# Assessing the effects of housing policy measures on new lending in Australia

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## 1. Introduction

In 2014, policymakers in Australia judged that the rapid increase in the share of housing lending to investors posed a growing risk to household balance sheets. At the time, housing prices were rising rapidly and there was a concern that investor activity could be amplifying the upswing in housing prices and construction activity, in turn raising the prospect of a sharp unwinding in the future. Moreover, strong growth in investor lending was occurring at a time when housing debt more broadly was rising considerably faster than incomes, off an already-high base. This was judged to pose a downside risk for economic activity because highly indebted households could sharply reduce their consumption in the event of falls in incomes or housing prices.

As a result, regulatory measures were implemented over several years which sought to address these risks. These measures targeted housing lending, rather than housing prices. The most high-profile and measurable of these policies were two benchmarks introduced by the Australian Prudential Regulation Authority (APRA): the first of these (announced in December 2014) sought to limit the rate of new investor lending growth and the second (announced in March 2017) to limit the share of new interest-only lending. Both benchmarks were applied at the institution level. This paper uses empirical methods to identify the effect of these two policy measures on new housing lending.

The approach follows that suggested by the Bank for International Settlements (BIS) for individual country teams to replicate across a range of Asia-Pacific countries (Cantú et al (2019)). It advocates the use of a bank-level dynamic panel regression to exploit bank-level variation, while controlling for bank-specific factors as well as macroeconomic factors that can affect banks' lending decisions. Dummy variables are used to identify the policy impact on new lending.

In addition to assessing the effect of the policies on the flow of total new housing lending, I replicate the procedure separately for loans to owner-occupiers and to investors. This breakdown of lending type is interesting because the policy measures implemented in Australia were motivated principally by the growth in lending to riskier lending types, such as investors, rather than owner-occupiers.

I find that the benchmarks had the effect of reducing the flow of new lending; this effect is statistically significant in some specifications. I also find that the

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benchmarks had a much larger, negative and statistically significant effect on the growth rate of lending to investors, which was the type of lending explicitly targeted by the first benchmark.

## 2. The Australian housing policy measures

The Australian prudential regulator, APRA, has a mandate both to protect depositors in authorised deposit-taking institutions (ADIs) and to promote the stability of the financial system as a whole. As a result, APRA has long been alert to risks inherent in ADIs' mortgage lending activities. As explained in its recent *Information Paper* (APRA (2019)), between 2014 and 2018 APRA substantially increased the intensity of its prudential oversight of residential mortgage lending by ADIs. These prudential measures were taken in response to the heightened risk environment. Reflecting its mandate, APRA's actions were designed to both strengthen the resilience of lenders and promote the stability of the financial system overall. Specifically, the actions focused on improving lending standards and practices at individual ADIs, and reducing the share of higher-risk lending across the system.

Two specific policy measures introduced by APRA are the focus of analysis in this paper:

1. In December 2014, APRA announced that it would be scrutinising the lending practices of ADIs with strong growth in lending to property investors. Specifically, it announced that ADIs that continued to report growth over the year in investor lending above a threshold of 10% would face further supervisory action.
    - To reinforce this, APRA made a follow-up announcement a few months later reiterating its intentions and noting possible consequences for ADIs in instances where investor growth remained above the 10% threshold.
2. In March 2017, APRA announced another benchmark, this time on the share of new lending that could be on interest-only terms, which was set at 30% for each ADI. APRA also stated that ADIs should limit the share of interest-only lending with high loan-to-valuation ratios (LVRs) and scrutinise those loans with very high LVRs.

Over the same period, APRA continued its efforts to improve lending standards and practices, including by reviewing lenders' loan serviceability assessment practices, amending the Prudential Practice Guide, and announcing that it would more closely scrutinise higher-risk mortgage lending such as high loan-to-income loans, high LVR loans, interest-only loans and loans with very long repayment terms.

