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# Liquidity: essence, risk, institutions, markets and regulation

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## Abstract of the London Discussion

[Institute and Faculty of Actuaries, Sessional Research Event, A report of the Liquidity Working Party, London, 17 November 2014]

This abstract relates to the following paper: Keating, C., Hatchett, J., Smith, A., Walton, J. and Zhao, T. Liquidity: essence, risk, institutions, markets and regulation. *British Actuarial Journal*, doi:10.1017/S1357321715000100

**The Chairman (Mr P. C. Jakhria, F.I.A., C.F.A.):** To take us through our topic, we have three key speakers; Mr Hatchett, Mr Walton and Mr Keating. Mr Hatchett is a partner and head of Corporate Consulting at Hymans Robertson and he specialises in providing financial risk management advice in relation to pensions. Mr Walton is an Investment Strategy Manager at L&G and his work in the past has covered hedging, direct investments, credit and market risks. Mr Keating has had a varied career spanning 40 years on infrastructure to investment managers for annuities to a research analyst. Mr Keating is currently an adviser to a number of organisations including the OECD on Capital Markets and Pensions.

**Dr J. P. L. Hatchett, F.I.A. (introducing the paper):** I'll give a high level introduction to what we mean by liquidity, how people measure it and some high level implications, sharing some of the working party's thoughts.

Mr Walton will then provide some comments on what this means for institutional investment strategy, a topic I'm sure is close to many of your hearts, as well as looking at a few insights on markets and regulation.

In our paper, we've suggested some questions which we hope are deliberately provocative and are looking forward to debate later.

One sign that there is more work to be done in this field is the lack of a common definition of liquidity. As a working party, we are focussed on having access to money and looked at this in a variety of contexts. Given where actuaries spend their time, it is worth pointing out early on that this is not a detailed guide to the matching premium in Solvency II. Nor is it focussed on managing the liquidity of the asset and liability side of the balance sheet in detail. However, what we do cover will be of interest to actuaries working in those sorts of fields.

We believe the definition and some of the corollaries are more or less straightforward. One point that is worth bringing out is the ability to trade an asset is typically related to how much other trade is going on in that asset or in similar assets. It is not related to the amount of issuance of that asset, that is, liquidity is related to the flow of the asset, not the overall stock.

We've highlighted three aspects which makes the analysis of liquidity particularly challenging.

Firstly, market value and liquidity overlap; by that we mean, if we're struggling to sell an asset for a high price, is it because the asset is just not worth very much or is it because liquidity in the asset is low and we need to consider how to disentangle those two effects.

Secondly, if we provide others with money now, in exchange for the promise of a return later, we're providing them with liquidity, on the basis of our trust in their promise. Our expectations of future liquidity are implicitly tied up in granting credit and so, disentangling liquidity and credit is difficult.

Thirdly, we can only access the money when the trade settles. Normally, we don't think about this too much and it's only highlighted in the settlement process when something goes wrong. Since we defined liquidity as access to money, we thought it worth covering money itself. Mervyn King said "money is what people accept as money" and Bitcoins have highlighted that quite clearly. The Government has a role here, both in levying taxes and defining legal tender, which helps drive acceptance of what will be accepted as money. As people, we accept money because we trust that others will accept that money again in future so it can act as a stored value to us. However, one of the reasons we need this store, is because we distrust others. We have trust in money, but we distrust that private debts of others will act as an equal store value and it's also far less useful as a medium of exchange.

Finally, in a world where cash is king, liquidity provides us with insurance that we will continue to have sufficient funds in order to meet our future needs for money.

Liquidity itself is not directly observable and it can manifest itself very differently in different markets and also at different points in time. This lack of direct observability means that lots of proxies have emerged. The most widely cited definitions are due to the late Sir Andrew Crockett who was a former General Manager for the Bank of International Settlements. However, alongside the many definitions of liquidity, there is an academic industry in trying to measure it. We found more than 80 different measures in the literature, which is a sign that further research is needed to rationalise these and understand what is the most important and provide a framework for giving clarity on all this.

A lot of the drivers of the liquidity of an instrument relate to information. Assets which hold their value well are typically more liquid, and holding their value means that their price is insensitive to news. They don't change in value when there is new news.

Simplicity, market norms and conventions are other ways which serve to reduce any information asymmetry, and also give investors greater confidence in the value of an asset. At a market level, active trading typically improves liquidity, although there are a couple of provisos that are worth mentioning. Firstly, you need the trading to be active when you want to trade. High frequency trading is an often cited example that can disappear at times of market stress, when liquidity is most needed.

Secondly, you need the active trading to be in the right size for the deals you want to do. We have set out a spectrum of liquidity which is a useful, simple model, but sometimes these models are interesting when they fall down. We have a list of a few examples.

On 15 October 2014, 10-year treasury yields that morning dropped by about 20 basis points, and then over the course of about 6 minutes, they dropped another 14 basis points and a few minutes later they went back up. We saw a spike in what is typically perceived to be the most liquid market in the world.

As a second example, within the last month or so, the CHAPS payment system in the UK that normally settles around £300 billion a day, failed for around 10 hours. Amongst others, many people who were trying to buy houses that day ended up in the newspapers. Even though they had cash, they were still unable to meet their obligations.

The third point is about asymmetric risks and the fact that assets, or asset classes tend to improve in liquidity only relatively slowly over time. As we know, market sentiment can change quite quickly and liquidity can fall out of a market very rapidly. There is an asymmetric way in the way that assets move along that spectrum.

Foreign exchange markets are also often called the most liquid of all financial markets. Around 4.5 trillion dollars are traded daily and are really significant markets by any measure. In particular, relative to the external liability global stock, that is an incredible flow. However, much of this trade is between dealer banks. Estimates of the trade in the real economy, trade and investment capital flows are less than 2% of the overall trade in foreign exchange. So the liquidity flows in the market are very much different to the actual liquidity flows around the wider economy.

