what constitutes systemic risk in financial services?

In the paper we consider four large case studies, and a number of smaller examples. I will touch on these and conclude with a policy discussion.

Although we put considerable effort into this piece of research, it is a secondary research in the sense that we did not carry out our own initial data analysis. We are relying on the work of others for sources of information, which is necessary in writing an overview report of this kind on a subject as broad as systemic risk in financial services. This is because there have been many financial crises, and much literature, especially on banking, which discusses the origins of financial crises and what can be done in response to them.

One especially useful source is an excellent book recently published by Reinhart & Rogoff, two leading US economists, who provide an overview of financial crises over nearly 800 years. The subtitle of their book is "Eight Centuries of Financial Folly".

Appendix A of the paper sets out our tabulation of large financial crises during the last two centuries. Table 1 in the main text shows large financial crises since the Second World War.

We have defined these in terms of large-scale financial crises that have occurred in economies with GDP in the top forty per cent in the world.

We also wanted to rule out national crises which are driven by weaknesses in law and governance. We have therefore excluded a number of countries, such as Russia. There is a World Bank Rule of Law Index to distinguish those countries which have a high standard of rule of law and those that do not. It is not purely a question of government failures which has led to financial failure, so we have added back a few of the more prominent cases, such as Argentina, India and China, as they are large countries. We also look at the Asian crises of 1997, which affected Indonesia, Thailand and others.

There are two lessons to learn from this table. Firstly, we note how frequently financial crises occur. Secondly, we note there were in fact no large-scale financial crises in the period from 1945 until 1973. These observations are quite central to the debate about systemic risk and how best to respond to it.

It is useful to highlight two prototype views of a financial crisis and financial instability. One, associated with the US economist Hyman Minsky, is that freely operating banking and credit markets are inherently unstable. His view is that it is inherent to financial mediation, particularly to banking (and investment banking), that there are episodes of euphoria. In his categorisation of the extension of credit, he talks about credit moving from a self-financing regime, where loans are paid back out of profits, to a cashflow regime. Another category is where new lending is being used to refinance old lending.

Minsky is pessimistic about policy-making. He sees attempts to cope with financial crises through cutting interest rates, or through providing direct fiscal support, as sowing the seeds for the next and successive crises.

The alternative view is one that suggests that a free market in financial services can work reasonably well, but it is critical to have effective regulation and effective governance.

The long post-war period from 1945 to 1973 was a period of tight regulation in many areas of finance, including foreign exchange trading. Banking was also highly regulated. Perhaps, to avoid financial crises, we should return to a world of great restrictions on financial activities. This might be successful in removing a great deal of financial instability, but it would obviously come with a high cost.

The key issue is whether we can achieve greater stability without suffering the costs of interfering substantially with free markets.

The second point is that many of these crises are associated with a rapid expansion of credit and, in many cases, with asset price booms. In some cases, but by no means all, they are associated with large-scale overseas borrowing. Some examples of this are Latin America, Scandinavia, and most recently the UK and the United States in 2007 and 2008.

Common features across the different crises are an association with recent financial liberalisation and a transition from controlled economics.

An important point is that deregulation is a cause of systemic risk, which is an argument for trying to restrain financial activities. It is certainly the case that financial liberalisation

can be dangerous. It has often been followed by mistakes in terms of over-lending. But it is not clear that that is a permanent feature of a liberalised financial economy. There are many cases where, after initial problems, new instruments are being traded freely without leading to financial difficulties.

There was an even larger number of crises before 1939. These are tabulated in Appendix A.

The key policy question is how to address systemic risk in financial services. Discussions are often clouded by the fact that few commentators define clearly what they mean by a systemic risk, or systemic financial risk. The common approach is simply to identify a systemic crisis as a large crisis that damages many financial institutions and has a large economic impact. The problem with this is that it is more a description of the effects of systemic financial risk rather than the causes and therefore is less helpful for coming up with positive measures.

We had three or four alternative definitions but, we settled on: "A systemic risk is a risk, that is not necessarily a financial one, materialising when an initial disturbance is transmitted through networks of interconnections linking firms, households and financial institutions with each other, and leading to either a breakdown or degradation of these networks."

The important point is that it is not necessarily something that arises from a large common shock. You could have an epidemiological catastrophe, or some huge environmental change, happening. There could be systemic shocks in the sense that that would lead to the breakdown or degradation of networks of connecting firms. But those shocks are difficult to prevent. From a policy point of view, it is important to distinguish other sources of systemic financial risk which emanate within the system. By better regulation and governance, one can reduce the occurrence of those sources or mitigate their effects when they do occur.

That is why the emphasis is on the networks of interconnections and on their breakdown or degradation.

Systemic risk is not necessarily financial systemic risk. In the paper we used the example of the breakdown of the New York electricity system in 1964/1965. A very small failure, the tripping of a safety system on the Canadian side the border, led to a series of knock-on effects and eventually to the collapse of the entire New York State electricity system. It affected many other states too.

This knock-on effect through the network of connections is a characteristic typical of systemic financial risk.

We could have said that the financial institutions themselves are part of a network of interconnections that link households. We could have slightly different variations on the definition we propose, but it seems that the most helpful definition focused on the risk to the system in financial services.

It is not necessarily the collapse of the financial system. Regulators were aware over the few years prior to the current financial crisis of minor shocks in parts of the new credit markets. In retrospect, these can be seen as warning signs of greater problems to come, yet regulators did not respond as strongly as they might have done. For example, in credit default swap market in 2005, the downgrading of the credit ratings for General Motors and Ford led to systemic problems

https://doi.org/10.1017/S1357321711000146 Published online by Cambridge University Press

within that particular market. We did not take the lesson at the time that this could perhaps spread much more widely.

Analysing networks of interconnections leads us to identify and distinguish four main networks among banks or between banks and their customers where systemic risks have arisen in the past. One was within payment systems. For example, the Herstatt closure led to the near breakdown of the New York inter-bank market. Regulators responded by insisting on mechanisms that avoid the settlement problems responsible for that incident.