These measures (and others) are summarised in the RBA's 2018 *Financial Stability Review* (RBA (2018)). In its *Information Paper*, APRA (2019) explained that the objective of the benchmark policy measures was to develop a response that was targeted, efficient, relatively easy to implement, and able to be dialled up or down as needed. The housing policy measures proposed by APRA were discussed and endorsed by the Council of Financial Regulators (CFR) prior to implementation. The CFR is a non-statutory body designed to heighten collaboration between Australia's four primary financial regulators that have a role in promoting financial stability: the RBA, APRA, the Australian Securities and Investments Commission (ASIC) and the Australian Treasury.

In April 2018, APRA announced that the investor loan growth benchmark was no longer required given that other permanent measures to strengthen lending standards had been introduced. APRA confirmed that the threshold would no longer apply to an ADI from 1 July 2018 if the ADI had remained below the benchmark for the previous six months and could prove that it had measures in place to meet APRA's tighter lending standards. Similarly, in December 2018 APRA announced that ADIs no longer subject to the investor loan growth benchmark would also no longer be subject to the benchmark on interest-only lending from 1 January 2019.

## 3. Empirical methodology

As per the BIS methodological approach, I use a bank-level dynamic panel regression to exploit variation at the bank level, while controlling for bank-specific factors as well as macroeconomic factors that can affect banks' lending decisions. I include a dummy variable to identify the policy impact on new lending.[2] This model is estimated first by using total new housing loan approvals as the dependent variable. In addition, I rerun the model using two alternative dependent variables, specifically housing loans to investors and housing loans to owner-occupiers. Together, these two types of lending make up total housing lending.

The policy announcements are represented as common shocks across all ADIs. They are also considered to be exogenous to any individual ADI since the timing of the announcements and target level of the benchmarks were determined by external agents (the regulators) based on system-wide factors and macroeconomic considerations, rather than being driven by a single ADI. Hence, the policy identification mechanism is a dummy variable equal to 1 only in the quarter when a new prudential housing policy is announced; that is, in the December 2014 and March 2017 quarters. The dummy variable takes the value of 0 in all other quarters. However, each policy is allowed to influence the growth rate of new lending for the four quarters following the announcement, as specified by the four-quarter lags associated with the policy dummy variable. This specification allows the policy shocks to have direct, and individually measurable, effects in the quarters following the announcements, which informs us of the dynamics of the adjustment process undertaken by banks. In addition, the total effect of the policy measures in the four quarters after the announcements (that is, the sum of the four quarters) is also measured.

An extended specification includes the interaction of the policy variable with bank-specific characteristics. Finally, I test the hypothesis that the effectiveness of policy measures may vary depending on the stance of monetary policy and on the stage of the business cycle.

[2] For details on empirical specifications, refer to the paper by Cantú et al in this volume.

## 4. Data

The two main data sets used in this research come from banks' regulatory reporting forms submitted to APRA. Data are quarterly and cover the period from March 2008 to December 2018. The variable of interest, *new housing loans approved*, is only reported to APRA by ADIs with more than A$ 1 billion in total loan assets, so some very small ADIs are excluded from the analysis. A breakdown of new loans approved for the purpose of investment and those approved for owner-occupier housing is available from the same source. I focus on the quarterly change in the logarithm of new loans in real terms – that is, deflated by the consumer price index, published by the Australian Bureau of Statistics (ABS). ADIs with less than three years of data submitted over the sample period are dropped from the sample.

It is important to note that the dependent variable is loan *approvals* in each quarter. I do not use credit outstanding, as this stock measure is subject to potential policy-induced loan purpose switching among existing loans, which affects the data quality around the time of the policy measures. This issue is discussed by the RBA in its *Statement on Monetary Policy* (RBA (2018)). Loan approvals may not correspond exactly to the value of new credit extended in the quarter for at least two reasons. First, there may be timing differences in recording a loan approval versus the loan origination. Second, the value of loans approved does not account for loan repayments made, or for further drawdowns on credit made by existing borrowers. However, neither of these factors should be affected by the policy announcements.

The bank-level controls used are the four characteristics specified in the BIS cross-country analysis framework: size (total assets in log terms), capital ratio (the ratio of Tier 1 capital to total assets), deposit funding ratio (the share of deposits in total liabilities) and liquidity ratio (the ratio of highly liquid assets to total assets). These controls are chosen to account for bank-level factors that can affect banks' decisions to lend or their strategic decisions on lending growth rates.

