

# Bank Balance Sheet Constraints and Money Market Divergence

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## Abstract

The spread between key Australian money market interest rates has widened and become more volatile in recent years. While this might seem to imply scope to profit from arbitrage – by borrowing at a low rate to invest at a higher one – banks have additional balance sheet considerations that need to be taken into account. We find that money market trades have generally not been profitable for the four major banks since the financial crisis. This is partly because debt funding costs have fallen by less than money market returns. In addition, equity funding, which is more expensive than debt, has increased. Consequently, the incentive for banks to arbitrage between money market interest rates has fallen. We also note that banks tend to prefer more profitable lines of business, such as lending for residential housing, over the narrow margins implied by money market arbitrage.

## Divergence in Money Market Rates

In recent years interest rates (or gross returns) in Australian money markets have significantly and persistently deviated from each other, and from the overnight cash rate (Graph 1).<sup>[1]</sup> Notable examples have been the swapping of Australian dollars into Japanese yen to earn the premium embedded in the forward foreign exchange swap rate and, to a lesser extent, the domestic repo rate (Becker and

Rickards 2017). Deviations in interest rates that are large and persistent typically represent a profit opportunity and should not occur. Theoretically, market participants exploit such opportunities by borrowing in the market where interest rates are lowest to invest in a market where interest rates are higher, until it is no longer profitable to do so.<sup>[2]</sup> However, since at least 2014, this does not appear to have happened to the extent that might be expected.<sup>[3]</sup>

This article examines whether the major banks have scope to ‘arbitrage’ away divergences between Australian dollar-denominated money market interest rates. To do so, we estimate the funding cost associated with each money market asset using data since 2008. A key finding is that overall balance sheet considerations have raised asset-specific funding costs relative to gross returns. Hence, until 2018, arbitrage trading has generally not been profitable. We show how much the constraints on the use of leverage affect funding costs. Money market trading tends to be a narrow-margin business. As a result, the major banks limit trading activities and structure their balance sheets towards higher return assets such as mortgage lending. However, banks continue to actively manage their own positions in money markets and act as ‘market makers’ for customers.

## Methodology

To determine the profitability of money market trades we calculate the net return banks can earn by arbitraging between money markets. We apply the methodology put forward in Cheung and Printant (2019), which accounts for the total balance sheet considerations that major banks face. This methodology explicitly accounts for differences in funding costs due to the characteristics of specific money market assets. This is important because prudential standards generally require supervised institutions (like banks) to fund riskier assets with a larger share of equity capital, which is typically more expensive than debt. The funding structure of a

bank is determined by the asset composition of its balance sheet and prudential regulation. While the debt funding cost we derive is independent of the investment decision, both the gross return on, and riskiness of, any specific investment have a material bearing on the net return that can be earned.

The net return  $NR_{it}$  that a bank earns on a position in an asset  $i$  at time  $t$  is calculated as the gross return  $GR_{it}$  on the asset net of the total cost of funding the position  $TC_{it}$ :

$$NR_{it} = GR_{it} - TC_{it} \quad (1)$$

We can rewrite  $TC_{it}$  as a weighted average of the institution’s overall debt funding rate ( $DFR_t$ ) and equity funding rate ( $EFR_t$ ):

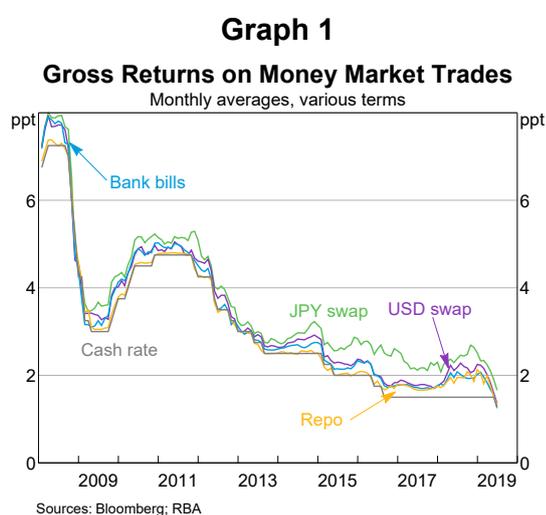
$$NR_{it} = GR_{it} - [\tau_{it} * EFR_t + [1 - \tau_{it}] * DFR_t] \quad (2)$$