Credit expansion is financed often by the increase in short-term deposits – retail deposits and, somewhat less stable, wholesale deposits. In the event of a loss of confidence there can be a major withdrawal of short-term funding, which can undermine liquidity, asset values and net worth.

The other prominent network relationship identified in the banking industry is a common underlying asset exposure. Commercial and residential property lending are classic examples. In a period of a credit boom, when risks appear low, the prices of this collateral can be at a higher level.

Our contribution is to look at this as a network linking different banks. In a succeeding credit downturn, the decline of collateral values can lead to a cumulative impact where the undermining of the bank network leads to a reluctance to provide lending and a shortage of credit, which in turn undermines collateral prices and, in extreme cases, can lead to insolvency. This has been experienced in the past two years but that is by no means the first time that there has been severe collateral damage. The term "collateral damage" has a specific meaning in the case of banking.

There are some cases of counterparty risk. A recent example is the purchase of insurance from AIG and from monoline insurance companies by way of protection using credit default swaps on some of the new credit instruments.

Many institutions practising this insurance did not consider the circumstances in which the insurer could itself end up under the threat of insolvency. They did not think through whether, in the case of a large shock, the insurance would be much less than it would be for a shock specific to a particular instrument, an important additional factor in the recent crisis.

One useful comment is the analogy with mortgage indemnity insurers in the UK, where there was a similar counterparty risk. There was the same assumption that if you bought insurance you were no longer exposed to risk, ignoring the possibility that the insurance company itself could end up insolvent and the risk could come back on the bank's balance sheet.

Of our list of four banking networks, the middle two create the most risk, but payment system risk and counterparty risks can also play an important role.

I will now turn to the question of systemic risk in the pensions and insurance industries. Any major shock can have an impact on life insurance companies and pension funds. An aggregate shock such as a epidemiological catastrophe has an effect on mortality and therefore the life and pensions industries; it could also have an effect on general insurance as well.

Systemic risk is like a force majeure. It has to be thought about in advance but it is not easy to take steps to limit such a risk ahead of time.

What we focus on in our paper is the extent to which systemic risk can originate from within the insurance industry or from within pension arrangements. This is quite different from banking. The case for expecting systemic risk to arise from within the long-term pension and insurance intermediation is a weak one. Therefore, the case for strong regulation of these industries as a protection against systemic risk is more important for banking than it is for insurance and pensions.

There are, exceptions and I highlight two in the paper. The first is inappropriate regulation. An example of this is when, in 1998, a combination of declining stock market values, low interest rates, and solvency rules at the time forced insurance companies to shift into bonds. It was particularly difficult to do because the long bond market was very thin. There was only one UK Government bond that was appropriate. The price of that bond was being forced up and the long-term yield was being forced down. This was a consequence of the regulation. There may be criticisms of the portfolio choices of the insurance companies, but what made this episode a systemic network risk was the rather crude imposition of solvency regulation. The lesson from that is that forcing rapid changes in asset portfolios in response to market-based measures of net worth can have a damaging impact.

The other exception is a general insurance case, which is similar to the counterparty risk for banking. There may be inadequate recognition of, and capitalisation against, insurance counterparties. The Lloyd's reinsurance spiral was another example of failure to analyse counterparty risks properly.

While there have been systemic problems in the insurance and pensions industry, our general conclusion is that as long as the industry is well run and regulated in a sensible manner, these do not present a great danger.

The paper treats four interesting case studies with a common theme, beginning with the 1930s.

It is clear that if the financial authorities step back from a systemic crisis at a time when these networks are being damaged by losses from one institution being passed on, whether via networks of counterparties or collateral or of short-term funding, then the damage is amplified. This implies that failure to support the system makes systemic crises much worse. On the other hand, if the financial authorities step in too readily to protect participants from the consequences of these risks, there is moral hazard: they are reducing incentives on private participants to manage their own risks effectively. That policy dilemma is apparent throughout these case studies.

In 2000–2002, the authorities probably over-reacted – we cut interest rates too much. We under-reacted in the 1930s. 2007–2008 is still an open question.

There are two points regarding the 1930s. Firstly, we did not have the same kind of bank safety net in those days. There were widespread uninsured bank failures. The other interesting dimension is the macroeconomics: monetary policy and fiscal policy are critical and play a similar role as protection given through the financial safety net.

The restored gold standard played a particularly unfortunate role in the 1930s in that there were a number of countries in deficit, such as Germany (in deficit as a consequence of the Versailles treaty) and the UK. But, unlike during the 19th century, there was little responsibility accepted by surplus countries, such as France, to play an economic role in maintaining stability. This created

https://doi.org/10.1017/S1357321711000146 Published online by Cambridge University Press

an aggregate deflationary bias in the world economy which was then exacerbated by a further inflationary credit buy-out on the part of US monetary authorities. A fragmented banking system and a huge public loss of confidence in banks led to a collapse in US money supply. The authorities did almost nothing in response to this and maintained very tight fiscal policy. We know the consequences of that sort of response. The lesson learned informed the response to the situation in 2000–2002, for example.

The 1929 stock market crash played almost no role in the systemic interactions which undermined the US and international system. There is a tendency to read in newspapers, "Stock market crash: we are going to have an economic cataclysm just like the 1930s after 1929". But this is not consistent with historical records. Stock prices climbed hugely again after the crash. They recovered more than half their losses. There is no direct mechanical link between them, although banks also lost money to some extent on corporate bonds and on property lending.

I will briefly mention the Asian crisis of 1997. It is a good example of a combination of collateral values and short-term funding with the extra feature that Thailand, South Korea and the other countries affected were especially undermined by the exchange rate arrangements, maintaining a fixed exchange rate against the dollar. In a sense this is counterparty risk again, the counterparty being the Central Bank, and the assumption that these exchange rate risks will be absorbed by the Central Bank and need not concern individual financial institutions.

There were severe losses in some countries. But it is notable that output growth was restored relatively rapidly. In South Korea and Malaysia, there was quite quick restoration. Indonesia suffered more.

