

Secured money market transactions: trends in the Australian repo rate

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1. Introduction

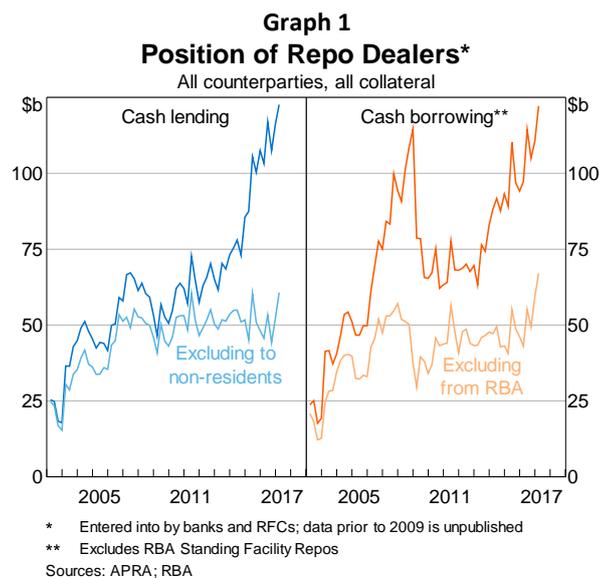
The repo market is an integral part of money markets that facilitates a more efficient financial system, and assists in the allocation of capital in the real economy.¹ The use of collateral combined with the practice of haircutting the value of securities to reflect credit risk and margining transactions to account for valuation changes, provides participants with a less risky means of transacting than unsecured money markets. As a result, repos are actively used to take positions in securities, arbitrage price differentials, manage cash flows, raise short-term financing without undertaking outright sales, and by the Reserve Bank of Australia to conduct its monetary policy operations (Wakeling and Wilson 2010). However, an excessive build-up of short-term leverage associated with over-reliance on repos can also be problematic, as was the case in the North Atlantic economies leading up to the 2008 financial crisis.

The value of positions in repos was around \$120 billion as at the end of 2016. The position of repo dealers in lending cash and accepting securities as collateral was broadly in line with the value of cash they borrowed on a secured basis. In aggregate, the Australian repo market can therefore be characterised as a means of intermediating cash flows ('matched book') rather than a key net funding market.² As has been the case for several years, deposits, long-term debt and equity represent the main sources of funding for banks in Australia (Cheung 2017), so that developments in the repo market have little direct impact on the cost of funds for banks or the interest rates at which borrowers access intermediated loans.

Since 2015, the composition of the market has shifted considerably, so that currently around half of all cash lent by repo dealers is directed to non-residents. Excluding cash lending to non-residents, there has been little change in repo dealers' positions vis-à-vis other segments of the market over the past decade (Graph 1). Non-residents have been an important source of demand for secured cash borrowing and exert notable influence on price determination in the repo market.

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- 1 Repurchase agreements, or 'repos', are money market transactions typically collateralised by fixed income securities. The agreement is a contract under which the seller lends the legal title to securities over a period of time in return for cash. Lending of securities under repo is therefore equivalent to borrowing cash. At the agreed future date, the securities and cash are returned to their original holders at a price that was determined at the time the agreement was entered into. The difference between the cash borrowed in the first leg of the transaction and the cash returned to the original holder in the second leg is the rate of interest on the cash borrowed – the 'repo rate'. A reverse repurchase agreement, or 'reverse repo' is a contract where the buyer who is borrowing securities for cash, undertakes to return them to the seller at an agreed price and future date (Cook 2012). Repurchase agreements and reverse repurchase agreements are referred to as 'repos' hereafter.
- 2 In the major economies and financial centres, institutions are more active in funding trading positions using the repo market. This type of activity and the associated leverage have been significantly curtailed since 2008 as a result of disintermediation during the financial crisis and deliberate regulatory actions.



On the other side of the repo market, the Reserve Bank is the source of around half of all cash borrowed by repo dealers. The central bank position in the repo market reflects its domestic liquidity management operations. These are exogenously determined by, among other factors, offsetting the liquidity impact resulting from the issue of banknotes and the cash management activities of the government. That is, when system liquidity would otherwise decline because payments are made into accounts held at the central bank to pay for new banknotes or to make transfers to the government, liquidity management operations are undertaken to offset the drain by lending cash back into the inter-bank market (Baker and Jacobs 2010). Although driven by different factors, the rising demand for cash from non-residents has occurred at the same time that the Reserve Bank has supplied more cash into the repo market. This reflects that repo dealers fund part of their client activity by borrowing from the central bank at its daily liquidity management auctions.

