



Market liquidity and bank capital

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I congratulate the organisers for having chosen such a topical subject for discussion. I am especially happy to share the stage with Lasse Pedersen. As many of you know, Lasse was a trailblazer in the research on liquidity. In his study with Markus Brunnermeier, Lasse showed us how market liquidity is inextricably bound up with funding liquidity, and hence why liquidity and leverage have to be considered together.²

Unlike share trading, which happens on organised exchanges, bonds are far less standardised. They have finite maturity and can carry financial and non-financial terms that vary from one bond to another. This lack of standardisation presents challenges for the trading of bonds on organised exchanges. In addition, many bondholders are institutional investors, who tend to buy and hold to maturity rather than trade actively. When these investors *do* decide to adjust their portfolios, their orders are typically quite large relative to the daily trading volume.

For these reasons, market liquidity in fixed income instruments depends on dealers’ ability to absorb demand and supply fluctuations by taking exposures on to their own balance sheets. In turn, dealers finance these asset positions by borrowing in capital markets, often by pledging the securities they take on as collateral. This is why funding liquidity, in the sense of the ease of borrowing conditions in capital markets, is so closely bound up with market liquidity.

The interaction between market liquidity and funding liquidity is back on the policy agenda, and I would like to address two related issues in my remarks today.

The first is the perception among many market participants that market liquidity has been impaired in some fixed income markets, especially in the market for corporate bonds. The second is the perception that banks have become more reluctant to engage in traditional intermediation activities. These two observations are then often bundled together into the argument that tighter bank capital regulation has undermined banks’ capacity to engage in intermediation activities and that market liquidity has deteriorated as a consequence. The remedy, according to this line of argument, is to loosen bank capital regulation, especially the rules on bank leverage.

To back up this argument, commentators cite evidence of “liquidity bifurcation”, where actively traded markets with tight bid-ask spreads coexist with more sparsely traded markets, especially in corporate bonds. Economists from the Federal Reserve Bank of New York have examined the evidence in

¹ I thank Stefan Avdjiev, Claudio Borio, Jaime Caruana, Dietrich Domanski, Neil Esho, Ingo Fender, Leonardo Gambacorta, Krista Hughes, Cathérine Koch, Ulf Lewrick, Robert McCauley, Luiz Pereira, Ilhyock Shim, Nikola Tarashev and Philip Turner for comments on earlier drafts and Sebastian Deiningner, Anamaria Illes, Jeff Slee and Agne Subelyte for excellent research assistance. The views expressed here are my own, and not necessarily those of the Bank for International Settlements or the Basel Committee on Banking Supervision.

² M Brunnermeier and L Pedersen, “Market liquidity and funding liquidity”, *Review of Financial Studies*, vol 22, 2009, pp 2201–38.



a series of blog pieces,³ and my BIS colleagues have also examined this issue.⁴ This topic was also the subject of a detailed study by the BIS-hosted CGFS central bank working group on liquidity in fixed income markets.⁵

The evidence for impaired market liquidity is mixed, especially considering the much larger size of fixed income markets following the burst of new issuance after the crisis, but there is some evidence that buyers and sellers resort to trading in smaller lots. There is also evidence that dealers have become more reluctant than before to take large exposures on to their own balance sheets. Instead, dealers who receive an order attempt to match it with an offsetting order so as to avoid taking risks on their own account. In the jargon, dealers are less willing to act as “principals” and instead prefer to be “agents”.

If market liquidity is impaired due to the inability of dealers to take exposures on to their own balance sheets, it is tempting then to jump to the conclusion that liquidity problems ought to be remedied by relaxing the rules on bank capital and leverage. However, before jumping to this conclusion, it is worth pausing to ask two questions.

First, what criteria should guide us when assessing whether liquidity is adequate or lacking? The answer will depend, among other things, on whether we consider only the short-term private interests of market participants or whether we consider the broader public interest. As I explain below, considerations of the public interest point to the importance of reliable liquidity that promotes resilient markets in the face of market disruptions. Although the private and public imperatives point in the same direction most of the time, they may occasionally diverge. I will say more on this shortly.

There is a second, possibly more important, question. If we conclude that liquidity is lacking because financial intermediaries are constrained from taking risks, what is the best way to remedy the problem? Is it sufficient just to loosen regulation and permit greater leverage on the same capital base, or is there a better alternative? I will answer both questions shortly, but let me first put these questions into some historical context.

Some historical context

We still have fresh memories of the ample liquidity provided by financial intermediaries in the run-up to the global financial crisis. Graph 1 plots the time path of the total assets and leverage of the US securities broker-dealer sector from 1990. The left-hand panel shows the total asset series of the broker-dealer sector, scaled to 100 at the start of the period. I have also plotted the total assets of the US non-financial corporate sector and the US household sector for comparison, both scaled to 100 at the start of the period. The right-hand panel shows the leverage of the US broker-dealer sector, where leverage is defined as the ratio of total assets to equity.

³ See T Adrian, M Fleming, O Shachar and E Vogt, “Has US corporate bond market liquidity deteriorated?”, Liberty Street blog, October 2015, <http://libertystreeteconomics.newyorkfed.org/2015/10/has-us-corporate-bond-market-liquidity-deteriorated.html>.