where  $\tau_{it}$  is the share of equity funding notionally allocated to asset  $i$  such that  $\tau_{it} = \frac{\text{Equity}_{it}}{\text{Value of asset}_{it}}$ , and the remainder  $(1 - \tau_{it})$  of asset  $i$  is funded with debt. While  $\tau_{it}$  is not directly observable, we estimate the minimum amount of equity funding required to satisfy current prudential standards for each asset  $i$ . [4]

## Assessing the Profitability of Money Market Arbitrage

Using the methodology above, we calculate the net returns for each money market asset and assess whether the investment is profitable after accounting for asset-specific funding costs. During the first half of 2008, net returns for bank bills or foreign exchange swaps were around 110 basis points, but around 60 basis points for repo (Graph 2). [5] The profitability of these trades declined during the financial crisis and net returns generally remained negative prior to 2018.

Since 2008, the total cost of funding declined in absolute terms as monetary policy became more accommodative. However, this decline in the cost of funding was less pronounced than the fall in gross money market returns. The main driver of the erosion in net returns has been the narrowing in the spread between gross returns and the debt funding costs (Graph 3). Most of this relative increase in debt funding costs is explained by the repricing of risk in retail deposits and longer-term debt, as well as



intensified competition for stable funding following the financial crisis (Atkin and Cheung 2017).

The decline in net returns is also attributable to an increase in both the cost of equity and the proportion of equity funding used. While it became profitable in 2018 for major banks to pay the debt funding rate to lend into the relatively safe repo market, the additional cost of equity associated with riskier investments in bank bills and foreign exchange swaps reduced the returns from arbitrage in these markets. Equity now accounts for around 20 per cent of the cost of funding these trades (up from around 5 per cent) which reflects the increase in capital buffers since 2008.

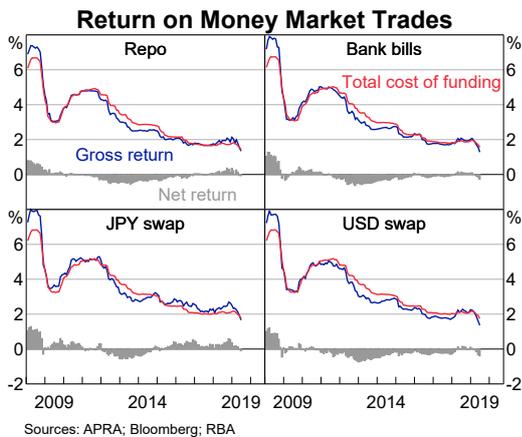
We extend our methodology to other assets on bank balance sheets to determine the opportunity cost associated with allocating funding to money market trading, and find that residential mortgages are always significantly more profitable than money

market trades over the sample period (Graph 4). This suggests that there has been a substantial opportunity cost associated with diverting equity funding away from mortgages and towards lower-margin activities such as money market trading (Bajaj *et al* (2018)). This is consistent with the balance sheets of the major banks being weighted towards mortgages and away from trading investments (Roengpitya, Tarashev and Tsatsaronis 2014).

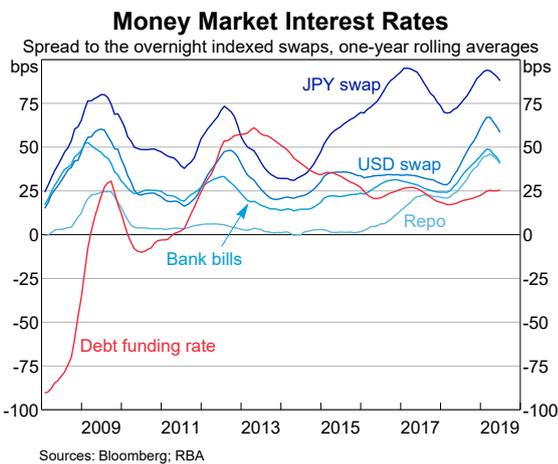
The methodology we outlined above assumes all investment activity is centrally funded at the aggregate balance sheet level. Subject to prudential regulations, this reflects the optimised allocation of capital to individual business units across the bank (Bajaj *et al* (2018)).<sup>[6]</sup> However, in practice, trading activities contracted by money market desks are at least partly ‘self-funded’ from a range of sources. For example, bond traders might choose to borrow in the repo market in order to invest in securities. This differs from broader funding of the institution through accepting deposits or raising offshore debt.

