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Developments in financial market liquidity¹

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In recent years, financial market participants have become increasingly worried about the significant decline in the level and resilience of financial market liquidity, raising concerns over the efficiency of markets and the increased risks associated with a liquidity shock. This article reviews international research on the topic, and generally finds evidence for a decline in the level and resilience of liquidity, although it has been mixed across markets. We also assess liquidity conditions in the New Zealand government bond, funding and short-term money markets, using common analytical measures of liquidity as well as drawing on discussions with numerous market participants. We find that the level of liquidity has declined to varying degrees across the different markets, and while risks of a liquidity shock have risen, the decline has been manageable thus far.

Section 1 of this article defines what liquidity is, section 2 discusses the global trends in liquidity, and section 3 examines liquidity conditions in New Zealand markets. Section 4 concludes.

1 What is liquidity?

Liquidity is a complex concept, with the term encompassing a range of ideas. There are three main types of liquidity in financial markets: market liquidity, which reflects the ability of market participants to execute large transactions at low cost with only a limited effect on the price; funding liquidity, which refers to the ability of an organisation (such as a bank) to raise debt as required at a reasonable cost; and monetary liquidity, which reflects the looseness of monetary conditions, in part owing to the stance of central banks. This article focuses primarily on developments in market liquidity, although funding and monetary liquidity are also discussed where relevant.

Market liquidity is important for the functioning of financial markets, helping to facilitate the efficient distribution of resources through the allocation of capital and risk. A low level of market liquidity can reduce these efficiencies, potentially inhibiting economic activity. While the level of liquidity in a market is important, the resilience of liquidity in a market is also key, especially in the face of a shock.² The IMF notes that highly

¹ The author would like to thank Enzo Cassino, Johan van der Schyff, Roger Perry, John Groom, Geordie Reid, Chris Kim, Mark Perry, Hayden Skilling, and all the market participants we spoke to for their helpful comments and assistance.

² The resilience of liquidity refers to the speed and ability of the market to correct pricing errors caused by shocks.

resilient market liquidity is critical to financial stability, because it means market prices are less prone to sudden sharp swings, and more likely to remain aligned with values determined by fundamental factors.³

2 Global trends in liquidity

Growing concerns about liquidity from market participants have been stimulated by a number of 'shocks' over the past few years. Events such as the October 2014 Treasury market 'flash rally' and the April 2015 'Bund tantrum' resulted in rapid moves in bond prices over short periods of time that did not appear to be explained by fundamentals.⁴ These moves are seen by many as evidence of reduced liquidity in some key markets. While bond market liquidity has been a key focus for several studies, liquidity concerns are not confined to this asset class. Foreign exchange markets have also been affected – including for the New Zealand dollar. For example, the NZD/USD cross rate on 25 August 2015 (New Zealand time) fell as much as three cents over 10 minutes, before quickly rebounding (figure 1).

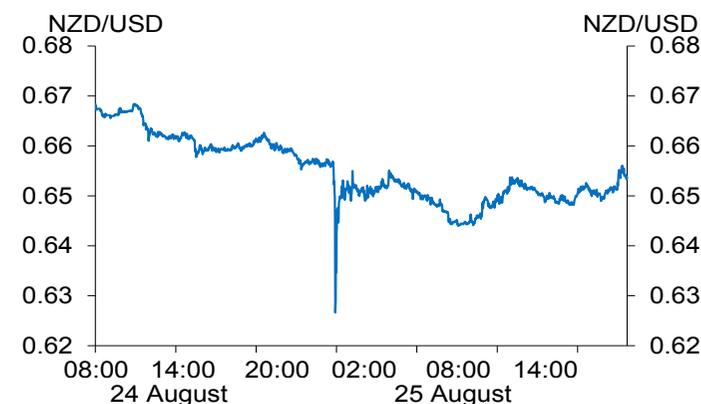
Key findings on liquidity

A range of research over the past few years has looked at liquidity conditions across markets and asset classes. Overall, the evidence points to declines in market liquidity, although only in some markets. One key conclusion is that there has been a bifurcation of liquidity across markets, with liquidity being increasingly concentrated in the

3 IMF (2015) 'Market Liquidity – Resilient or Fleeting?', *Global Financial Stability Report*.

4 See U.S. Department of the Treasury, Board of Governors of the Federal Reserve System, Federal Reserve Bank of New York, U.S. Securities and Exchange Commission, U.S. Commodity Futures Trading Commission (2015) for more details on the 'flash rally' and its causes.

Figure 1
NZD/USD
cross rate



Source: Reuters.

most liquid instruments, while deteriorating in less liquid ones. This has been particularly evident in bond markets, with large country sovereign bond markets having become relatively more liquid than those in smaller countries. There is also evidence of bifurcation across other classes, such as for corporate bonds.

Liquidity has declined across a number of dimensions. PwC identifies four broad areas reflecting a decline in liquidity: (i) difficulties in executing trades; (ii) a reduction in financial market depth; (iii) an increase in volatility; and (iv) a decline in liquidity in the assets that have traditionally been more liquid.⁵ PwC also notes that these effects are most pronounced in more dealer-driven, over-the-counter markets, such as those for fixed-income assets.