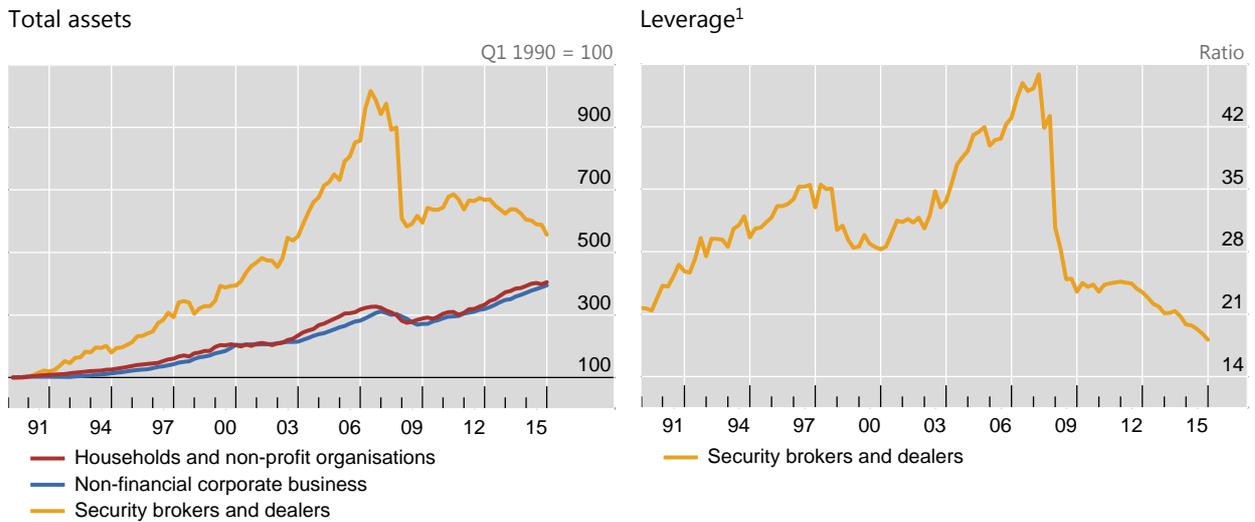
⁴ For instance, I Fender and U Lewrick, “Shifting tides – market liquidity and market-making in fixed income instruments”, *BIS Quarterly Review*, March 2015, www.bis.org/publ/qtrpdf/r_qt1503i.pdf.

⁵ CGFS, “Fixed income market liquidity”, *CGFS Publications*, no 55, January 2016, www.bis.org/publ/cgfs55.pdf.



Total assets and leverage of the US securities broker-dealer sector

Graph 1



¹ Calculated as total assets divided by equity.

Sources: Federal Reserve, *Flow of Funds*; BIS calculations.

By any standard, these charts for the US broker-dealer sector are dramatic. We see how the sector's total assets grew much faster than the rest of the economy. At the peak of the credit boom in June 2007, these assets had grown more than tenfold from 1990; the assets of non-financial corporates and households had grown by a more modest factor of three. With the onset of the crisis, however, broker-dealer assets fell sharply. The roller-coaster ride of the US broker-dealer sector is reflected in the fluctuations in its leverage, as shown in the right-hand panel. Leverage started out at 22 in 1990, rose to the dizzy height of 48 at the peak, only to plummet with the onset of the crisis in 2008.

Arguably, there was *too much* liquidity at the height of the boom in the broker-dealer sector. Dealer banks were taking on exposures in ways that proved to be unsustainable and ultimately very damaging for the real economy. The sharp contraction of dealer balance sheets was mirrored in the spike in credit spreads in traded instruments, serving to tighten credit conditions for borrowers and generating adverse spillovers to the real economy.

We know from the work of Simon Gilchrist and Egon Zakrajsek⁶ that bad things happen to the real economy when credit spreads spike. For instance, macro indicators such as output and employment deteriorate following the spike in credit spreads. What is more, there is evidence that the impact of spread fluctuation is asymmetric in the sense that a sharp upward spike in spreads does much greater damage to economic activity than a compression in spreads brings benefits. In one of his last speeches as a Fed Governor, Jeremy Stein went through the arguments and documented the evidence on this topic.⁷

Hindsight is a wonderful thing, and we can now pronounce upon whether there was too much or too little liquidity at the peak of the boom. Doing so in real time is, of course, a much more difficult exercise. However, one thing is clear. Conceptually, at least, there is such a thing as "too much liquidity". This is so,

⁶ S Gilchrist and E Zakrajsek, "Credit spreads and business cycle fluctuations", *American Economic Review*, vol 102, June 2012, pp 1692–720.

⁷ J Stein, "Incorporating financial stability considerations into a monetary policy framework", speech at the International Research Forum on Monetary Policy, 2014, www.federalreserve.gov/newsevents/speech/stein20140321a.htm.

even if market participants at the time are clamouring for more of it, because short-term private motives do not take sufficient account of what is sustainable and what is in the broader public interest.

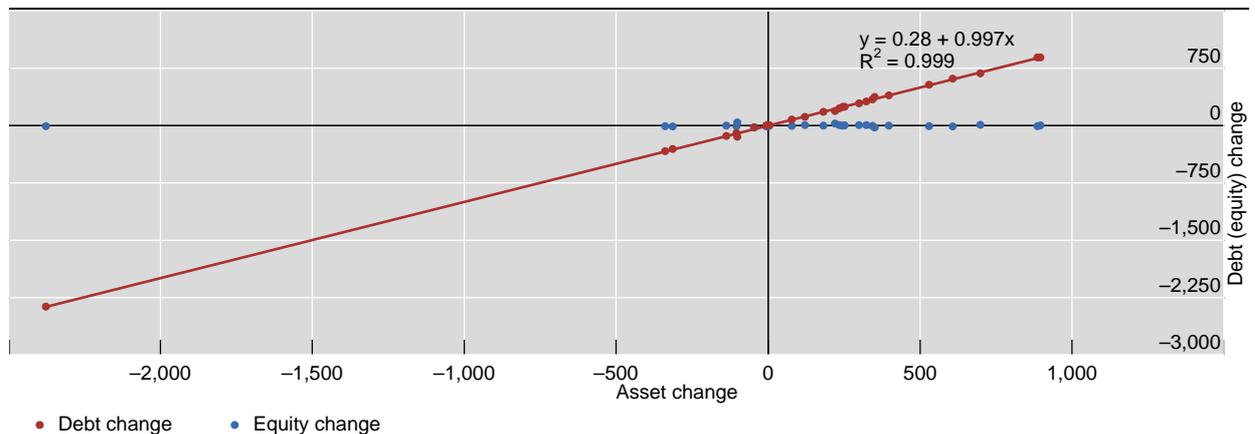
The two panels of Graph 1 show how the market liquidity provided by the broker-dealer sector goes hand in hand with its leverage. Over short periods, the fluctuations in total assets of the broker-dealer sector closely mirror the fluctuations in its leverage, as illustrated by the similar trajectories traced by the total assets series and the leverage series.