Liquidity can be seen as a form of insurance and as insurance, it naturally comes with a cost. So we should be parsimonious with it. Academic theory suggests that, left to its own devices, the private sector will not produce sufficient liquidity, or at least not a socially optimal amount, and so regulation of the provision of liquidity is well justified.

Interestingly, looking at specific assets, liquidity has the property that it goes up with issuance size, so the liquidity premium that investors will place on more liquid assets increases the more of that asset there is in the market.

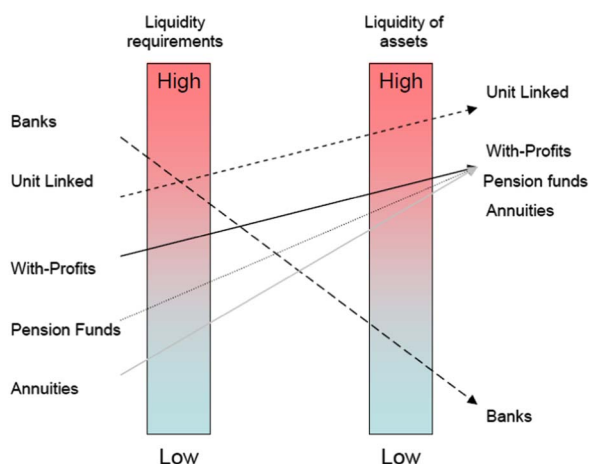
Our final point (importantly for actuaries given the training we have) relates to models which assess projects, and ranks projects, purely in terms of net present value of cash flows, largely ignore liquidity concerns. In the real world, companies and corporate treasuries in particular, spend a lot of time focussed on liquidity issues, and broader theoretical models show that institutions will rank projects in very different ways if they have a prioritisation framework that considers and values liquidity as insurance, and we ignore those liquidity strengths at our peril.

**Mr J. P. Walton, F.I.A. (introducing the paper):** I will start by discussing liquidity's impact on institutions.

Figure 1 is from a previous working party, demonstrating the liquidity transformation between assets and liabilities. The left of the chart shows liquidity requirements of liabilities. On the right is the offset against assets. Banks with liquid liabilities from depositors lend longer, which creates an illiquid asset, which is shown by the arrow going from the top left to the bottom right.

Pension schemes and annuity books have long-term illiquid liabilities that cannot be traded easily for cash. Assets backing those liabilities are generally more liquid.

So the rationale goes that where the liquidity of liability exceeds assets there is the potential to enhance returns to greater allocations to a liquid asset. We see this trend growing.



**Figure 1.** Many institutions appear to have excess liquidity.

There are many reasons why institutions need or want liquidity and not to match the cash flows in liability terms but taking liquidity risk. They may not be able to do so, particularly at longer tenures where their assets are not available. They need liquidity to pay the actual liabilities, and there is also a value on the ability to restructure a portfolio.

Liquid assets also enable participation in a market without investing in fundamental research, which incurs costs. The kind of fundamental credit research that I would need to enter into an asset for its full term.

So if I observe an illiquidity premium, how does an institution determine whether it is a buyer of it, essentially valuing the liquidity option? Quite rightly, most of liquidity management is focussed on examining marginal shocks to liquidity over short time horizons, for example, 1 day, 1 week, 1 month. As denoted in Figure 1, at the top we rank assets from most illiquid to most liquid, and demonstrating sufficient liquidity management is all about ensuring we have sufficient liquid assets to cover claims in the short term.

If I am decreasing the liquidity in my portfolio, I need to assess the increased risk of incurring losses as a result of that change and charge for that accordingly. In practice, pension schemes and insurers are often starting from such a liquid position and may charge little or having placed policies and management actions to limit this risk.

We pointed out in the paper that we need to consider, in addition to marginal liquidity shocks, all other causes for sale of assets and the costs and benefits of doing so.

As a long-term investor, I want to retain the option to sell assets before term for a number of reasons. It might be views on managing credit. Regulations might change in future or any other external trigger denoted by the arrows coming from the right, from the up or from the bottom (see Figure 2), meaning that there is some value on that liquidity option, and each investor, each institution, will place a different value on that versus what is available in the market.

As a very simplified example, how am I to determine a liquidity charge, that is, the extra yield I need on an illiquid asset versus a liquid one? We have gone, for an example, where a pension

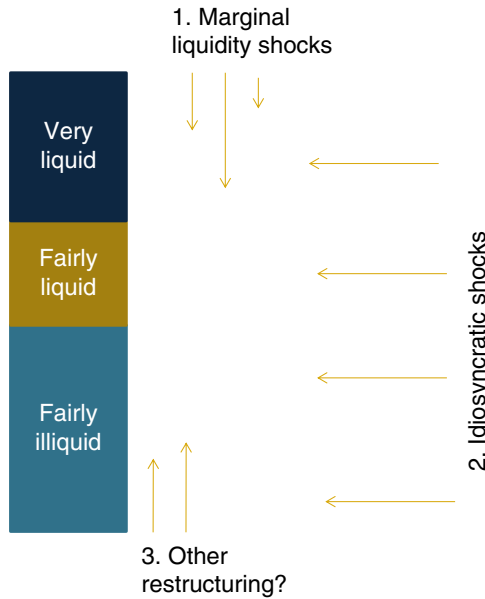


Figure 2. Valuing the liquidity option.



Figure 3. Continuum of investors.

scheme sponsor has a 2% probability of default per annum and then upon default, all my illiquid assets are sold to fund an insured buyout. Upon selling those assets, I incur transaction costs of 10%. Then on an expected basis an additional yield to compensate me for that risk might be 2% times 10%, which equals 20 basis points per annum.