In addition to bank decisions on lending, macroeconomic factors may affect the demand for credit and thus the growth rate of lending. To control for these factors, I use the following three macroeconomic controls suggested by the BIS protocol: the change in real quarterly gross domestic product (GDP), which measures economic growth; the quarterly change in the average level of the monetary policy interest rate, to account for changes in the stance of monetary policy and to some extent the baseline cost of borrowing; and the quarterly change in the real effective exchange rate (the trade-weighted index). Data on GDP are published by the ABS; the official monetary policy rate and the trade-weighted index (TWI) are published by the RBA. These macroeconomic factors are treated as being common to all lenders.

## 5. Discussion of results

Table 1 contains the key results for the preferred "baseline" model specification for total housing lending. Table 2 contains the results for the breakdown of lending to owner-occupiers and to investors. The policy impact in each of the four quarters after the policy announcements is presented separately, along with the sum of the four quarters for the overall size of the effect.

## 5.1 Impact of housing policies on lending

I find that the policy announcements were associated with a statistically significant decline in the rate of growth of total new housing lending over the year following the announcements; this is estimated to be equal to a reduction in the growth rate of new approvals of 0.16 percentage points in aggregate over the four quarters after each announcement (Table 1). This compares with the actual year-end growth rate in the total value of outstanding housing loans of around 6% at the time of each policy announcement.[3]

Importantly, I find that the decline is different for the two types of home lending (Table 2). Specifically, the results suggest that the decline in the growth rate of new loan approvals is substantially larger for loans to investors (Table 2, column 3), while there is no clear impact on owner-occupier loan approvals (Table 2, column 1). The decline in the growth rate of new investor approvals is estimated to be around 0.7 percentage points in aggregate over the four quarters following the policy announcements, which is more than four times the impact on total housing loans.[4] Investor loans outstanding were growing at a rate of around 16% in year-ended terms at the time of the first policy announcement, and at 4½% at the time of the second policy announcement.

The relatively larger impact on investor lending suggests that the policy measures were effective at reducing the growth in the lending types that were more directly targeted. The first policy targeted investor lending growth specifically, while the second targeted interest-only (IO) loans. IO loans can be to both investors and owner-occupiers. However, in Australia there are tax advantages to investors with IO loans and therefore a large share of investor loans are IO, while only a small share of owner-occupier loans are IO. Therefore, it is not surprising that the policy measures are found to have a more substantial impact on the growth of new investor loans than on owner-occupier loans. Nevertheless, it is an important finding that the policy measures were able to effectively target lending growth in particular housing lending segments, especially since similarly targeted measures have not been widely implemented globally.

Looking at the dynamics of the adjustment, the first quarter after the policy announcements is associated with a significant and negative effect on the growth of total new loans, as well as new owner-occupier and investor loans. This suggests that banks tend to respond immediately to such policies, according to the baseline specification. Interestingly, for investor loans only, the effectiveness of the policy measures in terms of the reduction in new lending growth seems to strengthen over time in the baseline specification, with the policy impact estimated to be larger for the third and fourth quarters after the announcements than for the first and second quarters.

This pattern may reflect the time taken for lending institutions to set up processes to reduce lending growth in the targeted segment. For example, in the quarter after the announcement was made, banks may have attempted to slow all

[3] According to data published by the ABS on housing lending; ABS catalogue number 5609.12.

[4] These figures abstract from dynamics captured in the lagged dependent variables, which have similar estimates across the different dependent variables. The interpretation of the policy effects is based on the baseline specification as there is no real economic interpretation of the policy effects on their own in the extended specification, which interacts the policy effect with bank characteristics.

types of lending while they sought ways to distinguish between lending types. Then, in subsequent quarters, institutions may have managed to slow new lending specifically in those targeted segments, which could have led to much larger declines in the growth rate of new lending in the targeted lending segments in the third and fourth quarters after the announcements, while other lending types were no longer constrained in the later quarters.