The period 2000 to 2002 reminds us of 1929 because there was a major equity market crash, but it was not quite so sharp. It did not happen over a few days. There was a major impact on the pensions system. In terms of our definition, this was not a systemic problem. The system continued to function with no disruption of pension provision. That is not to say that defined benefit pension arrangements, as a way of providing pensions, have been severely damaged. The same conclusion with regard to pensions applies to the most recent crisis.

Ever since the 1930s there has been substantial public sector support for financial services. However, there are longer-term consequences in terms of a difficult fiscal position, continuing weaknesses of banking and the concern about moral hazard: that having been saved by the system so forcefully once, participants are encouraged to engage in exactly the same kind of intermediation again. In short, we are not encouraging the structural change that is required.

The paper's discussion on policy issues is relatively short. It was easier to agree upon the interpretation of past episodes than to reach a common ground in terms of policy response. This is a debate that will continue for some years to come. We are only at the beginning of a full debate and discussion about how regulation and, perhaps, governance in the financial sector will be reformed as a consequence of the current financial crisis.

Policy response could be viewed in terms of three choices. One, probably the least favoured although many populist commentators support it, is to take lessons from history. We have to tightly regulate and control. That is not something which we support.

A second view is to focus on modelling and measuring systemic risk and using this to calibrate an activist regulatory response. This is common in work that is already coming out from the Basel Committee on Banking Supervision and Regulation, from the UK's FSA and from the US authorities.

Our preferred policy choice is to shift, as far as possible, the responsibility for network stability back to shareholders and investment institutions.

How are we going to have appropriate governance and regulation? It could be argued that we need to see much higher levels of capital within the financial system. There has to be flexible capital that can be used to absorb shocks. You need something as a buffer as opposed to being a hard, fixed requirement. There are various proposals for how that can be achieved. One is so-called 'contingent' capital,
to which we refer in the paper. There are other ways.

Another recommendation is to establish sufficient redundancy in other areas, for example, over-the-counter markets. This is about ensuring the system itself – the networks of interconnections – have sufficient redundancy in them so that private financial markets themselves can absorb anything within the expected range of events.

The conclusion is to have sufficient resilience so that networks absorb rather than transmit shocks. We have five recommendations in the paper: flexible capital requirements; ex-post provision of contingent capital; a requirement on private firms to think through how they will cope with system-wide shocks without forced sales; flexibility and redundancy in over-the-counter markets; and interventionist counterparty risk. It is particularly important to have full disclosure of information so that systemic exposure can be calibrated – not just by a regulator but by financial market participants.

Dr L. M. Pryor, F.I.A. (opening the discussion): The authors' discussion of how large-scale disturbances threaten the insolvency of financial institutions as a result of systemic risk is particularly useful, and their definition of a systemic risk as one that involves the network effect provides a valuable insight. The crux of the issue is that network effects magnify and intensify the problems.

One aspect is the policy recommendations or policy options. Both choices identified by the opener require reliable information, both by those being regulated and, for the second choice, by the regulators. Clearly, actuaries have an important role to play in this in the insurance and pensions areas, in particular their modelling skills can be useful in the area of identifying and managing risk. Good communication of the model is vital.

Another aspect is systemic risks in insurance companies and pension funds. The paper concludes that these are limited, but it is important that we do not become complacent. Hindsight is a wonderful thing and we have had plenty of opportunity for hindsight as far as financial crises are concerned, not least because there have been so many of them. Foresight is difficult but required in order to identify systemic risks that have not yet materialised. I suggest some areas in which systemic risks might arise and some questions that should be asked.

As the authors point out, the history of pension schemes in the UK is short when compared to the history of banks and insurers. For the first time we are facing a period when many members of

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pension schemes, both defined benefit (DB) and defined contribution (DC), are coming up to retirement or have already retired.

So the first question on the network effect that might exist concerns the interactions between the need for those pensioners to buy annuities and the limited number of annuity providers. Is it possible that supply will not meet demand? Will enough capital be available to support the annuities that will be required? Will the price at which annuities are available be so high that pensions from DC schemes are too low for pensioners to live on, resulting in significant social effects?

This leads to another potential area where network effects might be significant. We are seeing large-scale changes in the pensions landscape with many employers closing their DB schemes and increasing numbers of employees entering DC schemes. When we see even the bluest of blue chip companies closing their DB schemes, it is inevitable that others will follow. The herd instinct is strong and possibly unstoppable, and that is of course a network effect. Inevitably, DB schemes are becoming less important in the competitive market for employees, but what does this entail? Will the generally much lower contributions to DC schemes result in significant under-provision in retirement with consequent social effects? What will happen to those unlucky enough to retire when markets are low and annuities expensive? Will there be knock-on effects to the economy as a whole? Will DC assets be invested differently from DB assets; and, if so, what are the implications for capital markets?

There is one final question. Are systemic risks in insurance, and especially in pensions, like climate change? In other words, will they take a long time to crystallise, far longer than the average tenure of a CEO, and will too little be done to address them too late? And of course do they really exist?

I know where I stand on climate change. But I see no comparable analyses for pensioners. There is scope for some work to be done on those aspects.

Mr G. D. Clay, F.I.A.: I agree that pensions and insurance are much less exposed to liquidity risks than are banks, but the authors have gone a little too far in what they say. It is inappropriate to apply to insurers and pension funds the same solvency margin that applies to banks. However, there are investment effects that have caused systemic problems in the past.

For example in the late 1960s and early 1970s, as long-term interest rates in the UK rose to ever higher levels and eventually reached all-time highs, many insurance companies issued tranches of deferred annuity bonds which exploited the taxation basis of annuity funds. They were attractive investments and all tranches sold out in quick succession.

Incautiously, the policies allowed guaranteed surrender values, but the companies had no investment strategy to match the surrender value as well as the cash option at maturity, which was the benefit they expected to pay. Consequently, as interest rates rose it was almost a weekly event that one of those companies had to be rescued by another insurance company. Indeed the then President of the Institute came to dread the Monday morning call from the GAD, asking whose turn it was to be the rescuer. I see these events as resulting from an unforeseen investment-related systemic risk which has some characteristics similar to the banks' liquidity risk.