The IMF has concluded that the extraordinarily easy monetary policy stance of major developed nations since the 2008 Global Financial

5 PwC (2015) 'Global financial markets liquidity study', <http://www.pwc.com/gx/en/industries/financial-services/publications/financial-markets-liquidity-study.html>, accessed 20 November 2015.

Crisis (GFC) is likely masking increased liquidity risks by creating benign market liquidity conditions.⁶ When central banks move out of extraordinarily loose monetary policy and markets transition back to 'normal', there is concern that underlying structural declines in liquidity will become more apparent.

Studies have also concluded that the resilience of liquidity has been reduced, creating greater risks of 'liquidity disappearing when it is needed most'. An issue commonly raised is that even if liquidity seems ample during normal times, it is during a shock that it is needed most. Typically, liquidity in bond markets is provided by 'market makers' – traders prepared to buy or sell assets at the same time, offering 'two-way prices'. Several studies have found that market-making capacity has been reduced in many markets, owing to the introduction of more stringent regulation and changes in market structure. This development is seen as a key driver in reducing liquidity resilience.

Key drivers of liquidity

Research examining liquidity has highlighted three key drivers of changes in market liquidity in recent years: more stringent regulation, changes in market structure and extraordinarily loose monetary policy.

Regulation

Since the GFC, policymakers have introduced a wide range of regulations to improve banks' capital and liquidity positions, improve market infrastructure and capital market transparency, restrict certain activities by financial institutions, and ensure the resolvability of financial institutions. The reforms have been intended to create a more resilient

banking sector, but these might also have had some consequences for market liquidity.

Research and discussions with market participants frequently note how new regulation has reduced market making. In particular, increased capital requirements for banks means holding inventories of bonds to sell has become more expensive. This has resulted in some banks exiting or reducing participation in the market-making business, particularly in more peripheral and smaller markets, but even in some larger markets as well. The overall reduction in market-making capacity is seen as reducing both the level and resilience of market liquidity.

Regulations have also limited the ability of banks to use leverage. This has reduced liquidity in repo markets,⁷ which has also spread to other markets as banks use repo markets to finance trading and market-making activities.

Increased regulation has also had positive implications for market liquidity. Regulations introduced in the US and Europe have been implemented to improve market infrastructure, transparency and customer protection. These regulations will move some bilateral trading towards more centrally cleared solutions, reducing counterparty risk. Increased transparency is also expected to improve price discovery. While these factors have and will likely continue to improve liquidity, they still have their own issues. Given differing regulations across jurisdictions, liquidity has become more fragmented, limiting the gains thus far.

Overall, regulation is considered to have reduced the volume and resilience of liquidity across markets, with this change primarily occurring by reducing the capacity for market making. With the primary goal of the

6 IMF (2015).

7 Repurchase 'repo' markets are explained in more detail in Cook (2012).

regulation to improve the resilience of the banking sector, this is likely to be a more permanent structural change.

Market structure

Market structure encompasses a range of factors, with the main changes identified as the increasing role of mutual funds, a surge in issuance of smaller bond tranches, and increased use of electronic trading.

Some studies note the increasing role of mutual funds, which tend to have fixed holdings of assets that are traded less frequently and therefore reduce the liquidity available in the market. In addition, these types of investors tend to be more fickle, and are prone to attempt to exit a position all at once, reducing the resilience of liquidity. There was evidence that during the ‘taper tantrum’ in 2013, bonds that had more concentrated holdings by mutual funds tended to see a larger decline in liquidity.

The size of issuance matters for liquidity as well, with larger bond issue tranche sizes tending to have greater liquidity and greater resilience. This is because larger issues are more likely to have an associated credit default swap or to belong to an index,^{8,9} or because of economies of scale in gathering information about credit risk. Over the past few years, low global interest rates have encouraged a surge in new bond issuance, particularly in the corporate space. A high proportion of these issues are relatively small. Along with reduced market-making capacity from banks, the increased number of smaller tranches has contributed to an overall decline in liquidity.

8 A credit default swap is essentially a type of insurance on a bond that pays out in the event of a default.

9 Bonds that are part of an index are typically traded more as investors buy the bonds to match the index performance.

The increased amounts of trading that is occurring using electronic markets is also affecting liquidity, but in different ways. On one hand, electronic trading can greatly facilitate the matching between buyers and sellers. However, new trading strategies can lead to disruptions in market liquidity in the face of shocks. There was evidence that high-frequency trading contributed to the flash rally in the US Treasury market in October 2014.¹⁰ Regardless, the increasing electrification of markets is likely to be a long process, with regular over-the-counter trading (especially in fixed income markets) unlikely to end in the near future.

All told, the changing market structure is seen to have reduced both the level of liquidity as well as its resilience.

Monetary policy

A key question frequently asked is how can liquidity be getting worse when global monetary conditions are extraordinarily loose, with interest rates at or near record lows, and large quantitative easing programmes having been undertaken?