In practice, there are other reasons to sell assets and I want to allow for dependencies between defaults and the cost of realising them. That is a charge that often goes unrecognised beyond the costs due to liquidity shocks.

Investor perceptions are summarised in Figure 3. We have a continuum of investors ranging on the left of the diagram to short-term speculators who are holding for periods of days or seconds right through to the right, genuine buy and hold holders of assets versus liabilities where there is no chance of sale.

In practice, most investors lie somewhere between. We have made the point that most institutions have to allow for the possibility that they may wish to sell the assets in future even if they are not obliged to do so in assessing the value of an asset.

I will move on briefly to make some observations from markets particularly post the financial crisis.

Taking a step back, what causes liquidity to breakdown in a market? There are broadly two reasons: changes to uncertainty perceptions or change to risk and liquidity preferences. In the example of uncertainty perceptions changing, that effect was documented by Akerlof, referring to the second-hand car market.

Reference: “The market for lemons: Quality, uncertainty and the market mechanism” (Akerlof, 1970).

It also applies to the mortgage-backed securities (MBS) market in 2008. Essentially, buyers doubt the quality of an asset. Sellers know they have good assets. There is an information asymmetry there. Sellers do not sell because they are unlikely to be able to replace their asset with certainty with equilibrium with no trade, and liquidity breakdowns (again we saw this during the crisis) are reinforced by a number of spiral effects, capital based on credit quality or some market measures, using assets to fund on repossession, as was the case with the MBS market.

In that environment, liquidity is hoarded rationally by institutions. That liquidity has more value. Shocks are more likely and there are potential profits to be made from market dislocation so that liquidity has value.

Looking at some data throughout the crisis and beyond, Figure 4 shows decline of the interbank lending market in dollars through time, reflecting the adage “liquidity is fine until it is needed”, which is well discussed and documented.

We make the observation that liquidity did not transmit itself instantaneously or frictionally across sectors in the financial markets, which is often an assumption.

Moving on to actual asset classes, we observe that the turnover in many asset classes denoted in dollars has held up to a reasonable degree.

Figure 5 shows turnover of Treasuries, MBS and agency paper. Figure 6 shows municipals, investment grade corporates and high yields.



Figure 4. Unsecured Interbank Loans (Board of Governors of the Federal Reserve System).

As expected, there has been some decline in trading volumes in MBS and agency paper. Municipals have fallen off a cliff.

Investment grade corporates has held up reasonably well. However, bond trading is increasingly costly and concentrated so turnover, as a measure of liquidity, is only telling one side of the story here.

Figure 6 is demonstrating the decline in liquidity in the corporate bond market. It is a plot of turnover in billions of dollars against rank by turnover. Few credits are actively traded. That was true before the financial crisis but it has become even more so with that very skewed distribution,

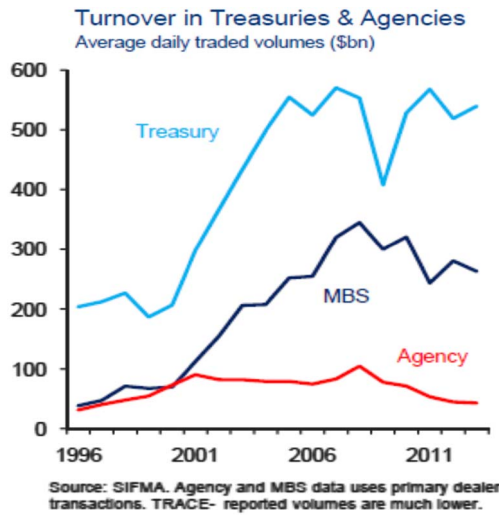


Figure 5. Turnover volumes in US bond markets.

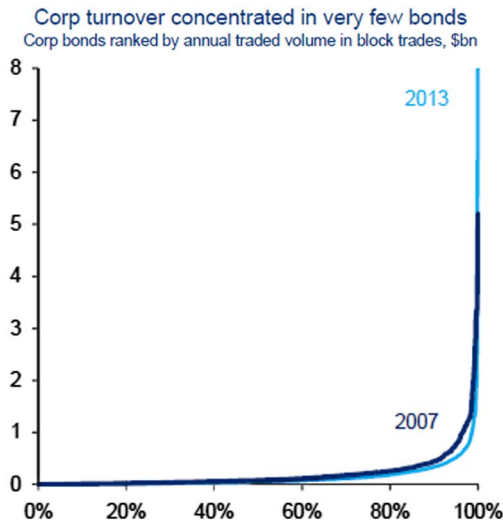


Figure 6. Corporate bond turnover concentration pre- and post-crisis (TRACE).

whereby only the top 5% or 10% of bonds by size or by liquidity are being actively traded. That is essentially largely as banks have withdrawn as intermediaries. The dollar stock in trading books has declined from around \$260 million before the crisis to \$50 million. Essentially, liquidity is moving towards Treasuries and to lower risk assets.

I end by making some observations on regulation and policy, particularly since the crisis.

We observe that without regulation, financial institutions will tend to minimise their holdings in liquidity stores; but post-crisis regulation in various forms has been around encouraging low-risk liquid assets. But these minimum liquidity requirements, enhanced requirements at the institutional level, do not necessarily improve liquidity for the whole system if that liquidity is trapped within institutions.

The final point that we make is to contemplate the purpose of liquidity regulation. Economic benefit comes from increasing outside trade between the real economy in a market. There is not necessarily any benefit just by improving liquid markets themselves if that liquidity is just from inside participants trading among themselves.