One of the observed ways that banks responded to the measures and actively sought to reduce demand for investor housing loans was by setting higher lending rates on their investor mortgage products relative to owner-occupier mortgages. However, consistent with the above dynamics, this differential pricing was only implemented with a six-month lag from the date of the first policy announcement. APRA also issued a follow-up statement six months after the first policy announcement which may have incited a stronger response from ADIs at this time. In contrast, differential mortgage pricing was applied by many ADIs immediately after the second policy announcement.

The methodology used in this paper identifies the *change* in policy setting as the policy shock that affects lending growth over the subsequent four quarters. However, it is possible that the effect of the policy measures was ongoing during the entire period that the benchmarks for lending growth remained in force. For example, the first policy measure was announced in December 2014 and remained in place until July 2018, while the second was announced in March 2017 and remained in place until the end of 2018. Of note, the second policy measure was announced when the first benchmark on investor credit growth was still in place. Therefore, further analysis may be required to ensure that the estimated effect of the second policy measure is not affected by its interaction with the first measure.

## 5.2 Interpretation of control factors

The approach and specification used in this paper assumes that bank-specific characteristics and macroeconomic factors can affect the supply of, or demand for, loans. Results from these regressions on Australian bank data imply that it is important to control for bank characteristics, as well as for macroeconomic factors, as these can affect the growth in new lending at a bank over time. In particular:

- The size of the bank is negatively associated with the growth rate of new lending in the following quarter, suggesting that banks with higher assets in a particular quarter are likely to have smaller percentage changes in loan growth in the following quarter. This could represent a loan growth rate management strategy of banks, or simply reflect a concave growth function.
- A bank's liquidity ratio is negatively associated with the growth rate of new lending in the following quarter, suggesting that banks tend to slow their lending growth after an increase in their liquidity ratio. This result raises the question of whether there remains some residual endogeneity; if a bank shifts towards holding more liquid assets, this would tend to involve a relative shift away from loans.
- The capital ratio is not a significant determinant of lending growth, while the funding ratio has a positive but insignificant impact on lending growth. These results suggest that banks' decisions on lending growth for the following quarter are not materially driven by their holdings of (higher-quality) capital or by their share of deposit funding. The former may be because during the period studied,

banks generally had sufficient Tier 1 capital to meet required minimums with a buffer, so that capital was not a constraint on lending. Capital ratios may have more of an effect on lending when they are more binding; that is, when a bank is closer to the regulatory minimum.

- Positive GDP growth is associated with a statistically significant increase in lending growth, while the relationship between changes in the RBA's policy target rate and changes in the growth rate of new lending is unclear depending on lending type and model specification. The RBA's policy target rate was declining over the entire sample, as monetary policy aimed to provide expansionary conditions over the period studied.
- The exchange rate is estimated to have no effect on lending growth. The lack of explanatory power of the TWI may reflect the domestic focus of mortgage lending and mortgage lenders and the use of hedging to remove exchange rate risk involved in debt funding.

One macroeconomic factor that is not explicitly controlled for in this model is housing price growth. It may be the case that housing price growth is a determinant, particularly for investors, of demand for property and hence bank finance at a particular time. Including a lag of this variable may increase the explanatory power of the model.

## 5.3 Role of interactions with bank characteristics

The extended specification including the interaction between the policy variable and bank-specific characteristics provides information on whether bank responses to the policy measures differ according to certain bank characteristics. I find that bank characteristics did affect how responsive banks were to the policies. Given that the policy actions in Australia were targeted at reducing the growth rate of particular lending types to a threshold limit, I expect that the bank characteristic most likely to affect the response to these policy actions would be the bank's lending growth rate prior to the policy announcement (rather than the bank's capital, funding or liquidity ratios). In contrast, if the policy action resulted in higher risk weights for mortgage lending, then I would expect that a bank's capital ratio might affect how responsive a particular bank is to the policy change.