Global monetary policy has affected liquidity in different ways. Traditional expansionary monetary policy is seen as increasing market liquidity. Market liquidity is improved through lower costs of market making and trading.

Unconventional monetary policy has had additional effects on liquidity. Policies that have involved large-scale, protracted asset purchases have had both positive and negative effects on liquidity. On one hand, when the central bank is a large predictable buyer in a market, liquidity is likely enhanced. Further, easy monetary policies and low interest rates

10 U.S. Department of the Treasury, Board of Governors of the Federal Reserve System, Federal Reserve Bank of New York, U.S. Securities and Exchange Commission, U.S. Commodity Futures Trading Commission (2015).

around the world have helped to induce a ‘search for yield’, with investors seeking higher yields in less traditional markets, in some cases adding to liquidity there. On the other hand, in some cases, asset purchases have significantly lowered the supply of securities available in the market, which has reduced liquidity.

Studies have generally argued that easy and unconventional monetary policy has had a net positive impact on market and funding liquidity in recent years, although this has been outweighed by the other factors discussed earlier. For example, the IMF argues that the abundance of central bank monetary liquidity has masked the underlying structural decline in liquidity, which will become more apparent when these policies are eventually unwound.¹¹

3 Developments in New Zealand liquidity

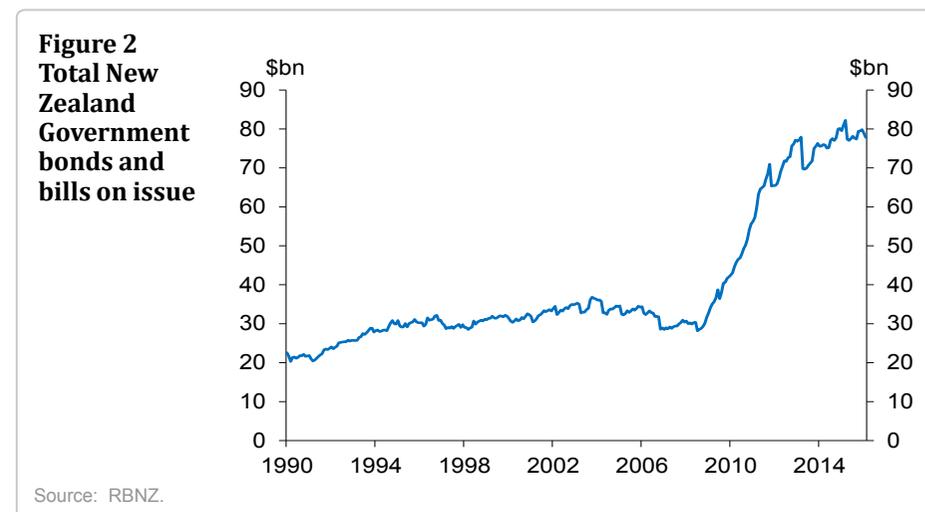
In this section we aim to assess whether these changes to liquidity globally have translated to New Zealand. To do this, we assess liquidity across three main markets: the New Zealand government bond market, bank funding markets, and short-term money markets. Overall we find some signs of lower liquidity in New Zealand markets, although to varying degrees.

11 IMF (2015).

New Zealand government bond market liquidity

New Zealand government bond market liquidity is important for the functioning of domestic financial markets, as many other market interest rates are set in relation to bond rates. If liquidity is poor then these rates can deviate from fundamentals and cause distortions in the market. Liquidity conditions are also important for investors who wish to participate in the market; if the market is too illiquid then some may choose not to invest because of concern that they cannot exit their investment (sell their bonds) if necessary. Having more investors involved in the market is useful to create demand and lower funding costs for the Crown, which issues the bonds.

The New Zealand government bond market has grown considerably since the GFC, driven by the extra funding required when the Government’s fiscal position turned from surplus to deficit. The total amount on issue has risen from about \$30 billion before the GFC to around \$80 billion at present (figure 2). While the total amount on issue



has increased significantly, the New Zealand government bond market is still very small on a global scale. The Australian government bond market totals about A\$368 billion, while US debt on issue is about US\$13.2 trillion.

Measures of bond market liquidity in New Zealand

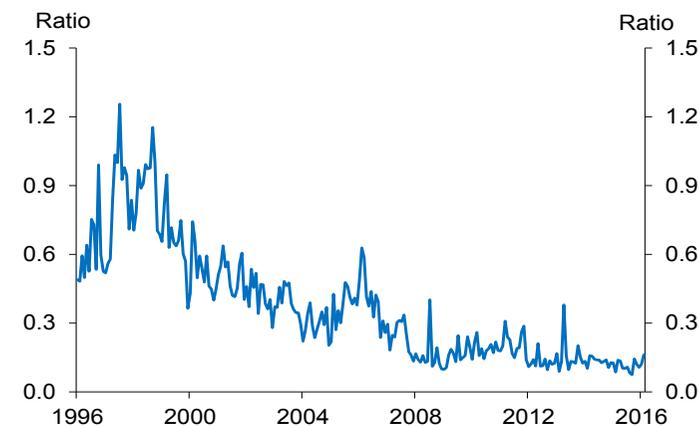
Turnover ratio

A common indicator used to assess liquidity in a market is the turnover ratio, which looks at the quantity of bonds transacted as a proportion of the total amount on issue. This measure aims to indirectly assess the depth and breadth of the market by giving an indication of the existence of numerous market participants and transactions. A drawback of this measure is that it is also associated with volatility (i.e. increased volatility may lead to more trading), which is thought to impede market liquidity. Thus the implications of changes in trading activity for market liquidity are not always clear.