Graph 2 lifts the lid on how balance sheet adjustment takes place over the cycle. Graph 2 is a scatter chart that plots the relationship between the annual change in total assets of the broker-dealer sector and how the change in assets are reflected in the sector's funding sources. The blue scatter shows how much of the change in assets is reflected in a change in the sector's equity, while the red scatter shows how much of the change in assets shows up as a change in debt.

Annual changes in assets, equity and debt for the US security brokers and dealers sector

1990–2015, in billions of US dollars

Graph 2



Scatter plot showing how much of the change in assets is accounted for by changes in debt and equity, respectively.

Sources: Federal Reserve, *Flow of Funds*; BIS calculations.

As we see, the fitted line through the red scatter has a slope that is essentially equal to 1, meaning that any change in assets over horizons of around one year are almost all accounted for by the change in debt. In contrast, the blue scatter for equity is flat, meaning that the bank's own funds do not vary much over the cycle. The consequences of deleveraging are clear to see in the sharp contraction of broker-dealer assets in 2008 shown as the red dot at the extreme bottom left-hand corner. Asset contraction shows up, dollar for dollar, as a contraction of the sector's debt. In 2008, total assets contracted by 2.3 trillion dollars, accompanied by a sharp tightening of liquidity conditions.

Let me draw on an analogy that I have used before.⁸ The relationship between the total assets of an intermediary and its equity is like that between a building and its foundations. The equity of the dealers – their capital – forms the building's foundation. The building's capacity is like the sector's total balance sheet capacity. The sector could adjust its capacity in two ways. It could increase the capacity of the building by broadening the foundations to build a sturdier structure, but the scatter chart suggests that

⁸ H S Shin, "Bank capital and monetary policy transmission", remarks at The ECB and its Watchers XVII conference held on 7 April 2016, Frankfurt, www.bis.org/speeches/sp160407.htm.



the sector has opted instead to pile new floors onto the existing structure. The foundations of the building are largely untouched, and new rooms are added by piling new floors on top of the existing structure. Liquidity provision may benefit from greater leverage, but this kind of liquidity is not very resilient. As soon as economic conditions turn less favourable for leverage, the dealers shrink their balance sheets with knock-on effects for the real economy.

It would take me too far astray to go into the reasons why such large fluctuations in leverage happen, but the critical point is that leverage is determined by the combination of the creditworthiness of the intermediary as a borrower and how tight overall credit conditions are in the financial system.⁹ If the financial system as a whole goes through a period of ample funding liquidity, even thinly capitalised banks can borrow on easy terms. Since banks borrow in order to lend, easier borrowing conditions translate into easier lending conditions, reinforcing the already easy financial conditions. By the nature of the interactions between liquidity conditions and leverage, the boom phase rides an apparent virtuous circle of greater leverage and easier liquidity. The problem is that this virtuous circle is only apparent, not real. The veil is lifted when the easy conditions go into reverse, and the amplification mechanism kicks in as a downward spiral.

Financial markets will always be subject to external shocks; the task for policymakers is to mitigate the endogenous, second-round effects that arise from the deleveraging reactions of the intermediaries themselves. What we learned painfully in 2008 was that dealer banks with high leverage not only *transmit* external shocks, they actually *amplify* these external shocks through the self-reinforcing downward spiral in leverage. We cannot eliminate external shocks, but we can mitigate the downward spiral by having intermediaries that are more resilient.

In retrospect, investors were offered ample liquidity in the run-up to the crisis, but it turned out to be unreliable, fair-weather liquidity. They were left out in the cold when the crisis set in. We are reminded of the caricature of the unreliable banker as having umbrellas at the ready when the sun shines, only to snatch them away when the rain sets in. Clearly, this kind of fickle liquidity is not what we should be aiming for when debating policy for the financial system. We should, instead, be aiming for resilient and reliable liquidity that can serve as a shock absorber.

Having said all of this, we should note how the sector's leverage has entered a gentle decline in recent months. Leverage at the end of 2015 stood at 18, and is lower than at the beginning of 1990. This decline in leverage reflects, in part, the diminished role of the shadow banking system in the post-crisis financial landscape, but it also serves to illustrate how intermediation capacity may have diminished in recent months. At 18, the leverage of the sector as a whole is not constrained by regulatory leverage caps mooted as part of the Basel III leverage requirement, but we cannot rule out some business lines of dealer banks being affected by constraints placed on leverage.

Bank capital and intermediation capacity

I posed two questions at the outset. The first was what criteria should guide us when formulating policy on market liquidity. My answer is that we should aim for resilient market liquidity that can cushion capital markets against shocks.

Let me turn to the second question. If we determine that liquidity is insufficient and that we should expand the risk-taking capacity of dealer banks, what is the best way to achieve such an expansion?

⁹ For details, see T Adrian and H S Shin, "Pro-cyclical leverage and value-at-risk", *Review of Financial Studies*, vol 27, no 2, 2014, pp 373–403.

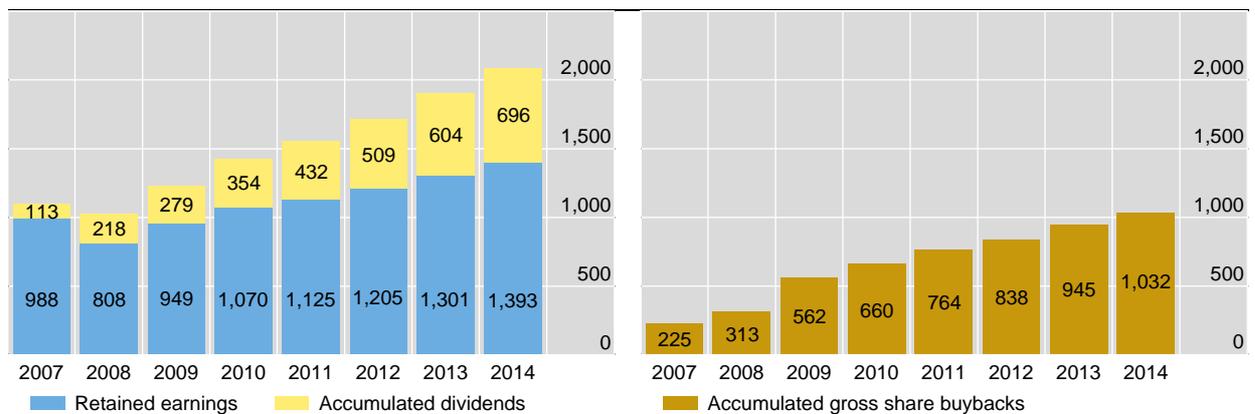


Loosening regulation is one way to increase dealer banks’ risk-taking capacity in the short run. An alternative would be to encourage banks to secure more solid foundations for their intermediation activities by building on a larger equity foundation. A bank’s equity – its capital – refers to its own funds. The bank’s own funds come from several sources, but the most important is the bank’s *retained earnings*. This portion of the bank’s equity refers to the accumulated stock of the bank’s profits since its inception that have not been paid out to shareholders. It represents the profits ploughed back into the bank since the beginning of its life.