Incidentally, similar things happened in the USA in the 1980s when Regulation Q ceased to apply to thrifts (i.e. building societies) and deposit rates rose rapidly. In order to compete, insurers had to

raise their interest rates on policies where they were required to have guaranteed surrender values. Consequently they had to realise assets at a discount to book value to pay surrender values on existing policies that could be reinvested to achieve higher investment returns. There was a lapse and re-entry option which any sane policyholder took, or alternatively transferred the money outside the insurance market.

The point from this analysis is that it is unwise for market practice, or the regulations which apply in some countries, to force guaranteed surrender values. We in the UK have striven long and hard to avoid them, and the 1970s experience was an anomaly which has further coloured our thinking. However, in other parts of the world such guarantees are still relatively common. There is therefore a potential systemic liquidity risk in parts of the insurance industry outside the UK. I doubt it is big enough to create a systemic problem on a worldwide basis, but I suggest it might merit a little attention.

My second example is relevant, perhaps, to the 1997–1998 Asian crisis. You have large portfolio investors around the world who may decide they will go into emerging economies and then subsequently decide that they will make a minor change in their weighting for a particular economy, of $\frac{1}{2}$% perhaps. That change might be more than 10% of the local stock market's total capitalisation – or even more as the percentage of the tradable stock – with an obviously significant impact on market prices. So it is possible for apparently random unconnected decisions, plus an element of herd instinct among the world's major investment institutions, to generate systemic pressures in particular countries. These should not reflect back into the worldwide system, so perhaps they are not a systemic risk in our terms, but it is a pretty major systemic event within the affected country if it brings down a number of their investing institutions.

Mr W. J. Bishop, F.I.A.: The current crisis is the most severe on an international basis experienced since the early 1930s. Almost regardless of what people do as a result, it is not likely that another crisis of that degree of severity will ensue for very many years just because people remember too much about what went wrong in the last one.

Better regulation may be able to help; but, as an earlier speaker said, looking for dangers of a new systematic crisis requires a degree of foresight which is unlikely to be found in many people, and particularly unlikely to be found among those who become regulators.

I have a comment on the subject of insurance companies and what happened around 1998 when I was actively engaged in the investment world on behalf of one. The paper quite correctly says that it was somewhat disastrous for insurance companies to be forced by inflexible regulation into buying gilt-edged bonds on unattractive terms. What it does not say is that it was also, viewed from a with-profits aspect, somewhat disastrous for them to be forced into selling equities when equity markets had already fallen substantially and were therefore, assuming a degree of cyclicality which has generally prevailed, more likely to be attractive than unattractive.

I remember earlier in the 1990s being left in charge of the office, while almost everyone else senior went off to a conference, at the point where the crisis relating to our forced withdrawal from the Exchange Rate Mechanism was building up. This was near the end of the year and equities were falling sharply and, because I was aware of the regulatory situation, I felt compelled to buy a fairly large chunk of equity put options as insurance. Everyone then came back from the conference; shortly after that, the market turned upwards and I had effectively lost £6 million.

https://doi.org/10.1017/S1357321711000146 Published online by Cambridge University Press

That was almost the only occasion in a long investment career where I had been congratulated by senior non-investment management for the perspicacity of my initiative. It was the product of too inflexible a regulatory regime.

Model risk might have been given a higher profile in this otherwise excellent paper. It tiptoes around it a bit in section 7.2, but mainly with the emphasis on short-term risk in individual banking institutions as opposed to systemic broad-based industry or system risks.

It does not seem to take into account the likelihood that the models themselves are seriously defective and have been for some considerable time. I was a bit disappointed that, in the long list of references to various papers, there was nothing associated with the name of Mandelbrot. Benoit Mandelbrot is best known for his remarkable work in the field of fractals and so-called chaos theory. It may just be worth remarking that chaos theory says that things behave fairly predictably as long as they remain within certain parameters but, outside that, you have a very different and much wilder form of mathematical distribution – something which is not altogether irrelevant to financial markets.

For the best part of 50 years, Mandelbrot has been disputing the basic tenets of a considerable part of conventional financial economics by saying that the models which people are using are based on rational expectations and assumptions that financial returns follow a normal bell curve distribution. They, he says, do not allow adequately for the tendency in extreme circumstances for fat tails and unexpected widespread correlations between markets which are often independent. There is a book called, "The (Mis)behaviour of Markets", written by Mandelbrot with an Economist journalist, called Richard Hudson. The book came out in America in 2004, long before the crisis was apparent, and it seems a pity that more attention was not paid to it.

In the same way that the Ptolemaic model of the planetary system prevailed in the face of a lack of commonsense for the best part of 1,700 years until Copernicus, Kepler and Newton came along, there is a large investment of intellectual capital in conventional financial economics-based models, particularly in American academia and business schools. It is taught as undisputed fact and, just like the astronomy episode, a lot of effort is put into saving appearances by tweaking existing theory. What is needed is to tackle the much harder task of developing a new financial groundwork that might lead to models that have a better correspondence with the realities and the tendency of financial markets to throw "wobblies" that are unanticipated by 99% of the participants and observers.

Mr M. G. White, F.I.A.: There are many of mentions of accounting but little discussion of the audit. My understanding is that the compulsory audit for banks arises from the failure of the Glasgow Bank in 1878. It was discovered that the bank had been trading while insolvent for some time. The courts have decided that an important purpose of the audit is to ensure that the company does not pay dividends out of capital. This puts an emphasis on prudence, a concept which appears to have been materially downgraded within the accounting frameworks recently.

As to whether we are out of the woods yet, I am not at all sure. Perhaps the "solution" will be a gradual reneging on debt through the mechanism of inflation. When and if participants in markets begin to form this view more widely, the international imbalances which feature in a number of the case studies in the paper could cause a second wave of disturbances, the consequences of which are difficult to guess. Today's low interest rates driving asset prices high once more may not last for ever.