We calculate this ratio for outright transactions (excluding repo and 'other') in the New Zealand government bond market in figure 3. The data are sourced from the New Zealand government bond turnover survey conducted by the Reserve Bank.

While the turnover ratio has declined significantly since the late 1990s, in this article we are most interested in recent developments. The trading environment in the late 1990s was very different, reflecting different types of investors and less strict risk controls for banks trading the bonds, which allowed for more active trading. The ratio has been relatively steady since the GFC in 2008, averaging about 0.16. While there was a slight dip in late 2015, potentially signalling a decline in liquidity, it has since rebounded higher towards the average.

Figure 3
Turnover ratio
(monthly turnover/
total bonds
on issue)



Source: RBNZ.

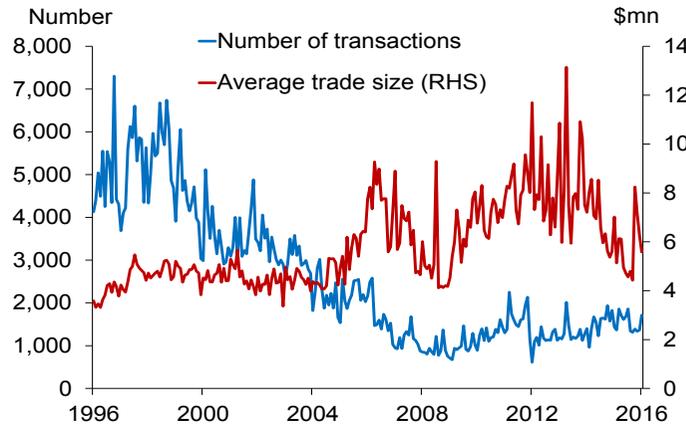
Number of and average size of transactions

A second measure frequently used to assess the breadth of markets is the number of transactions during a fixed period. A higher number is often associated with a more liquid market, although this has limitations related to volatility, similar to that of the turnover ratios. A third measure is the average size of transactions, which gives a better indication of the depth of the market. Larger transactions indicate greater depth in the market. Both of these measures are shown in figure 4.

The number of transactions has fallen relative to the late 1990s, providing a similar story to the turnover ratio. However, since just before the GFC and until recently, the number of transactions has remained relatively steady, averaging about 1400 a month. This measure doesn't point to any deterioration in liquidity in recent years.

However, the average trade size does raise some concerns around liquidity. The average trade size rose after the GFC, averaging \$8 million between 2010 and the end of 2013. Since then the average trade size

Figure 4
Number of and average size of transactions in the New Zealand government bond market (monthly)



Source: RBNZ.

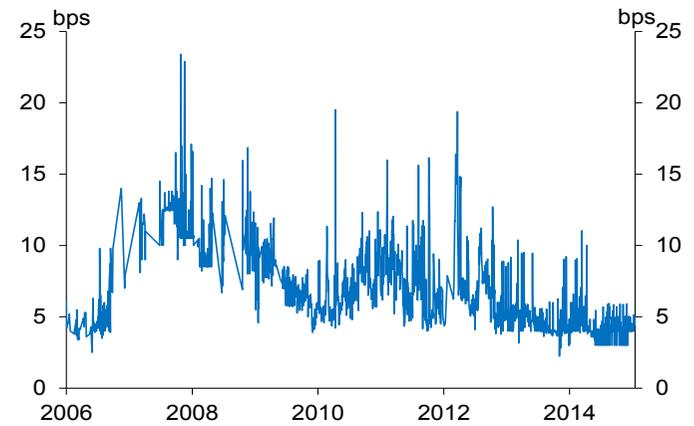
has trended lower, providing some evidence of lower liquidity, with market participants potentially having to lower trade sizes in order to get deals completed.

Bid-ask spreads

The bid-ask spread is a commonly used measure of market liquidity to indicate tightness in the market (i.e. the cost of trading). Typically the cost of the transaction is described as the difference between the bid or offer price and the midpoint. The main drawback of this measure is that the quotes are valid for only limited quantities and periods of time (i.e. they convey no information about the depth or breadth of the quotes).

Using data sourced from Bloomberg and the RBNZ, we create composite bid-ask spreads for nominal bonds and for the inflation-linked bonds. Each spread is weighted by the total quantity of each bond on issue at the time.