Total retained earnings, accumulated dividends and gross share buybacks since 2007 of 56 advanced economy¹ banks, including major dealer banks

In billions of US dollars

Graph 3



¹ Australia, Austria, Canada, France, Germany, Hong Kong SAR, Italy, Japan, Korea, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States.

Sources: S&P Capital IQ; BIS calculations.

Graph 3 shows the evolution of retained earnings of a group of 56 advanced economy banks that include the major dealer banks.¹⁰ Also shown are the cumulative dividend payments since 2007. The left-hand panel compares accumulated dividends with retained earnings, and the right-hand panel shows gross share buybacks. By the end of 2014, total retained earnings stood at 1.39 trillion dollars, but cumulative dividends since 2007 amounted to 696 billion dollars – almost exactly half of retained earnings.

Share buybacks in the right-hand panel are gross amounts and do not take account of new shares issued during the same period. For this reason, these figures overstate the erosion of bank capital. Nevertheless, depending on how they are financed, share buybacks can reinforce the impact of dividends in reducing overall bank capital.

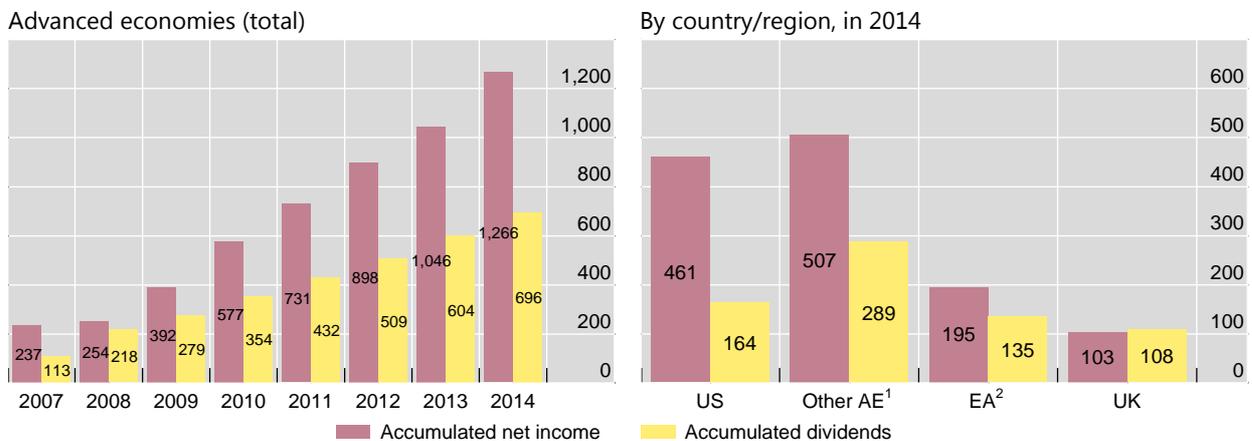
Why do banks choose to erode their capital in such large amounts? The question is especially pertinent if one also believes that banks’ risk-taking capacity is insufficient. Graph 3 suggests that if dealer banks have insufficient risk-taking capacity, this is due in large part to the choices made by the banks themselves. Through dividends and share buybacks, they have chosen a smaller capital base than was available to them.

¹⁰ The list of banks follows in Appendix 1. The data refer to the broker-dealer unit when available separately from the banking group. Otherwise, the data for the banking group as a whole are used for the calculation.

Accumulated net income and dividends since 2007 of 56 advanced economy banks, including major dealer banks

In billions of US dollars

Graph 4



Other AE = other advanced economies; US = United States; EA = euro area; UK = United Kingdom.

¹ Australia, Canada, Hong Kong SAR, Japan, Korea, Singapore, Sweden and Switzerland. ² Austria, France, Germany, Italy and Spain.

Sources: S&P Capital IQ; BIS calculations.

Graph 4 compares total cumulative profits and dividends of the 56 banks. We see that dividends eat up a very substantial proportion of total profits. From 2007 to 2014, cumulative dividends accounted for well over half of total profits – 696 billion dollars out of 1.266 trillion.

The right hand panel of Graph 4 shows the snapshot at the end of 2014 of cumulative profits and cumulative dividends separated out into jurisdictions. For the euro area and for the UK, the dividends are have been large in aggregate terms. In reading this chart, you should bear in mind that profit can be negative, while dividends cannot. When some banks make losses, the aggregate dividends can be quite large relative to aggregate profits, as loss-making banks pay no dividends, but reduce the pool of total profits. For the UK, cumulative dividends actually exceed profits in the aggregate. Profits sum to 103 billion dollars but dividends sum to 108 billion.

The picture that emerges from these snapshots is that banks have chosen to pay out a very substantial part of their profits as dividends at the expense of a smaller capital base. We need to understand better the reasons for banks' reluctance to plough their profits back into retained earnings, but a useful place to start is to ask whether there are tensions between the private interests of some bank stakeholders and the wider public interest of maintaining a soundly functioning banking system in support of economic activity.

This question is especially relevant when the bank's share price is substantially below the book value of its equity – that is, when the bank's market-to-book ratio is substantially below 1. According to the Q-theory of investment due to Tobin, when the market-to-book ratio falls short of 1, the owners of the firm are better off by liquidating the firm to recover the book value, which is higher than the market value foregone.