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Mr A. H. Silverman, F.I.A.: The paper covers the recent financial crisis, starting in section 6.5, and Dr Milne said that he did not want to address that in his prefacing remarks. But there a couple of points to add to what is in the paper.

Paragraph 6.5.4 refers, correctly, to the shift in recent decades from retail to wholesale funding in banks. A concurrent shift was from regulation by controlling cash central bank deposits and gilts as a percentage of lending (what used to be called the "reserve asset ratio") to controlling capital as a percentage of lending. This change happened around the 1970s or 1980s.

Capital is a slippery concept for banks and can be created quite ephemerally by market movements if the banks hold volatile securities.

As the paper says, the ratio of deposits to lending may have halved, but I have seen work showing the ratio of liquid assets to lending has actually been divided by four or five over the same period. This movement in regulation has severely diminished government's control over money supply and they have moved their targets away from that over the years. In effect, they have privatised that job to the banking system. One of the consequences is that there is now a move back to regulating liquidity. This is probably a significant trend.

Paragraph 6.5.8, and other paragraphs in section 6, focuses on the cheapness of funding that the banks realised through securitisation. There are additional reasons for this. Banks retained a lot of the equity in the credit deals. This was primarily because no one else would take the equity, because the borrowers were not paying enough on it, so optically the whole deal looked like it provided cheap funding. Secondly, a more fundamental reason securitisation was a cheap source of finance is that much of it was sold or funded from the investors who treated the securitisation paper as basically a cash investment. Therefore those investors asked for almost nothing more than a cash return on it.

The AAA tranches of securitisations were mostly bought by money market mutual funds, alongside the trading desks of banks and geared hedge funds. The money market mutual funds played a key role. The SIVs (structured investment vehicles), Conduits and CDOs (collateralised debt obligations), were a way of dressing up long-term risky assets so that they could be sold to these cash funds. If Lehman Brothers was the bail-out that never happened, but perhaps should have happened, then the money market mutual funds was the bail-out that did happen – a massive bail-out, particularly in the US. That was a bail-out that did happen but should not have done.

Finally, in the policy analysis in section 7, it is made clear that the insurance sector is not as vulnerable as the banks. Indeed, the insurance sector could be a positive force for stability in the markets. Part of the regulatory response should be to encourage, perhaps with fiscal incentives, locked-in long-term mass market savings in the credit market. These savings are, of course, typically gathered by the insurance sector. Long-term funds, in a sense, are better holders of long-term assets than the geared hedge funds, bank trading desks and money market mutual funds that took around 80%, according to some research, of the AAA tranches of securitisations.

There are many aspects to this but there is a good case for playing up the role, and possibly the future role, of mass market savings vehicles in bond and credit markets, and even asking for fiscal incentives from government, rather than feeling that the job is done, because we have resurrected the peculiar credit markets of recent years along with all their dangers. Large parts of those

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credit markets are really only accessible to the clients of hedge funds and banks' trading desks. There is further work to be done on that aspect.

Professor P. M. Booth, F.I.A. (responding): With regard to the paper, I would put a greater emphasis than the other authors on the problems that mismanaged monetary policy played in the lead up to financial crises. An over-inflation of the money supply tends to lead to general inflation and distorts financial markets. It is, in fact, quite difficult to point to a financial market calamity which has not been preceded by misguided monetary policy.

Turning to the policy conclusions, as well as issues to do with capital requirements and companies taking responsibility for their own decisions, it is important to have an effective mechanism for winding up a bank or other financial institution that is bust.

To some extent this has now been put in place. It is wrong that the creditors of the failed banks, including the providers of debt capital, hardly suffered at all as a result of their failure. Obviously, the providers of share capital have suffered. The providers of debt capital and other creditors have not suffered, because there was not a way of allowing for the bankruptcy and the winding down of failed banks without bringing down the financial system as a whole. There needs to be a way of ensuring that a bank can fail while certain aspects of the bank's activity can carry on. The authors will agree that is an important aspect of how we deal with systemic problems – not just having appropriate capital, so that the incidents are less likely to happen, but having the mechanism of winding up if problems do arise.

I have a comment on the points made by a previous speaker about everybody buying annuities at the same time. This problem would not arise as long as the price mechanism was able to deal with it effectively so that, if annuities became more expensive, we could decide to deal with our retirement in ways other than by buying annuities – for example, carrying on working for a while. Individuals may well suffer, just as individuals suffered when the baby boom generation all decided to buy houses at the same time and may all sell houses at the same time at some stage in the future, but you would not get a systemic crisis. Where you might get a systemic problem is if we are required to use our pension funds to buy annuities at a particular time.

With regard to Mr Silverman's point on the money market mutual funds, I also agree that it is outrageous that money market mutual funds have been bailed out. One of the purposes of the money market mutual funds – and, indeed, securitisation more generally – is to pull credit risk out of the banking system in order to make it less systemic. If that is going to happen then those who invest in money market mutual funds must accept that there is a fall in the value of their units should that credit risk materialise.

Mr I. J. Kenna, Associate: The 1930s was a completely different world from that in which we are living today. The 1930s crisis could have been omitted from the paper.

In 1997 China was expected to panic and devalue. China did not panic and devalue. The crisis soon ended. The Asian crisis could have been omitted from the paper.

The current financial crisis began in the mortgage market. The paper should have gone down to grassroots to estate agent and bank manager level. Estate agents get commission on sales. Bank managers are there to lend money.

https://doi.org/10.1017/S1357321711000146 Published online by Cambridge University Press

In the UK, in the years 1997 to 2007, retail prices went up 30%; pay went up 50%; home prices went up 200%. This was, and is, not sustainable. 125% loans, sub-prime mortgages, the banks' resort to the wholesale money market, credit default swaps, collateralised debt obligations, etc, simply made matters worse. The paper mentions nothing about this.

That leaves us with the stock market crisis of 2000 to 2003. The paper makes no mention of the Redington Effect. F.M. Redington, our elected greatest actuary, went below the actuarial surface to the accounts of the long-term savings institutions – life assurance companies, pension funds, etc. He revealed that, in any one year, the total cash income of the UK long-term savings institutions much exceeded their total cash expenditure. This left a large residue of net new money which had to be invested. Redington noted that there was nothing like enough new share issues to mop up the net new money.