Figure 5
Composite bid-ask spread for nominal New Zealand government bonds (basis points)

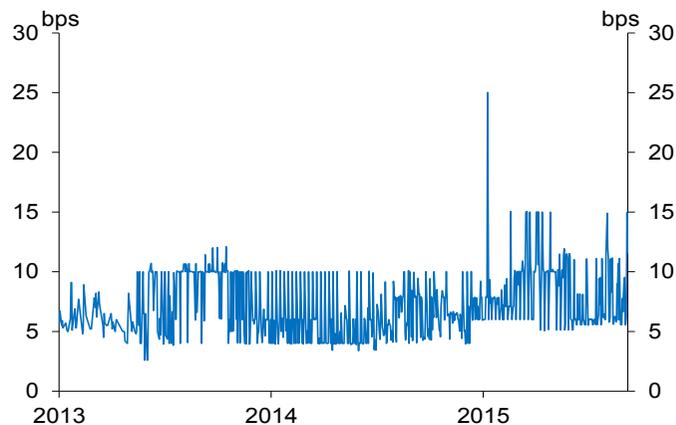


Source: Bloomberg, RBNZ.

Figure 5 shows that bid-ask spreads rose during the GFC, and remained elevated during the volatility of the European debt crisis, but have since fallen to average about four basis points in 2015. This would indicate that liquidity has actually improved over time. This is contrary to what some market makers said, who reported having to widen their spreads during 2015 in response to increasing liquidity pressures. This difference could come down to the data used: we used a standard composite measure of the spread sourced from Bloomberg, but as mentioned earlier, this doesn't necessarily have significant depth behind it. In addition, most trades are done 'over-the-counter', with participants contacting the market makers directly.

We have less history for the spread on inflation-linked bonds, with the 2025 inflation-linked bond being issued only in late 2012 and spread data available only since early 2013. Spreads on average are wider than for nominal bonds at eight basis points in 2015, reflecting the smaller quantities on offer and less active trading (it can take the market makers a long time to clear trades). Contrary to the nominal bond spread, the

Figure 6
Composite bid-ask spread for inflation-linked New Zealand government bonds
(basis points)



Source: Bloomberg, RBNZ.

spread on inflation-linked bonds has widened during 2015, with the spike corresponding to the 'unallocated' tender held during the year (figure 6). The change and wider spread than the nominal bonds matches up with comments from market participants that liquidity in the inflation-linked bond market is significantly worse than for the nominal bonds.

All told, our indicators of bond market liquidity give mixed results, with the number of transactions, bond turnover and bond spreads indicating no deterioration in liquidity, at least in the nominal market. On the other hand average trade sizes indicate liquidity has worsened slightly in recent years.

Discussion with market participants

Given the mixed pattern of results from quantitative indicators, we held discussions with a wide range of market participants in the New Zealand government bond market. We talked with market makers, the New Zealand Debt Management Office (NZDMO), investors, and those

running prudential liquidity books for banks, all of whom have an interest in the market.

While different participants shared different perspectives on New Zealand government bond market liquidity, some aspects were agreed on. Contacts generally accepted that while liquidity in the New Zealand government bond market was lacklustre relative to other markets, it had improved significantly since the GFC. This is predominantly owing to the greater supply, which has attracted a wider range of larger investors to the market. Nevertheless, the market was still described as 'patchy' and prices are significantly affected by large flows rather than staying in line with fundamentals. However, participants had learned to trade in these conditions by transacting in relatively small parcel sizes and waiting for the right time to trade.

The greatest concern we heard from market participants around bond market liquidity came from the market makers, with most suggesting that liquidity had declined in recent years. They saw the declines as being driven by both cyclical and structural factors. The structural change has been the regulatory changes that have increased the cost of capital, and have led to reduced participation in the market from some major investment banks. This is likely to be permanent and could intensify as further regulations are introduced.

Liquidity conditions have also declined owing to cyclical factors, with the current market outlook leading the major players to take similar positions, leading to shortages of some bonds at times. This will likely improve as the cycle progresses. These factors have made market making more difficult, with bond positions often taking months to clear, which might have taken weeks only a few years ago. Some market makers noted that they had widened their bid-ask spreads in response, although not by as

much as needed to compensate for the risk of having the positions on their books for longer.

Despite the concerns raised by the market makers on bond market liquidity, the investors we spoke to generally hadn't experienced any significant change in recent years. The patchy nature of liquidity was reiterated, with investors noting that market participants were often making similar trades, which meant bond prices got either very cheap or expensive relative to what the market perceived as fair value. However, generally investors were able to get prices quoted from market makers and were able to transact small volumes without difficulty. Even the larger investors we spoke to said they could generally get larger trades done, although these did take longer to execute.

The NZDMO said that bond market liquidity was important to help attract more investors and in turn lower borrowing costs for the Crown. Lower liquidity means investors require a larger 'liquidity risk premium', which increases the yield. The NZDMO noted it was supporting liquidity by using bond syndications to launch new bond lines so there was more on issue at the start of a bond's life, as well as getting more intermediaries engaged through the process. In addition, the NZDMO was issuing bonds on a fixed, predictable schedule, which was seen as improving liquidity.