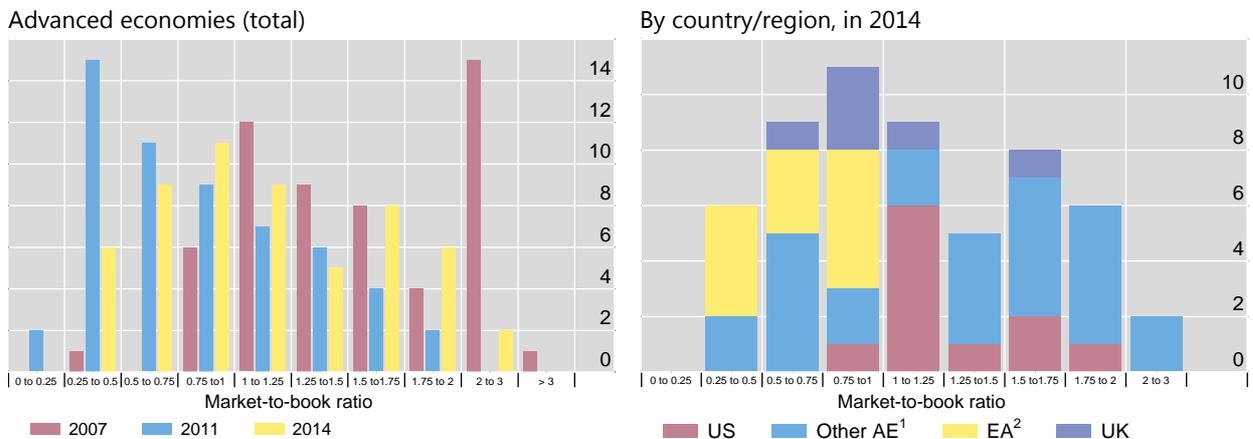
The incentive for dividend payments can be viewed from the same perspective. When the market-to-book ratio is below 1, shareholders can unlock some value from their shareholding by paying themselves a dividend. The incentive to boost short-term return through dividends may be even stronger if the shareholders have short horizons. As many shareholders are asset managers who place great weight on short-term relative performance against their peers, these short-term incentives may be strong.



Frequency distribution of market-to-book ratios

Number of firms in the range, sample of 56 advanced economy banks, including dealer banks

Graph 5



Other AE = other advanced economies; EA = euro area; UK = United Kingdom; US = United States.

¹ Australia, Canada, Hong Kong SAR, Japan, Korea, Singapore, Sweden and Switzerland. ² Austria, France, Germany, Italy and Spain.

Sources: S&P Capital IQ; BIS calculations.

Graph 5 shows how the market-to-book ratios of the banks in our sample have evolved since 2007. The left-hand panel shows snapshots of the frequency distribution according to the market-to-book ratio at three points in time – at the onset of the crisis in 2007, at the end of 2011 and the recent picture at the end of 2014. We see how market-to-book ratios generally had drifted down from 2007 to 2011, before recovering somewhat in 2014. What is especially notable is the large proportion of banks whose market-to-book ratio is below 1. At the end of 2014, almost half of the banks in our sample had a market-to-book ratio below 1.

The right-hand panel of Graph 5 shows the frequency distribution of the market-to-book ratio in 2014 sorted into regions. Euro area banks in yellow have a lowest market-to-book ratios, while US banks are found at the upper end. UK banks lie somewhere in between, and the other advanced economy banks display a wide range of market-to-book ratios.

To the extent that undercapitalised banks perpetuate slow growth and keep bank share prices under pressure, eroding bank capital through dividends may perpetuate low market-to-book ratios. Breaking this circle of slower growth and undercapitalised banks deserves more attention. Encouraging banks to plough more of their profits into retained earnings would help to break this circle and secure market liquidity that is resilient in the face of market shocks.

Let me now turn to how those market shocks may arise by discussing how asset managers enter the picture as market participants, and hence as customers of the dealer banks, not simply as bank shareholders.

Cash hoarding and procyclicality

Our understanding of crisis propagation is heavily influenced by the experience of the 2008 crisis. The watchwords are credit growth, leverage, maturity mismatch, complexity and “too big to fail”. While these factors are still relevant, changes in the pattern of financial intermediation in favour of the bond market have shifted the centre of gravity away from banks towards long-term investors. Asset managers come in many shapes and sizes, but they typically employ little if any leverage. Certainly, compared with banks and

other bank-like financial intermediaries, the leverage of asset managers is low. Nevertheless, the traditional view of asset managers as investors who can absorb losses without insolvency and who can play the role of a buffer against shocks to the financial system may need to be tempered somewhat.

Two related issues have come to the fore in discussions of asset managers and their role in episodes of financial instability. One is the possibility that collective investment vehicles such as bond mutual funds may be vulnerable to concerted redemption flows by investors in “run-like” episodes.¹¹

The second, related, issue is the procyclical tendencies of asset managers through asset fire sales and cash hoarding. Here, “cash hoarding” refers to the practice of asset managers selling more of the underlying assets than is necessary to meet redemptions by ultimate investors. This is especially relevant for collective investment vehicles that promise investors a speedy redemption of their stakes.

Although asset managers typically do not employ much leverage, if at all, asset fire sales and cash hoarding inject an important element of procyclicality. Episodes of concerted selling may generate fire-sale externalities in the sense that, when other asset managers sell and market prices come under pressure, an individual asset manager may be tempted to join the selling spree. This is especially true if the decision horizon is shortened due to short-term assessment of performance, and the effects will be especially potent when the underlying assets trade in highly illiquid markets. For this reason, the provision of resilient market liquidity (and hence the role of dealer banks) comes back into the picture as a central concern.

Let me sketch the findings from a recent study of this issue with some BIS colleagues.¹² The study was focused on the procyclical nature of cash holdings of fund managers of emerging market bond mutual funds. In a nutshell, the finding was that for every one hundred dollars’ worth of sales due to redemptions by ultimate investors, there is another 10 dollars’ worth of discretionary bond sales by the manager that can be attributed to cash hoarding.

Our approach to distinguishing investor-driven sales and discretionary sales is based on comparing changes in cash holdings with the inflows and outflows of investors’ money. At its simplest, consider a hypothetical passive mutual fund that holds no cash and is fully invested in bonds at all times. Then, investor redemptions result in sales of the same amount. In this case, we define all sales to be driven by investor flows, and there are no discretionary sales by the fund managers.