Coefficients on the interaction terms should be interpreted as differences in the effect of the policy on a given bank (rather than across banks) as the relevant bank characteristic variable changes. I refrain from interpreting the policy effect on its own in the specifications that include the interaction terms, because it corresponds to a bank with zero assets, capital ratio, funding ratio and liquidity ratio. Generalised conclusions from the regressions including interactions with bank characteristics include:

- As a bank's size increases, it tends to reduce its lending growth rate by less after the policy announcements. This is most clearly the case for investor housing lending.
- As a bank's capital ratio increases, it tends to decrease lending growth to owner-occupiers by more after the policy announcement. However, the opposite is found for lending growth to investors.

- As a bank's deposit funding ratio increases, it tends to reduce lending growth rates by less in response to the announcements, with this effect more prominent for investor lending.
- As a bank's liquidity ratio increases, it tends to report larger decreases in lending growth rates.

When we focus on the effect of bank characteristics on the responsiveness to the policy measures of investor lending, which was the more targeted lending type, the overall conclusion is that an individual bank responded more to the policy changes when it was smaller (in terms of total assets), had a lower capital ratio, a lower funding ratio or a higher liquidity ratio. I find that the total effect of the bank characteristic interaction with the policy variable is statistically significant in the regressions for investor lending, but rarely for owner-occupier lending.

## 5.4 Interaction of housing policy with the monetary policy cycle and business cycle

Tables 3 and 4 in the Annex report results from the specifications considering the interaction of housing policy with the monetary policy cycle and business cycle. I find that neither the monetary policy cycle nor the business cycle has a significant effect on the policy response. This may reflect the relative lack of variation in these cycles in the year after the policy announcements. The monetary policy cycle was at all times in an easing phase, while the business cycle was at all times in an expansion phase. Moreover, following the first policy announcement the RBA cash rate was only adjusted four times, to be 1 percentage point lower by the end of 2018 compared with the end of 2014. Similarly, quarterly growth in GDP was quite steady during this period.

While the coefficients are not statistically significant, the signs of the coefficients suggest that bank responses to policy announcements would be stronger when monetary policy is being tightened or GDP growth is weaker. This tentatively suggests that macroprudential interventions may need to be calibrated more conservatively when monetary policy is being tightened at the same time or GDP growth is weakening. However, it would require further testing and refinement to produce robust conclusions for Australia.

# 6. Conclusions

This paper assesses the effects of regulatory measures implemented in Australia to address the growth of higher-risk types of housing lending. The specific measures considered in this paper are benchmarks on the rate of new investor lending growth and on the share of new interest-only lending. Following the approach suggested by the BIS, I use a bank-level dynamic panel regression to investigate the effects of these policies, controlling for bank-specific factors as well as macroeconomic factors that can affect lending supply and demand.

I find that the policy measures had a negative effect on the rate of growth in new lending and that this reduction in growth was larger for investor lending than for owner-occupier lending. As the policy measures implemented in Australia directly or indirectly targeted the growth of investor lending, the results suggest that the measures were effective. I also find that bank characteristics, such as the size of the institution and its deposit funding ratio, can affect banks' response to policy measures.

Findings from this paper are consistent with other published research finding that various types of macroprudential policy around the world have been effective in reducing credit growth and its associated risks.