Notably though, while the Reserve Bank accounts for around half of cash borrowing positions outstanding, it is far less important as a share of market turnover. The typical duration of inter-bank repo agreements is very short, at less than one-tenth of the average duration of the Reserve Bank's repo book associated with market operations. Accordingly, the dollar value of turnover is also more than ten times higher, albeit only at the shorter tenors. Aggregate turnover in repos is likely to be approximately \$30 billion per day or around \$8 trillion per annum, although no precise metrics of this aspect of the repo market exist.³

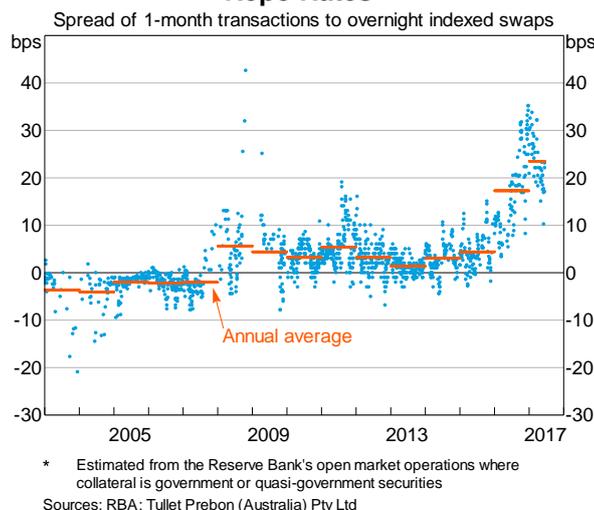
2. Long-term perspective on the repo rate

Prior to disruptions during the financial crisis in 2008, and ensuing stress-related volatility in European financial markets in 2011, repo rates in Australia broadly traded as could be expected. The Reserve Bank's transaction rates for 1-month secured cash lending under repo were typically below the unsecured inter-bank cash rate (Graph 2).⁴ This was in large part attributable to the inherent credit risk premium in the unsecured rate that does not affect appropriately collateralised lending.

3 The Reserve Bank deliberately contracts repurchase agreements at terms that do not interfere with the functioning of very short-term money markets (i.e., at or close to overnight). Terms can vary widely, typically anywhere between one week to six months, with an average duration of around one month. The remainder of the market is very skewed to short terms, with an average duration closer to just two days. See also (Australian Financial Markets Association (AFMA) 2015) for measures of turnover, and (Hing, Kelly and Olivan 2016) on the cash market in Australia. These findings are also relevant to Section 3.2.

4 The overnight unsecured inter-bank cash rate is the operational target for the implementation of monetary policy in Australia. While the Reserve Bank Board sets the cash rate target, liquidity management operations are never conducted on an unsecured basis, and hence the central bank does not transact in the market in which the cash rate is determined. Expected future cash rates are reflected in the overnight indexed swap (OIS) rate, which banks use to swap between fixed and floating interest rate exposures.

Graph 2
Repo Rates*



Financial markets began to experience a series of severe stresses in the period from 2008 to 2011. Especially north-Atlantic economies experienced wide-ranging financial disintermediation that adversely affected liquidity in repo markets. While the repo market in Australia had not been used to fund leveraged positions in sub-prime instruments as was the case in the more directly crises-affected economies, there was a spill-over that resulted in a rise in repo rates. The demand for cash was reflected in 1-month repo rates that no longer traded lower than the unsecured rate but well in excess. Rates spiked to over 40 basis points above the overnight indexed swap rate around the time of the Lehman Brothers collapse, and around 20 basis points when European markets relapsed into a bout of volatility. During that time there was little activity in the inter-bank repo market for anything other than very short terms using only the highest quality sovereign-issued collateral. The remainder of activity was intermediated by the Reserve Bank, using securities considered to be of lower grade and at longer terms that market participants were not willing to enter into with each other. Like other central banks during these times of stress, the Reserve Bank helped to complete the market in a manner that contained the impact of the crises.⁵