But now consider an alternative scenario with the same amount of investor redemptions. Suppose that the fund starts with no cash holding at the beginning of the period, but ends the period with a positive holding of cash, in spite of the investor redemptions. Then the positive cash holding at the end of the period can be regarded as the additional, discretionary sales undertaken by the fund, as the fund has ended up selling more than was strictly necessary to meet investor redemptions. This simple logic can be extended to funds that start the period with positive cash holdings. We can define discretionary sales so that the fund has undertaken discretionary sales by the *amount of the increase in cash holdings during the period*. This is a conservative definition of discretionary sales that allows funds to hold some cash, but only deems sales to be discretionary if the cash holdings increase in spite of investor redemptions.

To be precise, define F to be the net investor flows over some interval of time, and denote by ΔC the increased cash holding of the fund over the same interval. There are six possible combinations,

¹¹ See T Adrian, M Fleming, O Shachar and E Vogt, “Redemption risk of bond mutual funds and dealer positioning”, Liberty Street blog, October 2015, <http://libertystreeteconomics.newyorkfed.org/2015/10/redemption-risk-of-bond-mutual-funds-and-dealer-positioning.html>; and I Goldstein, H Jiang and D Ng, “Investor flows and fragility in corporate bond funds”, working paper, Wharton School, University of Pennsylvania, 2015.

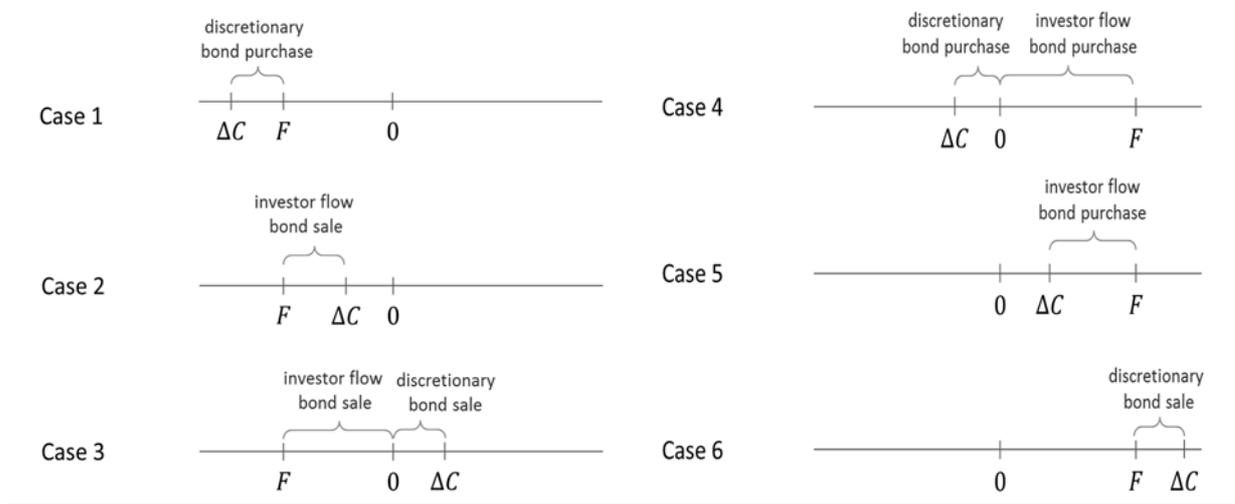
¹² J Shek, I Shim and H S Shin, “Investor redemptions and fund manager sales of emerging market bonds: how are they related?”, *BIS Working Papers*, no 509, August 2015, www.bis.org/publ/work509.pdf.



depending on whether investor flows are positive or negative, and how the cash position compares with net flows. The six cases are depicted in Graph 6.

Identifying cash hoarding by bond mutual fund managers

Graph 6



Cases 1 to 3 show investor outflows, as F is negative. In Case 1, cash holding falls by more than investor outflows. The fund manager having buys additional bonds, in spite of investor redemptions, thus playing a stabilising role in the market. Case 2 has investor outflows, and outflows are met partly by reducing cash and partly by selling bonds, and bond sales are entirely driven by investor redemptions.

Case 3 represents cash hoarding by fund managers. Redemptions result in net outflows, but cash holding actually *increases*. The fund manager sells more bonds than is necessary to meet redemptions. Cases 4 to 6 complete possibilities. By comparing net flows and cash holding changes, we can define for each fund, month, investor flow-driven purchases and discretionary purchases. Destabilising or procyclical behaviour by fund managers is given by Cases 3 and 4, whereas Cases 1 and 6 represent stabilising or countercyclical trading behaviour.

Graph 7 plots the frequency of each case in our data. We find that destabilising behaviour by the fund manager is much more common than stabilising behaviour, and in all instances but one, destabilising behaviour is the most common. One gauge of the degree or procyclicality of the bond fund managers is *how much* discretionary sales take place, as a proportion of investor-driven sales.