A more realistic approach might therefore be to replace the debt funding rate in our framework with the repo rate – typically the lowest money market rate over the sample period. This yields broadly similar results to our initial methodology. If banks were to borrow cash under repo to invest in bank bills, net returns would have been negative since 2016. Similarly, borrowing in the repo market to lend cash into US dollar-denominated foreign exchange swaps does not appear to have been a profitable investment for the major banks since

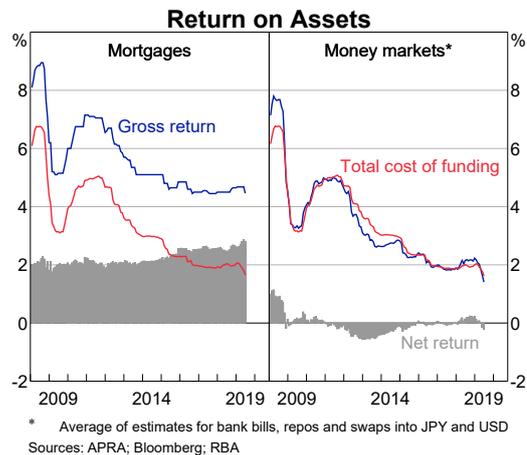
**Graph 2**



**Graph 3**



**Graph 4**



2009. The only market where spreads were sufficiently wide to yield a positive net return when funded by repo are those observed in the Japanese yen foreign exchange swap market. The net return for major banks borrowing under repo to lend into the Japanese yen foreign exchange swap market peaked at around 60 basis points in 2016, before narrowing to around 15 basis points for most of 2017–18.

Our approach does not measure how much arbitrage is already reflected in observed money market rates. That is, it may be possible arbitrage activity has already led to some convergence between funding and investment rates, thereby exhausting profitable trading opportunities.<sup>[7]</sup> However, the methodology is a useful framework to explain why complete convergence between market rates has not occurred.

### Profitability and Leverage of Money Market Participants

Our results in the previous section can be used to define a relationship between the profitability and funding structure of an investment. We do this by estimating the point at which investors just cover their costs. The ‘break-even spread’ is the minimum number of basis points between the gross return on an investment and the debt funding rate that generates zero net returns.

Intuitively, if investments were to become funded by a larger share of relatively expensive equity, the return required to break even would rise. If an investment is funded with a larger share of debt, the minimum required return declines because borrowing is less expensive.<sup>[8]</sup>

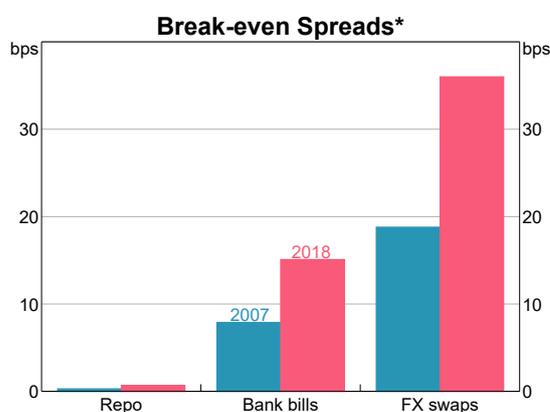
Before the crisis, banks were important providers of liquidity in money markets. These positions were funded by a relatively large share of debt, and break-even spreads were relatively low. The minimum break-even spread for repo investments funded at the aggregate debt funding rate was around one basis point (Graph 5). Reflecting the higher share of equity funding, the minimum break-even spread for bank bills and foreign exchange swaps was around 10 and 20 basis points, respectively. Following a period of repricing of risk,

break-even spreads doubled by 2018. This reflects two developments. First, the relative cost of equity rose over the period so that for any given degree of leverage, the implied minimum break-even spread is higher. Second, the share of equity funding for any money market investment has almost doubled over the period. This has had few consequences for investing in the repo market as the low risk (arising from the collateralisation of the trade) means little equity funding is required. However, by 2018, the break-even spread had risen to around 15 basis points for bank bills, and to around 35 basis points for foreign exchange swaps. Effectively, the hurdle for banks to achieve profitable arbitrage rose substantially and helps to explain a significant increase in the degree of dispersion in money market rates.