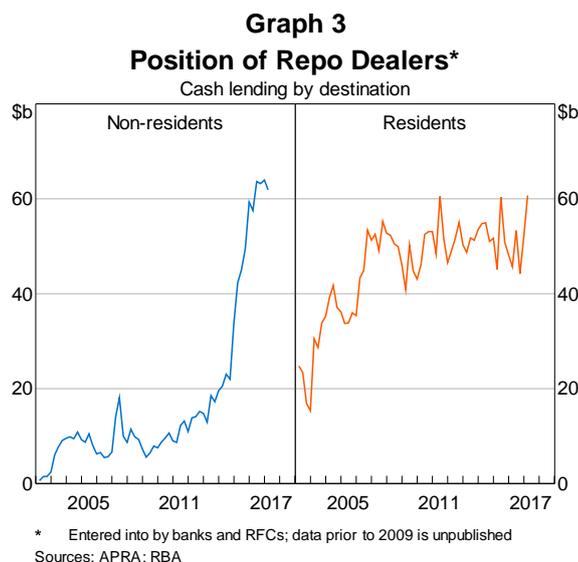
Following the worst stresses related to European financial markets in 2011, the premium that had opened up in repo rates narrowed but never reverted to be consistently below the unsecured rate. Repo rates were therefore not only higher but notably above unsecured rates, albeit for non-crises related reasons. This was also evident in other jurisdictions. Repo market activity in the major economies declined noticeably, while the Australian market was becoming deeper and more active in line with issuance of government debt securities. However, at this time implementation of a new suite of prudential regulations was also affecting the way that market participants began to price short-term money market instruments (CGFS (Committee on the Global Financial System) 2017). At least part of the failure of repo rates to normalise following the crises might therefore be attributable to the interaction of markets with regulations and the possibility that there is now a greater degree of segmentation that inhibits arbitrage between money markets.

The repo rate had also started to become noticeably more volatile, not necessarily in absolute day-to-day changes, but exhibited signs of events that can be characterised as cycles. In October 2016 rates rose by more than 10 basis points over a two-week period and subsequently reverted at a similar speed. In December of the same year, repo rates rose by 25 basis points, from below 10 basis points to around 35 basis points. Consistent with the interaction of markets with regulatory requirements, these cycles appear to have been at least loosely correlated with reporting periods of financial institutions.

⁵ A comprehensive series of explanations of the policy actions taken by the Reserve Bank and associated risk mitigation can be found in speeches by senior management and publications such as the *Annual Report*, *Bulletin*, and *Statement on Monetary Policy*. Refer for example to (Battellino 2007), (Debelle 2007) (2008a) (2008b), as well as (Kearns 2009).

3. More recent dynamics in repo pricing

The diverse range of participants in the repo market and the various functions that short-term secured money market transactions perform, mean that there is always a confluence of factors that affect how the interaction between demand and supply determines price. These dynamics make it difficult to ascertain with certainty why repo rates move in the manner observed over recent years. Nonetheless, one of the most notable developments in the repo market, which is consistent with the observed shift higher in rates, has been strong demand for cash from non-residents. Since 2015, repo dealers have sharply increased the amount of cash they lend to non-residents (Graph 3).



The increase in the quantity of cash traded in the domestic repo market, alongside the rise in repo rates, is consistent with a significant increase in demand for secured borrowing from non-residents rather than explanations of higher interest rates that rely on supply-side explanations. Notably, the recent rise in the repo rate is not reflected in higher rates in other domestic money markets.

3.1 Cash borrowing by non-residents and the cross-currency swap basis

In order for non-residents to participate in the Australian repo market, they either have existing holdings of the appropriate securities for collateral or need to acquire them (outright or on loan). While cash borrowing does not necessarily have to be secured by a particular type of security, it is often the case that liquid and highly-rated Australian Government Securities (AGS) are used as collateral (Cheung, Manning and Moore 2014).