All told, based on the measures we calculated and our discussions with market participants, we conclude that while New Zealand bond market liquidity has not contracted significantly in recent years for investors, this masks an underlying fall in liquidity being experienced by market makers. The risk has risen that more market makers might participate less in the market owing to increased regulatory obligations. This would likely lead to wider bid-ask spreads for investors, increasing the cost of transactions, and potentially reducing market efficiency. This would be

of most immediate concern to the Crown and the NZDMO, which would face an increased cost of funding. For the market as a whole, prices might deviate further away from fundamentals for longer, distorting benchmark interest rates.

Further, while not directly measurable, it appears that the resilience of liquidity has likely diminished in line with the lower participation from market makers. Evidence of a drop in resilience would become apparent only during a shock, where trading in the bond market becomes difficult and prices move very quickly. This is one of the major concerns around liquidity – that it appears to be there until it is needed the most.

Bank funding market liquidity

Bank funding markets are an important part of New Zealand's financial system, with a significant proportion of the funding used for lending by banks coming from overseas investors. As part of our assessment on liquidity, we discussed liquidity conditions with the bank treasurers (those responsible for sourcing funding) from the big four banks.¹²

Banks are generally funded through three main avenues: bank deposits, short-term wholesale debt (less than one year maturity), and long-term wholesale debt.¹³ While banks used to be funded more significantly through short-term wholesale means, the Core Funding Ratio,¹⁴ introduced in 2010, as well as banks' more conservative funding strategies, have meant the funding mix has moved more towards retail deposits and long-term wholesale debt. This section focuses on liquidity in the long-term wholesale debt market, which is typically seen as the

12 Cadamagnani, F, R Harimohan, and K Tangri (2015) provides a good description of how a bank's Treasury department operates.

13 See Wong (2012) for more details on how banks are funded.

14 See Hoskin, K, I Nield and J Richardson (2009) for more details on the Core Funding Ratio regulations.

marginal funding source for banks. This funding encompasses aspects of both market and funding liquidity.

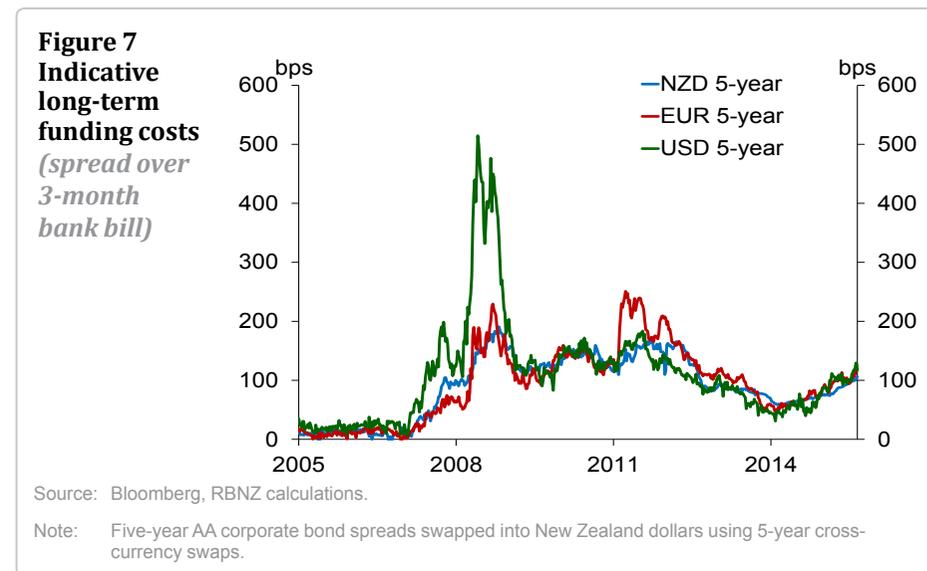
Most long-term wholesale funding comes from overseas markets – predominantly US and European markets. Bonds are issued in foreign currency, then foreign exchange and cross-currency basis swaps are used to convert the funds back into New Zealand dollars. The treasurers we spoke to noted that given the relatively slow credit growth and strong growth in retail deposits in New Zealand over the past several years, the need to get additional funding from overseas wholesale markets has been minimal. Nevertheless, banks like to issue bonds between two and five times a year, both to rollover existing debt, and to maintain contact and access to credit lines with investors and institutions.

Our discussions with treasurers tended to focus on developments in day-to-day market liquidity conditions. Banks have limited windows in which to issue given disclosure requirements, thus day-to-day market conditions are important as to the price they can obtain. For example, several treasurers noted that during the Greek crisis of mid-2015 markets were effectively closed for issuance for several days (without paying excessive credit spreads).

To some extent markets have always had times of increased volatility and uncertainty that can cause funding markets to close for short periods. The difference now is that reduced market liquidity has the potential to mean that: 1) there are more frequent periods of heightened volatility, and 2) when those periods do occur, they are more extreme.