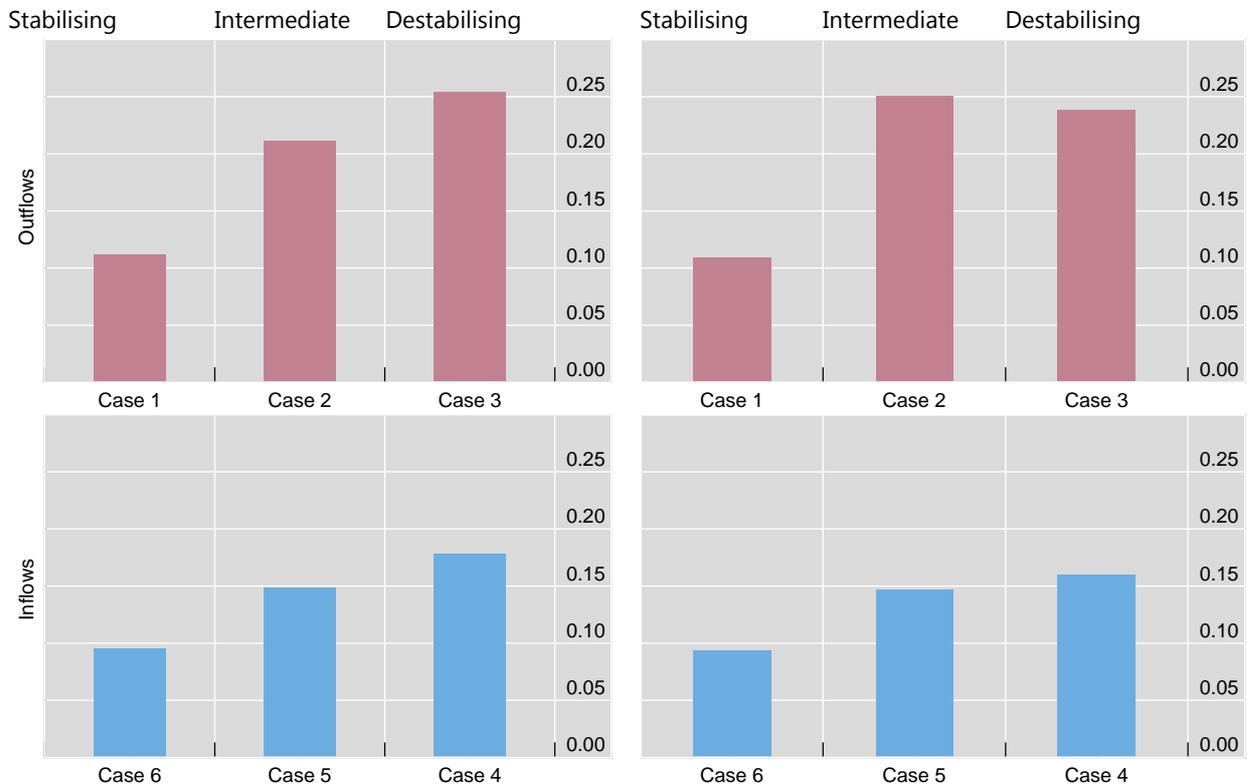


Frequency of stabilising/destabilising sales

Graph 7

18 global EME local currency funds

18 global EME international bond funds



Sources: J Shek, I Shim and H S Shin, "Investor redemptions and fund manager sales of emerging market bonds: how are they related?", *BIS Working Papers*, no 509, August 2015; EPFR.

Graph 8 taken from the BIS study shows the reconstruction of the changes in the net asset value of EME bond mutual funds around the time of the "taper tantrum" of 2013 into portions attributable to various components as indicated in Graph 8. In case you are interested in the detailed results, I have reproduced the panel regression table from the BIS study as Appendix 2.

Of particular interest is the relationship between the sales due to redemption pressures (dark red bars) from the discretionary sales by the asset manager (bright red bars). Both components tend to move in the same direction, meaning that when redemption pressure drives sales of underlying bonds, the asset managers add to the selling pressure through additional sales. In this way, cash hoarding by asset managers during periods of market stress may exacerbate selling pressures.

Our findings raise deeper questions about the way that asset sales interact with the strategic incentives underlying investor redemptions. Although the net asset value of mutual funds adjusts to changes in underlying market values, redemptions by one group of investors may exert negative spillovers on remaining investors through the shifts in composition of remaining assets from liquid to illiquid ones, as well as the marked-to-market changes in the value of remaining assets. Indeed, the less liquid the underlying assets are, the greater are the spillover effects of investor redemptions to remaining investors, thereby exacerbating the selling pressures in a run-like episode.

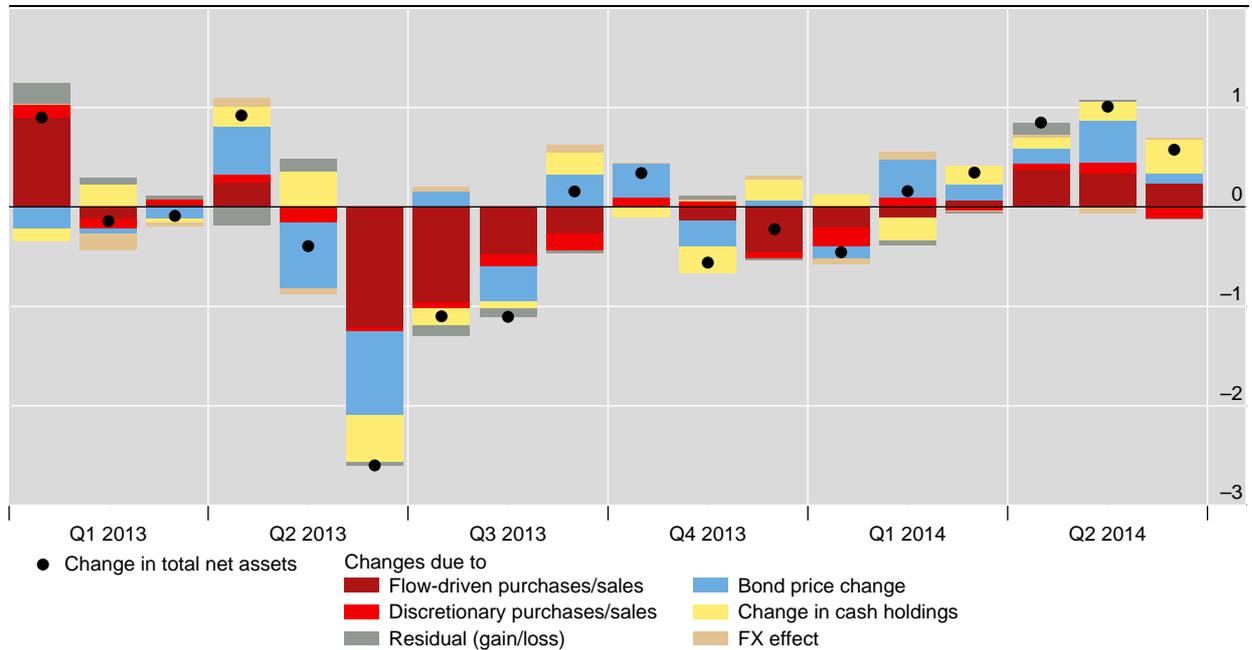
A fund manager may then anticipate further redemptions and try to secure enough cash to meet such redemptions. In turn, greater cash holdings will mitigate investors' incentive to run. Foreseeing these effects, greater discretionary sales by asset managers would then be a prudent response to anticipated redemptions.