I leave some questions which may prompt debate:

1. Do too many actuarial models ignore the option value of liquidity?
2. Do we sufficiently distinguish between a theoretical risk-free rate and an investible one based on liquid securities with an embedded liquidity premium in their price?
3. How might institutions better account for liquidity, its value, and their needs when making investment decisions?
4. Does liquidity regulation enhance or reduce liquidity in the “real economy”?
5. How can markets be regulated better to serve the real economy over traders?
6. How can the worst consequences of mark-to-market balance sheet management be mitigated to aid longer-term investment time horizons and reduce procyclicality?
7. How can we better assess liquidity, so measures focus on its availability when required, rather than being dominated by analysis of conditions when liquidity is already in ample supply? For instance, does increased turnover really mean increased liquidity in any economically meaningful sense?
8. How might we better understand money creation and the business cycle, to ward off some of the worst excesses of financial booms and busts?

**The Chairman:** Thank you for a very interesting talk on a topical subject. It comes at a very opportune time, not least because of all of the discussions currently happening across the UK annuity industry on the successor of the liquidity premiums, or the matching premium discussions. A large part of the industry is thinking about liquidity, and as such seeing a holistic piece on the different aspects of liquidity is very useful indeed.

There are some really useful insights, especially the different measures of liquidity and how they interact with each other.

What was also very interesting were your examples of liquidity failures in what were otherwise considered very safe havens in liquid assets, so Treasuries and also the failure of the CHAPS system were very concerning.



Finally, it was also useful to see some of the liquidity changes in context before and after the crisis. In particular, how the interbank lending has fared in contrast to all of the different corporate bonds and fixed income instruments. It was really interesting to see that turnover in fixed interest has held up, whereas at the same time interbank lending has completely crashed. So it was very, very useful as a context.

I understand that there has been recent correspondence from the PRA, which talks about new rules or new thoughts on what assets are eligible and ineligible.

Do you wish to add anything to that in the context of what you have looked at on liquidity on a holistic basis?

**Mr Walton:** Those rules are around demonstrating you have fixed cash flows and then if you choose to, you can have certainty around those cash flows matching your liabilities.

My discussion around wanting the option to sell in future remains; but in a regulatory context there is some uncertainty about exactly what that means in terms of demonstrating holding the asset to term.

**Dr L. M. Pryor, F.I.A.:** Many thanks to the authors for a really interesting paper. I found that it gave very clear explanations of some points.

One thing I was very interested in is that you are obviously focussing mainly on the financial services sector. But there were a couple of references to the fact that liquidity is also an important consideration for what you might call ordinary corporates as well.

You have referred to the fact that many of them have very big Treasury departments. So they are really looking at liquidity from the sharp end. It is a day-to-day concern for them about whether they are going to have enough cash tomorrow or next week, to pay their outgoings.

Could talk a bit more about that or if you think that there are any insights one could get from studying that part of what is going on in thinking about liquidity rather than looking at the financial services sector.

**Mr C. Keating:** The interesting phenomena that has occurred since the crisis is the way in which most of the larger corporates manage their Treasury function has changed.

Prior to the crisis, it was perfectly normal to have your contingencies in reserves in the form of standby lines of credit, or committed lines as they were generally referred to.

Since the crisis, we have seen a significant change in behaviour, partly because when people went to draw on those committed lines, the material changed, clauses were invoked and there were some rather fine words exchanged, usually.

One of the reasons we have seen as much corporate bond issuance is that corporate treasuries now will rather go out and issue the 7-, 10- or 15- year bond at these relatively low rates and sit with very, very high levels of cash earning them next to nothing in their corporate treasuries. That is probably the largest single reason why the corporate sector has as much cash as it has, which is surprising lots of people, but it has been a fact for rather a long time, and at the same time is even more indebted than it has ever been before.

That is true not just here; it is true in the US and in lots of European countries as well.

**Dr Pryor:** What does this mean for corporate businesses?

**Mr Keating:** I cannot run my business if I do not have cash. I cannot rely on standby lines the way that I used to because when I really needed them in a lot of cases they just were not there. I now need to have lots of cash in hand. The easiest way to do that is to go and borrow at rates which are, by any reckoning, very, very low.

What is interesting here is we have high levels of indebtedness, very high levels of cash and really very low levels of investment. That is the combination which seems to be driving the corporate sector at the moment.

But you should not expect to see the corporate sector investing until such point in time as they see demand for their goods and services, which basically means until Europe looks like it is going to pick up.

**Dr Hatchett:** The way you think of a corporate doing decision making is that it will do some discounted cash flow calculations on the projects that it would carry out with its money and would rank the projects in order. It would do the top ones.

Once you have a model in which liquidity is important, that is not the way you do the decision making any more. You might do a project with a lower net present value because it provides you with cash when you need cash, and that is a completely different way of looking at the world. Although companies are borrowing at low rates, they probably invested the cash at even lower rates. That is a project, if you like, with a negative net present value. But in the real world it is a very rational thing to do.

There is more work for actuaries to do to understand how the liquidity dimension and the value dimension can be integrated in a coherent way. Banks are trying to do it in the way that they are modelling cost of funding, and regulators are trying to get to grips with that. It feels like an area where there is more research to be done rather than there being a well-considered solution at present.

**Mr J. G. Spain:** The 5<sup>th</sup> question “How can markets be regulated better to serve the real economy over traders?” The real economy has traders in order to make the real economy work, so I assume the reference to traders is financial services “Del boys”.

The next question, number 6, “How can the worst consequences of mark-to-market balance sheet management be mitigated to aid longer-term investment time horizons and reduce procyclicality?” is more interesting. How about stopping using mark-to-market when it just does not work?

**Mr Keating:** I do not think that is right. Mark-to-market works. It just does not have the effects that people wanted it to have.