The banks we spoke to have noted that the ‘new issue premium’ they pay has generally increased over the past year, as global market uncertainty and volatility have increased, although these costs had been manageable thus far. The increase in cost can be illustrated in figure

7, which shows the spread above swap for senior unsecured five-year AA corporate bond yields, a similar type of debt to what banks issue. While liquidity problems could worsen over time, banks are actually in a relatively good position at present with their funding, in large part owing to the Core Funding Ratio regulations. This has meant that banks have a larger buffer in their funding, and if they do miss a window of funding owing to market conditions, then they are less exposed, particularly to rollover risk.



While funding liquidity was of most concern to the bank treasurers, market liquidity also plays a part in the funding process through the use of foreign exchange and cross-currency basis swaps. The treasurers we spoke to generally had noticed that the cost of using these swaps had increased, albeit not significantly, and attributed it to fewer market makers and higher capital costs for those remaining. Nevertheless, the treasurers were still confident they could get the trades done when required.

Reduced market making is also affecting the secondary markets for bank debt. While these markets have never been very liquid given their small size, the treasurers noted that liquidity had contracted further. Investment banks are a lot less likely to hold bank debt in their inventories and are reluctant to be market makers. If there is trading on the secondary market, it is likely to be in first few weeks after the primary issue, where some portfolio re-balancing occurs.

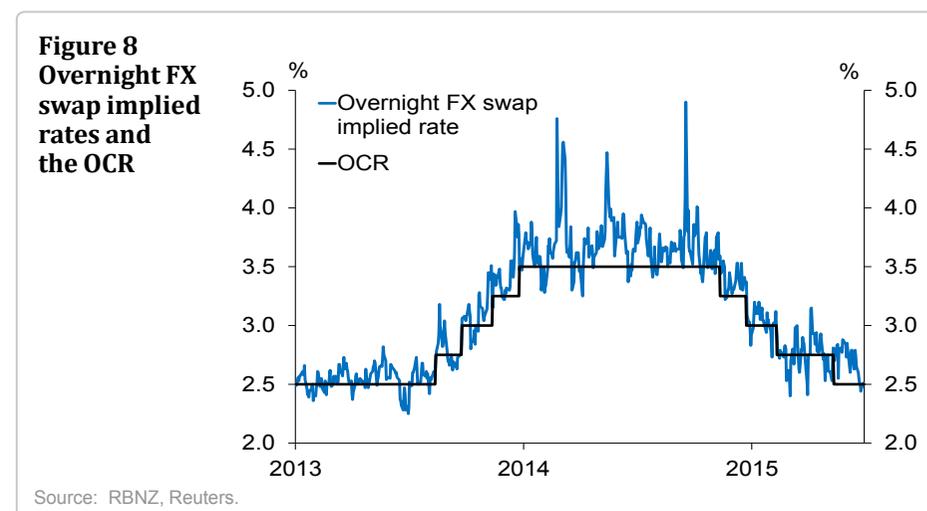
Short-term money market liquidity

Money markets refer to the segment of financial markets where financial instruments with short maturities are traded. The money market is used by participants to borrow and lend in the short term, from as short as overnight to up to a year. Instruments traded in short-term money markets include certificates of deposit, commercial paper, Treasury bills and repurchase agreements (repos), among others.

The money market is particularly important to the Reserve Bank, as it is one of the key channels through which monetary policy decisions are transmitted. For this article, we were most interested in assessing the liquidity in the very short-term money markets (e.g. overnight) such as foreign exchange swaps (FX swap) and repurchase transactions. The Reserve Bank undertakes repurchase transactions in its open market operations (OMOs) and is relatively active in the FX swap market to withdraw or inject funds into the banking system. Both OMOs and FX swaps are used to align the prevailing market rates as close to the prescribed Official Cash Rate (OCR) as possible. Rates can change daily for a number of reasons, including changes in the value of the New Zealand dollar, anticipated OCR changes or unanticipated changes to the level of cash in the banking system. OMOs and FX swaps are

used to smooth these factors and align interest rates.¹⁴ Should these market interest rates become too out of line with the OCR for a period of time, other key interest rates, such as the 90-day bank bill rate and mortgage rates, could be too high or too low relative to the intended monetary policy stance. Keeping rates near the OCR is also important for the reputation of the Reserve Bank, with a credible reputation lending support to achieving the monetary policy and financial stability objectives.

While there are periods of volatility from time to time in money markets, in late 2014 the Reserve Bank noticed that these periods were becoming more common and more sustained. This led to short-term interest rates and FX swap rates trading further away from the OCR for longer periods (figure 8).



A number of reasons were attributed for the increased volatility, but one of the main ones was reduced liquidity in the FX swap market. Market participants noted that regulation was playing a big part in reducing

14 For more details on how the Bank operates domestic market operations to implement monetary policy see Parekh (forthcoming, 2016).

liquidity, as well as impacting on market behaviour. In particular, traders were now being charged more for the use of the balance sheet for their trades, and previous 'arbitrage' trades that would have brought rates more in line with the OCR were now too expensive.

Furthermore, some banks that could have taken on risk in the past to bring the rates closer to OCR had withdrawn from the market either as a result of a shrinking balance sheet, or a shift to trade within a core group of products and currencies. This has reduced the liquidity in New Zealand dollar financial markets.