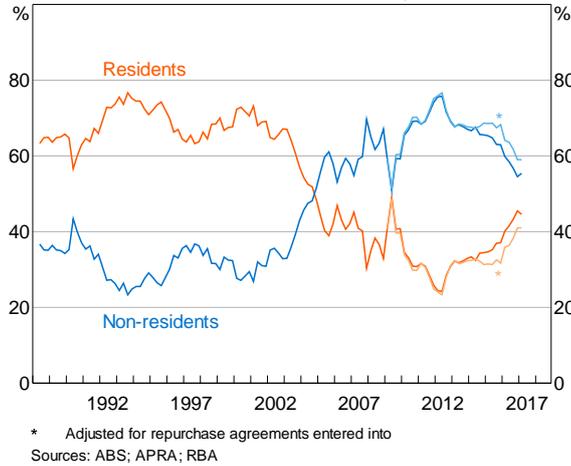
More than half of all AGS outstanding is currently held by non-residents (Graph 4). However, a significant proportion of that amount is thought to be held by central banks or other buy-and-hold investors who are not likely to have a frequent need to raise cash. Nonetheless, at the margin sovereign wealth funds, offshore pension funds, life insurance corporations and other financial institutions are now probably more active than several years ago in managing their Australian dollar denominated investment portfolios. Non-resident holders of AGS therefore have substantial collateral to directly engage with domestic repo dealers to raise Australian dollar cash. As non-residents have become more active in the repo market, they have lent part of their holdings of AGS back to Australian residents in return for cash. The measured non-resident holdings of legal title to securities declines for the duration of a repo but is reinstated on the second leg of the transaction as the repo matures.⁶ Reflecting this, while the non-residents' legal title holdings to AGS has declined to around 55 per cent of the outstanding stock,

⁶ In a repo the legal title to securities used as collateral passes from the seller of securities to the cash lender for the duration of the agreement, after which the legal title reverts to the seller. The economic interest in the security (e.g., the coupon payment), however, remains with the seller of the security at all times.

adding back in the net repo positions of non-residents, shows their underlying economic interest in AGS is actually around \$25 billion higher at 60 per cent of the stock. While this is lower than in preceding years, it is a significant adjustment to consider.

Graph 4

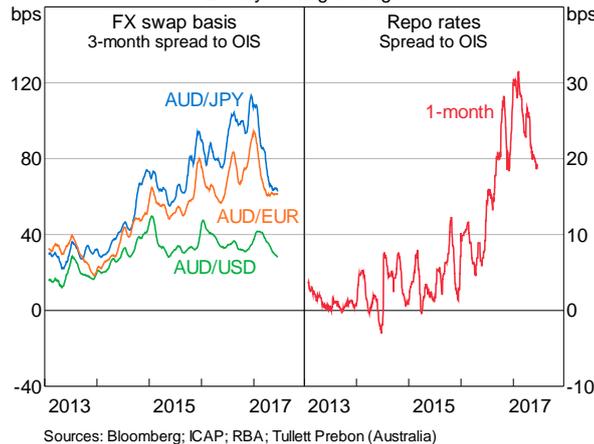
Holdings of AGS
Per cent of total outstanding



Given the low global interest rate environment over recent years, it is not surprising that when profitable opportunities present themselves, debt holders seek to engage in some return enhancement. For example, even though non-residents wish to retain the underlying economic interest in Australian dollar denominated securities, from time-to-time there might be advantages to lending out the stock to reinvest the cash proceeds in a complimentary investment. One of the most prominent of these has been swapping Australian dollars into foreign currencies, notably the European euro and especially the Japanese yen, to earn the premium embedded in the forward foreign exchange swap rate (Graph 5). This trade is generally referred to as the cross-currency swap basis trade.⁷