**Mr Spain:** That is fine. It does not work.

**Mr A. K. Gupta, F.F.A.:** We have all got so ingrained in our thinking that liquidity is a good thing that we rarely stop to think about the cost of it and how much is enough.

I worry about the cost because it does operate at multiple levels, affecting customers, institutions and the economy.

If we start with customers, we encourage retail customers to invest in liquid assets. In fact, we make it very difficult for them to invest in illiquid assets. That means many customers who are investing over the long term are giving up potential returns and having lower pensions as a result.

To reflect what Mr Spain just said, our regulatory capital and accounting regimes are based on mark-to-market. That drives life companies and pension funds to have liquidity requirements that are far in excess of their natural needs and, as a result, they contribute to liquidity shortages in times of stress and turmoil.

The issue that concerns me most is the impact of liquidity requirements on the ability of long-term institutions to invest over the long term and to invest efficiently.

I was part of a Bank of England working party involved in a 2-year study looking into procyclicality and asset allocation of life companies and pension funds. As part of this, we thought carefully about how mark-to-market-based regulation impacts long-term investment.

Our work there left me with this concern: liquidity drives volatility. It is a key driver of volatility. Volatility is the underlying measure of market risk used in mark-to-market-based regulation accounting. But market risk is very different to investment risk.

If I am investing long term, I care about investment risk; by that I mean permanent loss in the value of my investments, whereas market risk reflects liquidity and volatility. At the very time that market risk can be at the highest, investment risk can be very low.

In the middle of a crisis, for example, volatility is typically very high, but because markets have then fallen, investment risk can be very low. So at the time I could and perhaps should be investing, our regulation and accounting is discouraging me from doing so.

Of course, the opposite happens when markets are high. I am concerned that our focus on liquidity and volatility is in fact driving long-term investors to take precisely the wrong actions. That is leading to procyclicality and we need to think carefully about how much liquidity is healthy.

The authors have done a really good service and are to be congratulated for their work and for drawing attention to this really important issue.

**Mr Keating:** I agree with the gist of what you are saying. The relationship between liquidity and volatility is complex. It is in fact U-shaped in the sense that extremely low liquidity can result in high volatility; similarly, excessive liquidity will also result in extreme volatility.

The thing to understand about this is that liquidity has a cost. The most liquid asset will be the most expensive relative to its fundamental values. What that means is that the short term is operating to the detriment of the long term. By operating in short-term liquid assets, trading them willy-nilly, and increasing volatility, we are doing two things: we are driving up the price of that asset, which of course operates to the detriment of the long-term holder, where the income yield is critical (certainly critical in terms of long-term compound returns).

The other thing this induced volatility is doing is it drives a wedge between the arithmetic return and the geometric compound return: 20% volatility, 2% underperformance in compound terms relative to the arithmetic.

Short-termism is much more pernicious than you might think in the sense that it does harm to the long-term expected experience.

**Mr Gupta:** To follow that up, have we taken risk techniques designed for trading organisations and short-term organisations and applied them to long-term organisations and in doing so undermining long-term investment?

**Mr Keating:** We have taken the short-term trading model, which was value at risk. We are now applying it all over the place and we are using cross-sectional ensemble statistics when we should, for long-term institutions, be looking at the time serial. That will give you very different sets of results.

There are yet more problems associated with that. When you are talking about the long term, you really are no longer talking about risk in this preventative sense (in this general insurance type sense). What you are talking about is uncertainty. What that means is we cannot identify the full set. There are circumstances likely to occur. We simply have no possibility of knowing what they might be. New inventions, for example.

What you have to do in that circumstance is move from the static-type risk management approaches that we have been using, and we have been applying those static approaches in things like LDI and ALM in the insurance industry, and setting all future in stone as if it could be set in stone today. That is a major mistake.

What we should be doing is adopting an approach, which follows the precautionary principle. To this horizon, we can forecast with reasonable degrees of predictability, so let us make our allocations on the basis of that. What might that period be? It may be 3 years. It may in a life company be 10 years. But it is most unlikely to be 50 or 100 years.

**Mr D. C. E. Wilson, F.I.A.:** There are some hints in the paper that the answer to the question 4, of whether liquidity regulation enhances or reduces liquidity in the real economy, might be “reduce it”. I want to check that I have interpreted that correctly. If that is the case, then presumably that is not the intention; and what, if anything, can we do about it to seek to change regulation in a way which would deliver the most desirable outcomes?

I should not assume that is around increasing or decreasing in any sense. I have interpreted it as it is around increasing in the outside, in the real economy, rather than worrying about the inside, the market.

**Mr Keating:** The problem with liquidity regulation is it requires liquidity to be hoarded within financial institutions. Once it is hoarded within a financial institution, it cannot be available to the real economy. You have removed it from that.

That means either you have to do something to increase the velocity of liquidity outside of the financial system or you have to increase the money stock or the liquidity stock in some way outside the system.

The problem with doing that is you are running the cusp of an inflationary spiral in doing so, in doing either of those. It is a very tight line to follow.

Central Bank monetary policy in a world post-liquidity regulation will have to be very, very different indeed. We have already passed the point. If you look at US high powered money, it peaked last June

and it has been declining ever since, largely because they have been draining through overnight reverse repo and term deposit facilities.

**Mr Wilson:** So presumably if you could rely on the corporates to continue to hoard the liquidity, then the banks could manage in a non-inflationary way in the way that they wanted to, but it is the risk that they might unhoard that and reintroduce it into the economy that is the real challenge?

**Mr Keating:** If a bank has the statutory regulated liquidity requirement, and I go in as a corporate to call on my committed line of credit, he is quite likely to say to me “I cannot give you this liquidity. I am not allowed to”.