The result was that much of the net new money had to be invested in already existing shares, pushing share prices up. The upward trend of share prices appeared to prove what good investments shares were. This supplied adequate justification for further investment in shares.

I have examined the UK figures for long-term savings institutions over the years since Redington wrote his paper. Apart from three explicable hiccups, the Redington Effect continued to exist.

Redington himself was not unduly worried. He reasoned that some day disinvestment would have to take place to pay claims and pensions, and that shares would then go down in price. This did not happen.

Disinvestment may well take place. But it need not take place. In general, cash expenditure is met out of cash income.

The Redington Effect is independent of the official printing of extra money which also pushes share prices upwards, as we have seen recently.

Coming to the actuarial field, actuaries and their defined benefit pension scheme clients were delighted to see the upwards trend of the share market.

In the 1980s, pensions actuaries told their customers that pensions in payment could be improved, automatic contingent widows' pensions introduced, automatic increases of pensions in payment brought in and perhaps even increases in pension accrual rates – and all for modest increases, if any, in employers' contributions. In the 1990s, pensions actuaries went further and agreed to employers' contribution holidays. By the new millennium actual share yields were about 2%–$2\frac{1}{2}$% with no growth. The share market slumped. Pensions actuaries were compelled to advise a vast increase in employers' contributions and defined benefit schemes closed. All this happened before any account was taken of improved longevity. The paper mentions nothing about all this.

Nevertheless, all may not yet be lost. However, before solutions can be advanced to either of the above crises, the Actuarial Profession needs to acknowledge the above facts.

Dr S. M. Coutts, F.I.A.: I follow the previous speaker by saying that there are significant omissions in the paper. Very little was spoken about cashflow, whereas mismatching of cashflow underlines the problems. International Financial Reporting Standards (IFRS) seems to have been ignored,

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whereas IFRS contributed to the mark-to-market approach significantly. The collection of data is not talked about in terms of the information that the banks have; but, still, the banks do not know what exposure they have – even today, some two years on. Also the paper does not talk about the management, who did not understand what they were doing, and that is part of the systemic risk. Finally, the paper did not mention anything about the credit agencies and how they enhanced the risk.

I also take issue with the view of the three examples of insurance systemic risk. The first one is in paragraph 5.7.3, mortgage indemnity insurance. The reasons why this failed are manifold. The insurance company argued that if the policyholder had a mortgage, the risk-taker will help the purchaser with a 20% increase in loan. As long as that person is employed it does not matter if the price of property goes down. Alternatively, if the price of the house remained high and the policyholder loses employment, it does not matter because you can sell the house and get the money back. However, what happened was unemployment and a fall of property prices at the same time.

Let me now take your second example, at paragraph 5.7.4, which treats AIG. I have a completely different scenario. My scenario is that IFRS mark-to-market contributed significantly to the whole crisis. I also take the view that AIG and the insurance companies writing mortgage protection policies had similar concepts – they were just different models. My interpretation of events, as far as AIG goes, is that the banks had CDOs sitting there. The banks found out that there was a problem in that the values of these CDOs were dropping. However, the banks could not value these liabilities correctly because they did not know what was in them (a data issue). But the accountants said that the banks have to value these risks, since under IFRS, they have to take account of them in their accounts. As there is a market out there, they should use mark-to-market.

Let me put this in perspective. Consider $1 trillion, then 1% of a trillion is $10 billion. However, banks did not only have $1 trillion worth of risks: they had $7 trillion to $9 trillion worth. So the accountants said that they have to recognise a write-down – take just $\frac{1}{2}$% on. So the banks wrote down their risks by $40 billion to $50 billion. These losses of capital occurred just like that.

The accountants said that they were aware that the banks had risk protection from an insurance company called AIG. This protection was usually in the form of a stop loss, which covered them for part of the risk. The write-down was reduced by these insurance sums and the banks sent their claims to AIG – not one bank but many since AIG protected a significant share of the bank market. Therefore, AIG received claims of $50 billion-$70 billion overnight. AIG, because of mark-to–market, had to recognise all these claims immediately. However, no money passed hands. Nothing happened except that AIG was bankrupt overnight.

Now, how do the accountants deal with catastrophe risks, such as CDOs? Let's assume that AIG expected a $100 billion claim every 100 years. Their actuaries were asked what the premium would be and the actuaries quoted $1 billion every year. However, IFRS said that once the first $1 billion has been paid, if there is no claim, AIG cannot accumulate a reserve for a 1 in 100 years claim. They have to pay it as profit. So even if AIG knew what they were doing, they were foiled by the IFRS.

Now let us go to the third example, which is Lloyd's. The Lloyd's example is almost a complete copy of the CDO crisis. For 300 years, Lloyd's packaged their risks but called it the "reinsurance LMX market" (renamed ART (alternative risk transfer) in the early 1990s). From day one, when

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the risks were simple, everyone knew what the risk was, but by the early 1980s everybody was trying to understand what was inside these reinsurance LMX treaties. I was in Lloyd's market at that time. Everybody was passing the risk upwards – what was referred to as the spiral – and everybody (including actuaries) was making money. We all convinced ourselves there was nothing to worry about. However, the spiral was incestuous. People were buying their own risk, although they did not know it, because they did not have the data.

When Equitas came along, one of the first things to be requested was for the data to be collected so that the market could understand the exposure. So, as a consequence of Equitas, the whole of the Lloyd's market started to collect the data at the source. The next time there was a catastrophe like 9/11 or Katrina, within 24 hours the London market knew its exposure. But the banks until today do not know their exposure.

Vice-President (Mr S. Creedon F.I.A.): The subject of the discussion has occupied many of the finest minds in the world over the last year or so. A lesson for our own discussion is that the ultimate fall-out from the global financial crisis is rather like the time, late in the last century, when the late Chinese premier, Zhou-en-Lai, was asked what he thought about the implications of the French Revolution which happened 200 years before. His wise answer was: "It is far too early to tell". The financial crisis is rather similar.