However, this is a stylised representation of bank activities. There are other sources of revenue which are not explicitly taken into account, such as fees, charges and the revenue earned from market making activities. Some costs are also omitted, such as staffing, maintenance of a branch network and systems.

While major banks have a diminished incentive to arbitrage across money market rates post-crisis, this may not be true for other market participants. In the domestic repo market, around half the cash lent by dealers is borrowed by non-residents who are likely to be non-bank entities. Non-bank entities may be better able to take advantage of arbitrage opportunities across money markets, as they are

**Graph 5**



\* Minimum required spread between the gross return on the investment and the debt funding rate

Sources: APRA; Authors' calculations; RBA

typically less constrained by prudential requirements.

However, constraints on the balance sheets of the regulated banking sector may spill over to non-bank market participants and limit their arbitrage activities. Banks are an important source of funding for non-banks through the provision of credit lines. To the extent that this source of funds is curtailed, non-banks may be affected by regulation in the banking sector. In the United States, Boyarchenko *et al* (2018) suggest regulatory requirements that apply to broker-dealers have spilled over to non-regulated entities because regulated broker-dealers are less willing to extend credit. Consequently, this has limited the ability of non-regulated entities to pursue arbitrage opportunities. It is difficult to assess the extent to which funding to non-bank

participants may have been constrained in the Australian context. Notwithstanding this, it is likely that bank lending volumes to non-bank participants in the domestic repo market are too small to close persistent money market arbitrage opportunities (Becker and Rickards 2017).

## Conclusion

The incentive for banks to completely arbitrage away the divergences between money market rates has fallen since 2008. We find that developments in broadly defined funding costs can help to explain this divergence. Consequently, some dispersion in money market rates may occur unless arbitrage becomes more profitable for banks or non-bank participants emerge as the principal arbitrageurs. ✖

## Footnotes

- [\*] The authors are from Domestic Markets Department. This article summarises a recently released Research Discussion Paper, and interested readers should refer to Cheung and Printant (2019) for further detail.
- [1] Money markets primarily consist of trading in Australian dollars in the unsecured cash market or via short-term investments, such as repurchase agreements (repos), bank bills and foreign exchange swaps. Interest rates across these different markets should generally be similar as the same product – Australian dollar cash – is traded in all these markets.
- [2] In this paper, we do not adhere to the typical definition of arbitrage where all aspects of the transaction are contracted to eliminate all risk.
- [3] Covered Interest Parity, whereby the expected interest rate to borrow Australian dollars in the domestic money market should be equal to the rate of borrowing Australian dollars in another currency while covering this foreign exchange exposure (using a foreign exchange swap or forward contract), appears to have been violated significantly and persistently.
- [4] For the full derivation, see Cheung and Printant (2019).
- [5] In 2008, the gross return associated with swapping Australian dollars into Japanese yen was around 120 basis points higher than the debt funding rate. Notwithstanding that gross returns have increased due to the widening in the cross-currency foreign exchange swap basis associated with this trade, the net return we derive is substantially lower at around 30 basis points in 2018.
- [6] Wakeling and Wilson (2010) note that business units can source funding internally from the institution's treasury but are typically charged a transfer price that reflects the broader cost structure of the bank. As a result, the internal cost of funding is likely to be higher than the cost of debt described in the baseline model.
- [7] Indeed, we note that money market rates have become significantly more correlated in recent years. This could be interpreted as an indication of a higher degree of market integration and trading activity.
- [8] Refer to Cheung and Printant (2019) for a detailed explanation of the relationship between the composition of funding (debt or equity) with required returns.

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