The Reserve Bank has responded to the reduced liquidity and increased volatility by transacting more in the FX swap market, in an attempt to 'replace' some of the lost liquidity. While there are still periods of volatility, generally the increased participation in the market has improved market conditions thus far and allowed short-term rates to trade closer to the OCR. However, should liquidity deteriorate further, it will become more challenging for the Bank to respond, given balance sheet size and prudent risk management.

4 Conclusion

This article has examined diminishing liquidity in financial markets in recent years. Globally, concern about lower liquidity is rising, with increasing financial market volatility a possible symptom. High levels of liquidity as well as strong resilience are important for the efficient functioning of financial markets and optimal capital allocation.

We found that international research into recent liquidity developments generally identified a decline in market liquidity, although this was not evident in all markets. There is also evidence that the resilience of liquidity has declined in some markets, increasing financial stability risks. The primary drivers for the decline in liquidity have been increased regulations on market makers and a changing market structure. Extraordinarily easy monetary policy on balance has added to liquidity, and is likely masking the full structural decline in liquidity. This means lower financial market liquidity may become even more apparent when major central banks tighten monetary conditions again.

We examined liquidity developments in three key areas of New Zealand financial markets: the New Zealand government bond market, bank funding markets, and short-term money markets. Overall, we found that liquidity has declined across these markets, but to varying degrees.

In New Zealand government bond markets, we found mixed evidence for declines in market liquidity, with one measure indicating declines, while others pointed to little change. Nevertheless, market makers we spoke to noted they had seen a decline in liquidity in the market, although had been able to 'absorb' it thus far, allowing investors to trade as normal. Nevertheless, risks have increased that more market makers might participate less in the market owing to an increased regulatory burden, exacerbating poor liquidity conditions further and raising costs for investors and the New Zealand Government.

Funding liquidity in New Zealand's bank funding market has only modestly diminished over the past year, owing primarily to greater market volatility caused by events such as the Greek crisis in 2015. However, these costs have been manageable thus far, and regulations such as the Core Funding Ratio and more conservative bank risk appetites mean that

banks are more resilient than before the global financial crisis to shocks to funding markets.

Finally, we identified a notable decline in liquidity in New Zealand short-term FX swap markets, which resulted in higher volatility and key interest rates being out of line with the OCR for longer. In short-term markets the effect of new regulation has caused some market participants to withdraw. In response, the Reserve Bank has increased its participation in the FX swap market, which appears to have improved market conditions.

References

Bank for International Settlements (2014) 'Market-making and proprietary trading: industry trend, drivers and policy implications' *CGFS Papers* No 52.

Bank for International Settlements (2015) 'Global liquidity: selected indicators' Update to Global Liquidity Indicators, http://www.bis.org/statistics/gli/gli_feb15.pdf, accessed 23 November 2015.

Cadamagnani, F, R Harimohan, and K Tangri (2015) 'A bank within a bank: how a commercial bank's treasury function affects the interest rates set for loans and deposits' *Bank of England Quarterly Bulletin* 2015 Q2.

Cook, B (2012) 'What is the repo market? Why does it matter?' Reserve Bank of New Zealand *Bulletin* 75(4), pp 13-21.

Fleming, M J (2003) 'Measuring Treasury Market Liquidity' *Economic Policy Review* 9, no.3, Federal Reserve Bank of New York.

Hoskin, K, I Nield and J Richardson (2009) 'The Reserve Bank's new liquidity policy for banks', Reserve Bank of New Zealand *Bulletin* 72(4), pp 5-18.

IMF (2015) 'Market Liquidity – Resilient or Fleeting?', *Global Financial Stability Report*.

PwC (2015) 'Global financial markets liquidity study', <http://www.pwc.com/gx/en/industries/financial-services/publications/financial-markets-liquidity-study.html>, accessed 20 November 2015.

Sarr, A and T Lybek (2002) 'Measuring Liquidity in Financial Markets' IMF *Working Paper* WP/02/232.

Setia, R, A Pradhan, A Nashikkar, J Abate, C Aksu, G Maraffino, H Worthington, H Rohra, F Engelhard, J Harju, M Islam, A Fukunaga and N Oshikubo (2015) 'Declining liquidity in sovereign markets: Emerging fault lines' Barclays Interest Rates Research.

Shafik, M (2015) 'Dealing with change: Liquidity in evolving market structures', speech to AQR Asset Management Institute, London Business School, 2015, <http://www.bankofengland.co.uk/publications/Documents/news/2015/855.pdf>, accessed 27 October 2015.

U.S. Department of the Treasury, Board of Governors of the Federal Reserve System, Federal Reserve Bank of New York, U.S. Securities and Exchange Commission, U.S. Commodity Futures Trading Commission (2015) 'The U.S. Treasury Market on October 15, 2014' Joint Report, 2015.

Wong, J (2012) 'Bank funding – the change in composition and pricing'
Reserve Bank of New Zealand *Bulletin* 75(2), pp 15-24.