The authors from the Cass Business School have all worked hard to create what is and will be a valuable source on the financial crisis, and the Actuarial Profession is pleased to have been able to be associated with that work.

I have one historical observation prompted by 6.2.34 of the paper, which talks about life insurance in the 1930s. I recall the late and great Frank Redington describing the pressure which was on the life assurance industry in the 1930s, pressure coming from investment in bonds, both government bonds and various other forms of corporate debt. As Redington described it, as investment returns came under pressure, no single life office wanted to be the first to take the rational response of cutting bonuses. Redington would also say that it was only the outbreak of war at the end of the decade which allowed offices collectively to change their bonus rates and thereby effectively to save themselves.

That was Redington's story, alongside the many described and recounted by the authors, which reminds us that finance and financial system markets are like a larger-than-life reflection of ourselves, our behaviour, our psychology, with all its rationality sometimes and irrationality at other times.

I am a fan of Robert Shiller, who wrote the book, "Irrational Exuberance". Shiller was a great advocate of the extension of financial markets to take on more of the range of risks to which we are all subject while, at the same time, being aware of the imperfections of markets.

The authors do particularly well to draw out clearly the significant differences between banking and the business of insurance and pensions. Insurance industries can fail – I recall working on a spectacular collective failure in a Caribbean country some years back. But I agree with the authors that the risks, and the interconnectedness of the industry and its risks, are far less significant than for banking. It is important that the regulatory context for insurers recognises this, and the development of Solvency II will bear watching in this particular context.

https://doi.org/10.1017/S1357321711000146 Published online by Cambridge University Press

There are many good things about Solvency II – particularly the emphasis on Pillar II, the active engagement of supervisors with firms. But I do have some concerns that the conceptual framework for Solvency II fails to take into account the relative illiquidity of some, if not most, of life insurer liabilities.

And what about our profession? Previous speakers have touched upon this. I am also a fan of Riccardo Rebonato who regularly speaks of what he calls 'FLLP syndrome' (Future Looks Like Past). We actuaries are well trained in probability and statistics. We are trained to understand and to analyse the relevance of historic data to risk management. We also are trained in critical thinking and in the exercise of judgement, which should allow us to recognise the limitations of the data with which we work. We are trained to distinguish between risk, which should be factual, and uncertainty, which is not.

An implicit theme of the paper is that things go wrong when we tend to overestimate the scope of what is tractable and underestimate the scope of what is uncertain.

Actuaries are not immune from this syndrome, so we would do well to address in our research, and in our discussions within the profession, new techniques such as behavioural finance which features in our discussions of recent years, and techniques such as futurism and scenario generation, which the authors also mention.

In a few months the first group of students will sit our new enterprise risk management examination. Some will become eligible for the global Chartered Enterprise Risk actuary designation. This is not new for our profession. Frank Redington was practising what we would recognise as financial risk management as long ago as the 1950s. But it does reflect our profession's commitment to providing globally competitive education and the credentials, which are in tune with the post-crisis expectations of enterprise risk management.

Mr P. J. Sweeting, F.I.A. (closing the discussion): I chair the Global Financial Crisis Group that commissioned this research. I believe that this paper is a well-timed intervention addressing an issue of great importance to all actuaries. It is well-timed because changes are still being made in response to the crisis, and will continue to be made for some time to come. There will be changes to primary legislation and to frameworks such as the Basel Accords and European solvency regulations.

It is also an issue for all actuaries. Some work directly for investment banks and clearly have an interest in the crisis. Many more work for insurers and/or pension schemes, which may experience changes in the way they are forced to operate. But apart from the fact that all financial institutions deal with banks, and so will be affected in that way, all firms are affected if there are reductions in the level of liquidity or in response to other adverse banking conditions.

This means that actuaries should seek to influence any changes that are being made in response to the crisis.

The description in the paper of the different types of financial crises is instructive, as is the explanation of major crises of the past. However, explaining the past was only one requirement of this paper; it was also to recommend how crises could be averted in future, which this paper does in conceptual terms.

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The authors deliberately steer clear of discussing the implementation of the policy recommendations they make. This is fair enough as the paper already runs to a hundred pages and implementation issues could easily double this length. However, implementation of these suggested policy responses needs careful consideration.

Let us look at this in the context of the recommendations. The first is that capital requirements should be counter-cyclical, since this would help avoid issues that arise from the forced selling of assets. This is a sensible concept, but in order to implement counter-cyclical measures, you need to know whereabouts in the cycle you are. While it is relatively easy to see where you were 10 years ago, it is difficult to know where you were 10 minutes ago. Your position in the cycle depends not just on what precedes the point of assessment but what follows it. Why is this important? If you think you are at a minimum, then this might imply lower capital requirements, if you are trying to avoid pro-cyclicality. However, if it later turns out thatyou were only halfway to a minimum then you will end up with a large number of under-capitalised institutions.

The recommendation that firms hold additional capital, or have the means to raise it, is an interesting one. In particular, the suggestion that you do not just have to have a bigger capital buffer but can put in place a way of raising this capital in times of stress seems a sensible way to avoid heavy reductions in returns on capital. This does mean, however, that additional capital would be sought when it could least easily be raised. The structure of contingent capital would therefore need to be considered carefully.

The recommendation of back-ups for derivative contracts to control counterparty risk is in the same vein. This clearly reduces systemic risk, but it requires that if your counterparty has gone bust, your back-up has remained solvent. The issue with systemic risks is that this becomes less likely. This suggests that the identity and the structure of any back-up should be considered carefully.

The recommendations of increased regulatory focus on systemic risk are essential. The first, which is that management should be forced to focus on its exposure to systemic risks, is fairly obvious. The second recommendation is that they should provide enough information for regulators to identify damaging systemic interactions. This information would be useful, but there needs to be consideration of how it would be used. It could be publicised to encourage action by the firm through market discipline; it could be used by the regulator to require greater capitalisation; however, it could also be used by the regulator to determine the structure of industries. One concern I have about many measures designed to maintain market integrity is that they concentrate only on what individual firms are doing. If you reduce the risk of insolvency of a firm to 1-in-200, then this can help protect the firm; however, if the same 1-in-200 year event affects all firms similarly, then systemic risk is still present. Perhaps there is a role for regulators to ensure that there is a diversification of business strategies and funding sources as these are another source of systemic risk across industries.