The role of banks as insurers of liquidity to the real economy has been decidedly compromised by this.

**Dr Hatchett:** There appears to be a parallel between required liquidity and required capital as well. Insurance companies have to hold more capital than their capital requirements to make sure that they do not go under their capital requirement, which does to some extent, provide a lower risk promise to policyholders. It also restricts the way that insurance companies can invest because they have to invest sufficiently defensively in a balance sheet sense to protect their capital levels, which goes to the point that Mr Gupta raised.

There has been a trend, particularly pensions in the UK, of liabilities becoming more and more fixed in some sense or turned into hard guarantees. That has some desirable attributes from an individual who does not want a benefit that is not guaranteed; but in the pensions industry we have seen UK DB pensions essentially closed in the private sector.

In insurance, it has pushed up the cost of guaranteed products and driven individuals towards unit-linked assets and towards there being a perception that annuities are incredibly bad value, but they are the cost of providing “guarantees” at a risk that I assume regulators, and us as influencers of those regulators, view as being acceptable. In a liquidity sense, it is causing banks to hoard liquidity, which then causes corporates to hoard liquidity, which then leads to a set of problems that we can see.

A lot of it is trying to drive risk below a level at which it can be managed, and it creates more risk at a systemic level than allowing a system where failures are acceptable and are part and parcel of life because you then get more upside as well as potentially having a limited amount of more downside. But at a societal level we are all potentially better off with different approach to systemic risk management.

**Mr Keating:** I will add one further point in that area and that is the idea that we are selling liquid securities to the consumer. This is true in the fund management area. But there are two sets of institutions which were specifically designed to sell illiquid contracts. These are things like deferred annuities in life assurance and pensions of the DB form.

Deferred annuities and annuities may have been terribly bad value for money prior to the Chancellors interventions earlier this year. But that does not stop them from being a near-perfect form of security or investment design. We killed the wrong problem with the Chancellors solution.

The reason that things like burial societies, life companies and defined benefit pensions came into being, was for a very simple reason. It could not be done in markets. If it could have been done in markets, there would have been no need for groups of people to band together

and create these bodies, which is what they did. Where that leaves you when you have this market consistent nonsense is that you are trying to force illiquid contracts which were written for perfectly good reasons into some form of market consistent behaviour and this is just nonsense.

**Mr Walton:** Mr Spain talked about what makes an asset class liquid, and norms and conventions, and standardisation is one thing. That is an area regulators can potentially focus on in a market. That does not necessarily increase liquidity of outside investors, but it can substantially increase the overall liquidity of the market, at least inside.

**Mr Keating:** The most important characteristic of a liquid security is that it should be information insensitive, that is, you can still sell it.

Now, think about transparency in that context. You come to some surprising answers.

**Mr J. G. Dewey, F.I.A.:** You have made a very clear case that liquidity should attract a risk premium. Potentially that premium should be time varying and vary across asset class. At the same time you touched on the potential investor appetite for liquidity.

Have you done any work to quantify both the liquidity premium inherent in different asset classes, and also risk budgeting or liquidity budgeting? The extent to which an individual investor of a given type in given circumstances can afford to take that liquidity risk?

**Dr Hatchett:** The short answer to the first question is no we have not sought to look at yields and try to disentangle which part of that yield might be an investor paying for liquidity insurance or not. There is a wide literature in that space that we have not sought to add to.

On the institutional side, we have covered it briefly. Mr Walton talked about it a bit.

One of the things that you get to, is that some liquidity requirements are marginal, so if you have a derivative strategy, you might do some modelling about how volatile will prices be and how much liquidity do I need to run that strategy without having to unwind it at some certain confidence level, accepting uncertainty? So that might be uniform across different investors.

Then there are idiosyncratic risks such as if you are an investor who says “I will only hold investment-grade corporate bonds”, then you may need to sell a corporate bond if it goes below investment grade. To some extent, that is your choice as an investor.

Then there are risks that you just need to sell which will be very institution specific. If you are a DB pension scheme, the time at which mark-to-market bites in the UK, is if your sponsor becomes insolvent, you need to liquidate your assets and pass them to an insurer, either as cash or in terms of gilts in highly liquid assets. So at that point your illiquidity gets crystallised. That is very much about your particular sponsor going bust, which is entirely idiosyncratic to you as an investor.

There may be other choices about investors who may move out of an asset class for ESG reasons or something else. But different investors may choose to liquidate parts of their portfolio for entirely individual reasons, which is why they will place a different cost of liquidity on themselves based on how they wish to approach the market with one extreme being someone who says “I will buy and

hold and I will not sell these assets under any circumstances”, in which you have no costs of having to realise those assets.

**Mr Keating:** In response to “Have we done work on quantifying?” I have been doing work on that since we wrote the paper.

Liquidity currently is by design as a result of quantitative easing and Mark Carney’s actions, as cheap as it has ever been. That has been the entire purpose of this exercise.

In that world, should you be buying the most liquid, which is now at an all-time cheap level, or should you be buying the most illiquid, as most insurance companies seem to be chasing?

There is a second element that needs to be considered if you are going to look at pricing liquidity. You have to see it in the context of the term structure and the simplest understanding of what a Treasury yield is telling us.

A Treasury yield of 2% tells us that liquidity in the future at the maturity of that bond is going to be very cheap. A Treasury yield of 10% tells us that we expect it to be very, very valuable.

It is very difficult to price this as largely you do not know what Mark Carney is going to do.

**Mr J. Instance, F.I.A.:** Mr Gupta first mentioned this, and Mr Keating developed the idea about the individual’s propensity or love of liquidity in terms of investing in cash ISAs. So as a result of the Chancellor’s pension’s changes, will we see a switch out of highly illiquid DB pension arrangements into highly liquid DC and perhaps taking the cash out?