Graph 5

Repo Rates and FX Swap Basis
21-day moving average

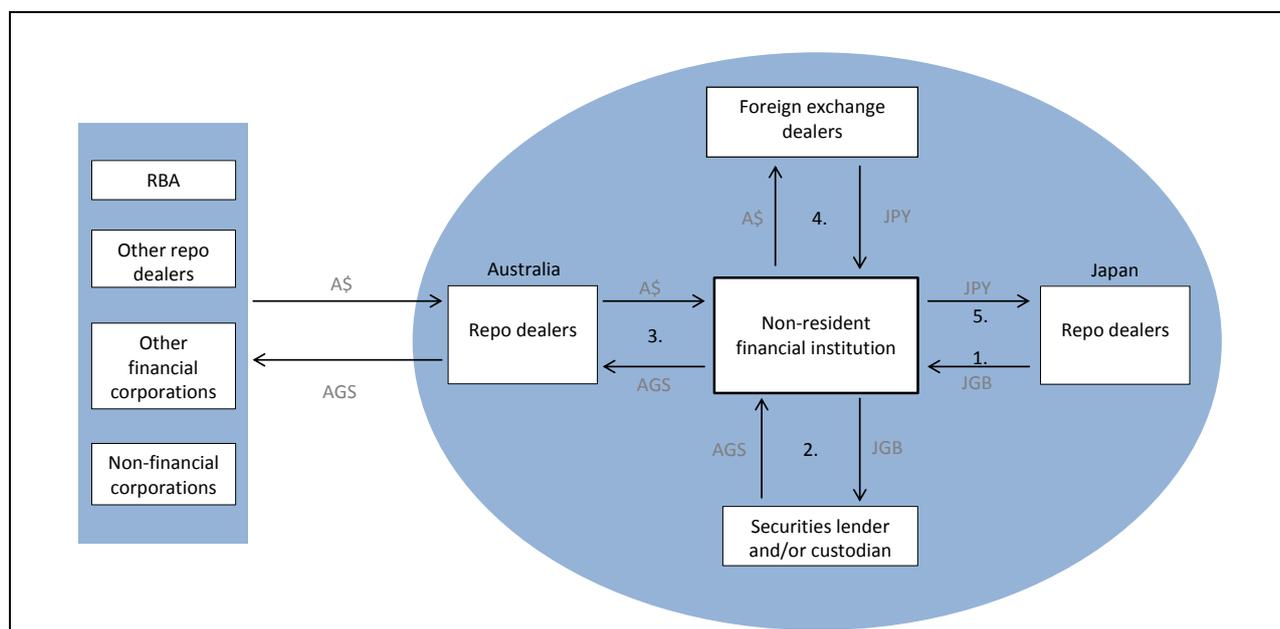


It is also possible for non-residents that do not have an existing position in the relevant collateral to acquire securities by entering into collateral transformation transactions (Dive *et al* 2011). For example, an institution might enter into a transaction with a securities custodian to swap foreign currency securities for AGS, which is then more easily used in the Australian repo market. The visibility of such transactions is limited and currently there is no reliable way of estimating how important the associated flows might be.

⁷ For a discussion of the cross-currency swap basis and covered interest party, see (Borio *et al* 2016).
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Take the following stylised example as an illustration. If a non-resident financial institution at the centre of initiating a series of transactions were to borrow Japanese Government Bonds (JGBs) in the Japanese repo market with yen cash, it could then use the JGBs as collateral to borrow AGS through a custodian or securities lending arrangement (steps 1 and 2 in Figure 1). In a separate transaction, the non-resident could then use the AGS as collateral in a secured transaction with a domestic repo dealer to borrow Australian dollar cash, which in turn could be swapped into Japanese yen through the foreign exchange market in order to earn the swap basis (steps 3 and 4). In the final step of the trading strategy, the Japanese yen cash acquired by the non-resident via the swap could be used to fund the initial repo where JGBs were borrowed (step 5). If the foreign exchange swap basis is sufficiently wide, so that it clears the hurdle of more than covering the costs implied by each transaction in this example, the trade would be profitable for the non-resident financial institution. It is not clear what the threshold for entering into the sequence of trades is, but it most likely varies not only by investor type, but over time, and is influenced by a spectrum of other investment returns.

Figure 1: Stylised Example of Cross-currency Swap Basis Involving the Australian Repo Market



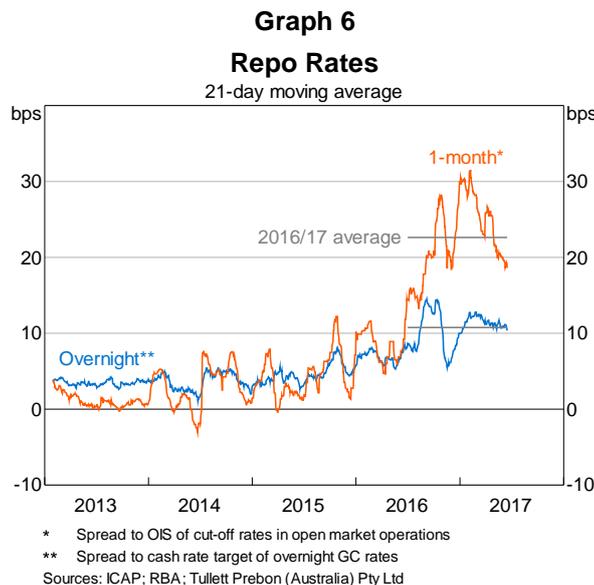
Source: RBA

The Australian repo dealer acquires the cash lent to the non-resident by re-selling the AGS received in the repo with a different counterparty in the Australian repo market, possibly the Reserve Bank. In this manner the demand for the cross-currency basis trade might also indirectly influence the way repo dealers price their approach rates at the Reserve Bank's daily auction and explain the correlation between repo rates and the basis in cross-currency swaps. Notably, while increases in the basis have tended to be associated with higher repo rates, falls in the basis do not appear to be immediately reflected in lower repo rates. This suggests that repo rates are subject to a degree of persistence, or stickiness, and are also affected by a range of other factors such as arbitrage between bond futures and the market for physicals (Becker, Fang and Wang 2016).