As I suggested earlier, these comments are going beyond the scope of the paper, moving away from principles and towards implementation, but they are important. I found this paper informative and helpful, and I thank the authors for their work in producing this report.

Mr J. Pickles (replying): On behalf of the authors, I would like to thank the Actuarial Profession for asking us to write this paper and for inviting us here this evening.

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We are grateful for the feedback you have given us. We hoped for feedback on three particular aspects of the paper: first, on our definition of systemic risk with its emphasis on networks of connections; second, on whether you agree that the pension and insurance sectors are less vulnerable than banks to systemic risk; and third, on our policy recommendations.

I am pleased that most of the speakers seemed to accept our definition of systemic risk, based on networks of connections, because that definition allows you to focus on this vast subject – it helps you to make sense of what is otherwise just a series of past financial crises and it links into some promising new research which is taking place on network analysis.

I take Dr Pryor's point that the pensions system is subject to considerable risks. We could possibly have a debate about whether or not they are systemic, which takes us back to our definition.

I thank everybody for their robust comments on our policy recommendations, particularly Mr Sweeting's thoughts.

For those of you who like reading about financial crises, I might just mention that Alistair Milne has published a new book, "Fall of the House of Credit", which is available from all good booksellers.

Finally, I thank two of our co-authors, Ka Kei and Poetra, who are from Indonesia and China and who grappled with this vast and esoteric subject in a language which is not their first tongue.

Vice-President (Mr S. Creedon, F.I.A.): It remains for me to express my own thanks, and the thanks of everyone in the Hall, as evidenced by the applause, to the authors, to Paul Sweeting for closing the discussion and for getting this going in the first place, and to everyone who participated in the discussion.

Written Contribution

Mr O. J. Lockwood, F.I.A.: I was struck on reading the paper that the authors have defined a systemic risk event as, fundamentally, a relationship breakdown. Firstly, it would be highly beneficial to understand the mechanism by which the relationships break down, so that preventative action can be taken rather than relying on dealing with the consequences when a systemic crisis does occur. Secondly, the human element behind what causes a systemic crisis is important, and this leads us to question whether the frequency and severity of systemic crises that have occurred can be explained entirely in terms of the actions of rational economic agents.

I agree with the authors that further research on modelling the potential for a systemic financial crisis in terms of networks would be highly valuable. However, I regard it as an open question as to how widely used such models will be in five or ten years' time. The situation strikes me as somewhat similar to that of cause-based mortality modelling, except that, rather than looking at the underlying drivers of mortality, we are looking at the underlying drivers of a systemic crisis. In terms of the analogy with mortality, it might appear obvious to an external observer that we should consider each cause of death separately in modelling mortality. In practice, a high level of judgement needs to be applied to estimating the parameters of these relatively complex models. The potential lack of robustness where statistical methods are used for the estimation, given the limited data available, means that these models may fail to produce reasonable results if they are not used with care. Extrapolative models that do not explicitly consider the underlying drivers continue to be

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widely used. It remains to be seen whether improvements in any or all of the available data, the precise form of the model used and the methods for estimating the parameters will enhance the usefulness of the results from such models in the future, both for mortality and for systemic financial crises. A particularly challenging element for systemic financial crises is likely to be how these models capture the behavioural element of what causes a crisis.

What are the implications of this for regulation? The authors criticise the emphasis on quantitative modelling of risk at the individual firm level as a key contributor to the crisis. The criticism here needs to be focused on the fact that the modelling was at the individual firm level rather than on the fact that it was quantitative. A financial institution has to determine a quantitative amount of capital to hold, and the regulator has to satisfy itself that that level of capital is sufficient, given the institution's risk profile and its risk mitigation strategy, to provide an adequate level of protection for customers. Clearly there is a need for the capital requirement to take account of systemic risk. I agree there is a greater need for judgement in determining what capital requirements should be for systemic risk than for risks such as market risk, where the modelling tools are more developed. It should be possible to define suitable systemic risk scenarios that might affect the firm, but the judgement will relate to whether such scenarios correspond to the level of confidence at which capital requirements are being set. Nevertheless, it is important that capital requirements are arrived at by a robust process and, of necessity, that involves quantifying risks about which considerable judgement is required. Only then can one begin to challenge the assumptions underlying the quantification in a systematic way.

Assuming it has been accepted that some form of quantification is necessary, we then need to decide on the most appropriate metric for determining capital requirements. Referring to the insurance industry, the current metric under the ICAS regime, which is also to be the metric under Solvency II, is a 99.5% value-at-risk over one year. However, I suggest that a regulator would be seen as fulfilling its function if one in 200 insurance companies failed each year and the policyholders of the companies that failed were protected by an appropriate compensation scheme but would not be seen as fulfilling its objective if a systemic crisis destroying the entire insurance industry occurred once every 200 years. To allow for this we need some refinement of the concept of the 1-in-200 year event, which still has a transparent meaning when applied to individual firms. I cannot see how this can be achieved without using a run-off measure to determine capital requirements, as opposed to a 1-year value at risk. Under the 1-year approach, all firms become unable to meet their capital requirements if there is a chance of more than 0.5% of a sufficiently severe systemic crisis occurring within the next year, and by that time, it is likely to be too late to require all firms to raise additional capital. Under the run-off approach, however, the regulator is concerned with controlling the probability of failure at some point during the lifetime of an institution's outstanding financial obligations and this forces it to consider the possibility of a potential systemic crisis not only over the next year but over the entire lifetime of the outstanding obligations. A further advantage of the run-off approach is that it does not depend on the assumption that the liabilities can be transferred to a third party in a year's time at the value placed on them in the valuation. Under the stressed conditions of the 1-in-200 year event, one must doubt whether that would be possible in practice.

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