This paper very timely raises the issue of the price of liquidity. What sort of role do actuaries have to educate and inform people making very significant and potentially very expensive decisions given the price of liquidity?

**Mr Keating:** The individual certainly has a love of cash. What can you do about it? This is partly a question of consumer education. If you really want to bring it home in a hurry, when a cash ISA matures, you should just say “Had you put this in National Savings it would have been worth this much more”. Or you can choose whatever your favourite alternate is. Will people go that way? Probably not. You can probably affect some at the margin.

**Mr K. B. Donaldson, F.I.A.:** Regarding your last question on money creation, Martin Wolf, chief economist at the *Financial Times*, got some publicity earlier this year. He suggested money creation is too valuable to be left to the banks and should be taken back by the government. I cannot see that happening for a very long time. You cite Professor Werner in your paper. He also has some interesting ideas on reshaping money creation and disabling the banks from making certain fairly sweeping types of investment. I wondered where you were on money creation or whether or not you think that the current system is the least bad.

**Mr Keating:** Money creation generates *seigniorage*, which was a huge topic of discussion at the time of the creation of the euro. Do we really want to allow *seigniorage* to be captured by the banking system or by a non-official body? That is what the question really comes down to.

The answer is we should be prepared to tolerate money creation outside of the banking system because it is distributed money creation. If these were unitary banks just with a head office in London and no distribution capacity across the country, it would probably be a very different kettle of fish.

As long as this is legal tender, valid in payment of taxes, then it is probably okay. You cannot have bodies creating a separate unit of account. The function of money that matters more than any other is money as a unit of account. All of the others follow from that.

If you allow money creation in a way where you lose the *seigniorage* and you begin to damage the value and the consistency of money as a unit of account, then you have a problem.

Would I allow something like Bitcoins to be called money? No. Could Scotland have used the pound sterling as its currency? Yes. There is nothing that the Bank of England could have done about it, nor should there have been any reason for the Bank of England to worry about it.

**The Chairman:** One could argue that money is whatever enough people agreed to be a medium of exchange. If enough people agreed for a Bitcoin to be a medium of exchange, then it is money until it breaks down.

**Mr Keating:** Money has to possess all of the properties, not just one. What you are describing there is a partial money, a quasi-money.

**Mr Spain:** The problem I have with mark-to-market for long-term entities is that short-term movements just do not give anything like a reliable estimate of what is going to happen over 10 or 15 years, or longer.

That leads me to conclude that the discount rate which we have been using as a mechanism for over 200 years has probably passed its sell by date. It is the sort of thing which liquidity premium would never come into, you just could not say “Add 0.2%. We have done it. We have solved the problem”.

We should be looking at forward projection and taking into account projected cash flows, assets and liabilities stochastically as intelligently as we can and no longer, at least in a DB environment, just looking at mark-to-market and 1½%.

When index-linked gilts were first issued something like 30 years ago, I cannot remember anybody saying “We expect yields to go negative”, which is what happened.

We need to rethink not just in terms of liquidity but everything else. We have to change what we do as a profession.

**The Chairman:** I have a lot of sympathy with those views. It triggers another question. Mr Wilson talked about the impact of liquidity regulation. Also, what one wonders about is the impact of unintended consequences of other regulation.

For example, if you mandate annuity funds to invest only in a very certain pre-prescribed type of asset, does that unintentionally have impact on the liquidity aspects of everything you can and



cannot invest in? Is that something that had been thought about prior to the regulations coming in place?

**Mr Keating:** I will come back first on Mr Spain's point about mark-to-market. There is nothing intrinsically wrong with mark-to-market if those market prices reflect fundamental values. The problem is that they do not. The reason is that those securities which are most liquid are those which are furthest from fundamental value. They are those which are most prone also to herding and all sorts of momentum effects.

That creates problems, and that is the nature of the problem with mark-to-market. The volatility that you are looking at has nothing to do with changes in the fundamentals. It has almost everything to do with the game against others, where I am trying to beat you or someone else in the market. That is endogenous volatility and it is probably 80% to 90% of the action that we see.

This is why when you look at very long holding periods where that sort of action has simply smoothed out, you come down to long-term volatilities which are 2%, 3% or perhaps 4%, but more or less the same, as they should be, as the volatility of the economy, as the volatility of GDP.

It is only what is produced in GDP that can turn up in investment returns. You can have some variation between labour share and capital share. Overall, there is going to be a limit. It is quite clear, it is GDP growth.

**Mr Spain:** Mark-to-market, which takes account of volatility, which is irrelevant to long-term entities whose managers' trustees can soak up the volatility, without worrying over long periods, can lead to huge misallocation of resources within corporates to their pension schemes, which seem to be in very little better shape on conventional measures at the moment than they were, say, 6 years ago at the expense of investment and at the expense of jobs.

**Dr Hatchett:** It is not mark-to-market that is the problem; it is basing actions on it that is the problem.

**Mr Walton:** That observation is more around rates. But in insurance, in Solvency II matching adjustment, there is effectively a mark-to-market of credit, but also, on the liabilities side, we expect that to be cancelled and cancel that out.

I have been working in the US recently, and there is book value accounting there, but mark-to-market went when the credit gets really bad. In credit space, there is a mixture of mark-to-market and non-mark-to-market to allow for that. I think your observation was more on rates.

**Dr Hatchett:** I agree broadly with the limitations that you identified. With a DB pension scheme, the incidence of sponsor failure is not that low. There are hundreds of schemes that have been through the PPF, and more that have been PPF-solvent and bought out. In that tail risk you do have to liquidate your position.