3.2 Possible spill-over to term premia in repo rates

Until recently, overnight repo rates transacted between commercial banks moved broadly in line with term rates contracted by the Reserve Bank (Graph 6). At least in part this might be because repo dealers sometimes benchmark their transactions to the spreads observable at the Reserve Bank's 09:45 AEST auction window. This co-movement occurred despite different eligibility criteria for collateral. While the overnight market repo rate shown is contracted exclusively against first grade general collateral (Australian Government Securities and semi-

government paper), the Reserve Bank accepts a wider range of collateral.⁸ Since the additional collateral accepted in central bank open market operations is haircut in a manner that replicates the credit characteristics of general collateral, the Reserve Bank auction rate and market rates reflect similar credit risks.



The shift higher observed in 1-month rates in the Reserve Bank's auction was initially mirrored in overnight repo rates. Notably however, since mid-2016 overnight market rates have averaged around 10 basis points above the overnight indexed swap rate, whereas rates observed at tenors longer than this continued to rise.⁹ This divergence exhibits characteristics of a term premium in the repo market out to 1-month agreements and could be due to a number of non-credit related factors. It is possible that prudential regulations that aim to limit the short-term positions of banks make term repos more attractive, although the relevant regulations did not change at the time the observed divergence opened up.

The term premium could also be related to the cash lending position the banks have with their clients. Since we know that non-residents who borrow in the repo market to fund their cross-currency basis trades have become more important, there might be a connection. That is, because the Japanese yen cross-currency swap basis trade itself has a term premium, investors probably enter into swaps at terms that are not as short as day-to-day cash management transactions. Repo dealers, who are party to related transactions, might seek to match the maturity of their cash funding with their cash lending. This could manifest itself as the gap between the overnight and 1-month rates. In other words, repo dealers prefer not to roll their funding for a term loan on a daily basis because of the associated refinancing risk. Consequently, bids received at the daily Reserve Bank liquidity auction may reflect the preference of repo dealers to manage the refinancing risk on these transactions that cannot be easily be covered in the inter-bank market.

4. Adjustments and possible implications

Since 2016 there appears to have been a demand-driven increase in repo rates, which at least in part can be linked to non-residents becoming more active managers of their portfolios of Australian dollar denominated securities. The rise in repo rates has been accompanied by an increase in volatility for reasons that are very different to the crises-related market conditions observed during earlier episodes over the past decade. To a degree, it can be

⁸ Securities eligible as collateral in open market operations are listed in the technical guidelines on the Reserve Bank website <http://www.rba.gov.au/mkt-operations/resources/tech-notes/eligible-securities.html>.

⁹ Notwithstanding that there is much less liquidity in inter-bank repo rates beyond a 7-day term, the market transacts 1-month repo at a spread to OIS similar to the rates more readily observable at Reserve Bank liquidity operations. It is therefore unlikely that the difference between short-term market rates (general collateral only) and term rates (all market operations eligible collateral) are attributable to differences in the composition of collateral.

argued that the observed flows in the repo and foreign exchange markets described in this paper are an indication that investors respond to arbitrage opportunities.¹⁰ Money markets are therefore not completely segmented, even if there are some barriers to perfect and riskless arbitrage. On the other hand, a question arises as to whether higher and more volatile repo rates are somehow having adverse effects. Given that demand-side pressures appear to be bidding up prices to take advantage of profit opportunities, there is no immediately obvious reason why higher repo rates should be a major source of concern. The repo market mainly performs an intermediation function and is not a main source of funding for bank lending activity. As such, higher repo rates have not been translated into the broader interest rate structure in the economy (such as the rate at which banks issue debt). There is also some evidence to suggest that the demand-driven increase in rates induces an increase in supply. Nevertheless, it remains important to understand, now and in the future, how money market rates are determined, the impact on the financial sector, and thereby the economy more broadly.

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¹⁰ A related question is whether or not the cross-currency swap basis underlying these observed trends in Australian financial markets is a source for concern. Generally the answer to that question appears to be 'no' (Debelle 2017).