Redemption-driven and discretionary sales of EME bonds

Sum of 16 global EME international bond funds in billions of US dollars

Graph 8



The sample consists of 16 global EME international currency (mostly USD) bond funds tracked by EPFR, managed mainly by US and European asset management companies. Monthly data on cash holdings and asset allocations as well as investor flows are taken from EPFR. The sample period is January 2013 to June 2014. For full details, see J Shek, I Shim and HS Shin: "Investor redemptions and fund manager sales of emerging market bonds: how are they related?", *BIS Working Papers*, no 509, August 2015.

Source: EPFR.

Nevertheless, the fund manager may face a delicate balancing act between selling too much into an illiquid market, thereby reducing net asset value, and securing enough cash to meet future redemption pressures and defusing the run-like incentives.

These factors suggest that we need to understand better the joint determination of investor redemptions and fund managers' discretionary sales. Indeed, how investors and fund managers will interact depends crucially on how liquid the market for the underlying assets are. For this reason, resilient market liquidity provided by dealer banks secured through a sturdy capital base is likely to be pivotal in discussions of financial stability.

Concluding remarks

There is some evidence that dealer intermediation capacity falls short of historical levels, especially when compared with the period of ample liquidity before the crisis.

What are the implications and what is to be done? Conceptually, at least, there is such a thing as "too much liquidity". It seems clear with the benefit of hindsight that the run-up to the global financial crisis was just such a period. However, hindsight is a wonderful thing. It is no easy task to make real-time judgments on whether liquidity suffices or not.

If risk-taking capacity is too low, how should we increase it? Simply loosening bank leverage requirements will not do much in securing robust, reliable market liquidity. Instead, encouraging banks to



maintain broad foundations for their intermediation activity through adequate capital seems to be a more promising alternative.

No doubt, such a prescription may prove unpopular with asset managers, with their hats on as bank shareholders. On the other hand, asset managers are also market participants who benefit from more robust liquidity. Wearing their hats as customers of the dealer banks and as consumers of market liquidity, they will be the primary beneficiaries of the greater resilience of liquidity. Above all, having a financial system that supports the real economy is in the broader public interest, even for those who are not direct stakeholders of dealer banks or their direct customers.

What we learned painfully in 2008 was that dealer banks with over-stretched leverage not only *transmit* external shocks, they actually *amplify* these external shocks through the self-reinforcing downward spiral in leverage. Financial markets will always be subject to external shocks; the task for policymakers is to mitigate the endogenous, second-round effects by helping intermediaries to be more resilient.



Appendix 1: Sample of global banks and broker-dealers used in Graphs 3, 4 and 5

United States: 11; Other advanced economies: 27; euro area: 12; United Kingdom: 6

Australia & New Zealand Banking Group, Banco Bilbao Vizcaya Argentaria, Banco Santander, Bank of America Corporation, Bank of Montreal, Bank of New York Mellon Corporation, Bank of Nova Scotia, Barclays, BB&T Corporation, BNP Paribas, BOC Hong Kong Holdings, CaixaBank, Canadian Imperial Bank of Commerce, Capital One Financial Corporation, Commerzbank, Commonwealth Bank of Australia, Crédit Industriel et Commercial, Credit Suisse Group, DBS Group Holdings, Deutsche Bank, Erste Group Bank, Goldman Sachs Group, Hana Financial Group, HSBC Holdings, Industrial Bank of Korea, Intesa Sanpaolo, JPMorgan Chase, Lloyds Banking Group, Mitsubishi UFJ Financial Group, Mizuho Financial Group, Morgan Stanley, National Australia Bank, National Westminster Bank, Natixis, Nomura Holdings, Nordea Bank, Oversea-Chinese Banking Corporation, Principal Financial Group, Resona Holdings, Royal Bank of Canada, Royal Bank of Scotland Group, Shinkin Central Bank, Skandinaviska Enskilda Banken, Société Générale Group, Standard Chartered, State Street Corporation, Sumitomo Mitsui Financial Group, Svenska Handelsbanken, Swedbank, Toronto-Dominion Bank, US Bancorp, UBS Group, UniCredit, United Overseas Bank, Wells Fargo & Company, Westpac Banking Corporation.



Appendix 2: Panel regression results for discretionary purchases by EME bond fund managers

Panel regressions						
Dependent variable is discretionary purchases						
18 EME international bond funds						
	(1)	(2)	(3)	(4)	(5)	(6)
Flow-driven purchases (<i>FP</i>)	0.083** (2.135)	0.101*** (3.142)		0.097** (1.886)	0.107** (2.219)	
max{ <i>FP</i> , 0}				-0.038 (-0.442)	-0.015 (-0.195)	
Total investor net flows (<i>TF</i>)			0.058*** (2.405)			0.079** (2.110)
max{ <i>TF</i> , 0}						-0.045 (-0.845)
$\Delta \ln(VIX)$		-0.222 (-0.162)	-0.360 (-0.258)		-0.237 (-0.176)	-0.364 (-0.256)
18 EME local currency bond funds						
	(1)	(2)	(3)	(4)	(5)	(6)
Flow-driven purchases (<i>FP</i>)	0.135*** (2.850)	0.133*** (3.332)		0.119*** (4.152)	0.113*** (3.890)	
max{ <i>FP</i> , 0}				0.036 (0.287)	0.041 (0.419)	
Total investor net flows (<i>TF</i>)			0.078** (2.257)			0.052** (2.295)
max{ <i>TF</i> , 0}						0.054 (0.791)
$\Delta \ln(VIX)$		-3.207*** (-2.400)	-3.453*** (-2.473)		-3.203*** (-2.400)	-3.500*** (-2.510)

Coefficients on the explanatory variables from panel regressions with fund fixed effect. Dependent and explanatory variables are normalised by the *NAV* of each fund at the beginning of the month, except for the VIX. *t*-statistics in brackets are calculated from standard errors clustered at the fund level. For details, see J Shek, I Shim and H S Shin, "Investor redemptions and fund manager sales of emerging market bonds: how are they related?", *BIS Working Papers*, no 509, August 2015.

Source: EPFR.