There is a funny dynamic where 90% of the time we are investing over the next 20 years, or maybe it is 99% of the time, depending on your sponsor, but there is this tail risk where some of the time we have to sell our assets in a very short period.

You need to understand both of those aspects to decide how much weight to put on mark-to-market, but it is probably not zero and how much weight to put on a stochastic model over the long term to understand the volatility of cash flows that you get from your assets and how they pay liabilities over time.

Returning to the question about regulation driving asset allocation, one of the things that I have observed recently is you have seen academic studies by people at the Bank of England and others looking at how the regulatory climate for DB schemes has led them to buy gilts, driving down yields, which has created deficits, has led people to think, “We had better de-risk, so we will buy more gilts”. There are not enough (long dated) gilts around.

So you have to take a systemic look at what regulation is doing because banks want some of these gilts to manage repo and manage their liquidity.

If you are very cynical you may say from a government perspective, all these people lowering the government’s cost of financing has some attraction.

**Mr Gupta:** It is the unforeseen consequences of mark-to-market and its impact on asset allocation that concern me.

One of the things that struck me from the Bank of England work was the extent to which we observed de-risking both within DB pension schemes and with-profits and annuity funds. The de-risking, which has taken place, is way beyond what you would expect from natural scheme shortening of short duration.

For example, the allocation to equities of the DB pension sector between the years 2000 and 2011 fell from something like 70% to 35%. That coincided with the introduction of FRS 17. We saw similar results in life assurance.

Compare that to local authority pension schemes, which were not subject to mark-to-market. They fell from 70% to 60%.

Another thing which struck me was maybe what we are seeing is people rebasing their risk appetites so that pre-mark-to-market, they tried to pitch their risk appetites at the midpoint of the cycle. But with mark-to-market, they had to re-base their risk appetites to the bottom of the cycle. Otherwise, you have to sell assets in a falling market, which is pernicious.

One of the consequences of mark-to-market may have been a rebasing of risk appetites to the perceived bottom of the cycle.

The other unintended consequence of mark-to-market is herding. One of the things we identified, particularly in the DB pensions world, was a massive degree of herding. That really came across in a study on the impact of the index-linked market. We found that the actions of pension funds had led to a suppression of the 20-year index-linked gilt yield by something like 165bps, and the actions of life companies led to suppression of index-linked gilt yields by 74bps.

So all of that in turn increased deficits, which led to more purchases of index-linked gilts, which led to even higher deficits and set up a vicious downwards spiral.

It is these unforeseen consequences that can be quite damaging.

**Dr Hatchett:** It reminds me of something that we talk about in our paper, which goes back to the work of Keynes, which stated that there is no such thing as liquidity for the market as a whole. The most liquid asset is central bank reserves. If we had to sell all other assets and convert them to Central Bank reserves, we would have to shrink the entire asset base of the UK down to the level of Central Bank reserves.

**Dr Hatchett:** So it just highlights the fallacy. You can drive liquidity so far, you can drive mark-to-market so far, and if you keep pushing, then you get pernicious and deeply undesirable systemic consequences.

**Mr Keating:** Mr Gupta's Bank of England paper found only very weak evidence of procyclical in the pensions and insurance world.

Going back to liquidity, I will suggest that those findings now are out of date, because of EMIR (European Markets Infrastructure Regulation) coming in will require the maintenance of high-quality collateral by insurers and pension funds.

The collateral flows (the liquidity flows from collateral) is just a form of liquidity. It could be enormous if we were to see another crisis-type melt down. They are going to be big enough anyway, but they are probably on the margins of manageability. There is room for an enormous business here in collateral management under these regulations. Quite honestly, the sooner we kick the regulation out, the better. But that is not going to happen very soon.

**Mr Gupta:** If I may come back on your first point about evidence of procyclicality, the thing that I found working at the Bank of England is that they set the bar for evidence very high. It is a bit like proving global warming. You will never get a consensus view that global warming exists.

What we did find was enough evidence to say yes, there is a real problem here. The Bank of England would not have published the paper if it did not really believe that there was an issue here.

There was certainly some statistically significant evidence of procyclicality. We did not look at the use of derivatives. We felt had we been able to look at derivative usage, we would have found more. There was a lot of anecdotal evidence. Perhaps the strongest evidence we found of procyclicality was the heavy use of regulatory forbearance. You would not have had regulatory forbearance if you did not have the procyclicality to begin with.

There are big flaws with regulatory forbearance in so far as you have to assume that it will never happen. So you have to work on the basis that it will not happen. It is all *ex post*. You need *ex ante* tools.

**Mr Gupta:** It is a very high hurdle to get the Bank of England to sign off a paper saying that there is clear evidence.

**Mr Walton:** Just expanding on those cyclicity points, from work that I have been involved in, you only really lose on credit historically when you invest at very tight spreads and then defaults emerge over the next 10 or 20 years, rather than investing at average spreads and you get a period of distress. It is quite difficult to deal with that reality through a lot of capital credit models. One thing is to charge essentially for downgrades rather than just a long-term buy and default haircut, so you are

allowing for the fact that assets can downgrade and so you need to hold more capital and need to demand a return on that capital. So it is just about charging in the right places to be able then to have a framework which you can take actions to avoid procyclicality.

**The Chairman:** I think it has been a really good discussion. There has been a very interesting debate after the presentations, which touched on a variety of aspects including procyclicality and various aspects of regulation. There have also been a lot of interesting insights into the Bank of England paper on procyclicality.

On that note, I remember reading that paper and looking at the history of the asset allocation for with-profits funds. It was around 2003 when it started declining. This also coincided with the introduction of market consistent regulations in terms of the Prudential Sourcebook. I do not know whether it was statistically significant but shall leave you to draw your own conclusions with regards to the coincidence.