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# Annex: Tables

**Table 1**

**Effects of housing lending policies on housing loan growth in Australia**

| Dependent variable: Quarterly change in total new housing loan approvals | | |
|---|---|---|
| | Baseline specification | Interaction with bank characteristics |
| ***Policy effects*** | | |
| *Σ(four quarters)* | *-0.16*** | *-1.63*** |
| quarter t+1 | -0.06** | -0.85** |
| quarter t+2 | -0.01 | -0.40 |
| quarter t+3 | -0.04 | -1.43*** |
| quarter t+4 | -0.05 | 1.06** |
| Sum Lending lags | -0.31*** | -0.29*** |
| *Bank controls* | | |
| Size | -0.08* | -0.11** |
| Capital ratio | -0.00 | 0.00 |
| Funding ratio | 0.20 | 0.18 |
| Liquidity ratio | -0.01** | -0.01*** |
| *Macroeconomic controls* | | |
| Cashrate | 0.01 | -0.01 |
| GDP | 0.07** | 0.06** |
| TWI | 0.00 | -0.00 |
| *Interaction of policy variable with bank characteristics* | | |
| ΔPolicy x Size | | |
| *Σ(four quarters)* | | *0.05* |
| quarter t+1 | | 0.03** |
| quarter t+2 | | 0.02 |
| quarter t+3 | | 0.04*** |
| quarter t+4 | | -0.04** |
| ΔPolicy x Capital ratio | | |
| *Σ(four quarters)* | | *-0.01* |
| quarter t+1 | | 0.01 |
| quarter t+2 | | -0.01*** |
| quarter t+3 | | 0.01** |
| quarter t+4 | | -0.01 |
| ΔPolicy x Funding ratio | | |
| *Σ(four quarters)* | | *0.78**** |
| quarter t+1 | | 0.12 |
| quarter t+2 | | 0.26** |
| quarter t+3 | | 0.34*** |
| quarter t+4 | | 0.06 |
| ΔPolicy x Liquidity ratio | | |
| *Σ(four quarters)* | | *-0.03**** |
| quarter t+1 | | 0.00 |
| quarter t+2 | | -0.01* |
| quarter t+3 | | -0.01* |
| quarter t+4 | | -0.02*** |
| Seasonal dummies | Yes | Yes |
| Bank fixed effects | Yes | Yes |
| Sample period | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 |
| ADIs | 28 | 28 |
| Observations | 753 | 707 |

*, ** and *** represent statistical significance at the 10, 5 and 1 per cent level.

## Table 2

**Effects of housing lending policies on housing loan growth in Australia**

| | Dependent variable: Quarterly change in new **owner-occupier** loan approvals | | Dependent variable: Quarterly change in new **investor** loan approvals | |
|---|---|---|---|---|
| | Baseline specification | Interaction with bank characteristics | Baseline specification | Interaction with bank characteristics |
| ***Policy effects*** | | | | |
| *Σ(four quarters)* | *-0.02* | *-1.16* | *-0.70**** | *-8.84**** |
| quarter t+1 | -0.04* | -0.67* | -0.14* | -3.15** |
| quarter t+2 | 0.01 | -0.13 | -0.16* | -2.28** |
| quarter t+3 | 0.01 | -1.32*** | -0.22*** | -3.45*** |
| quarter t+4 | 0.00 | 0.96 | -0.22*** | 0.04 |
| Sum Lending lags | -0.33*** | -0.32*** | -0.26*** | -0.24*** |
| *Bank controls* | | | | |
| Size | -0.08 | -0.12* | -0.00 | 0.01 |
| Capital ratio | -0.00 | -0.00 | 0.01 | 0.01 |
| Funding ratio | 0.17 | 0.16 | 0.25 | 0.12 |
| Liquidity ratio | -0.01*** | -0.01*** | 0.00 | 0.00 |
| *Macroeconomic controls* | | | | |
| Cashrate | -0.02 | -0.05 | 0.07* | 0.05 |
| GDP | 0.08*** | 0.07** | 0.08* | 0.06 |
| TWI | 0.00 | 0.00 | -0.00 | -0.00 |
| *Interaction of policy variable with bank characteristics* | | | | |
| ΔPolicy x Size | | | | |
| *Σ(four quarters)* | | *0.05* | | *0.22*** |
| quarter t+1 | | 0.02** | | 0.03** |
| quarter t+2 | | 0.01 | | 0.02 |
| quarter t+3 | | 0.04*** | | 0.04*** |
| quarter t+4 | | -0.03 | | -0.04** |
| ΔPolicy x Capital ratio | | | | |
| *Σ(four quarters)* | | *-0.02**** | | *0.06**** |
| quarter t+1 | | 0.00 | | 0.02** |
| quarter t+2 | | -0.01*** | | -0.00 |
| quarter t+3 | | 0.00 | | 0.03*** |
| quarter t+4 | | -0.01 | | 0.01 |
| ΔPolicy x Funding ratio | | | | |
| *Σ(four quarters)* | | 0.51 | | *3.38**** |
| quarter t+1 | | -0.05 | | 1.22*** |
| quarter t+2 | | 0.21 | | 0.78*** |
| quarter t+3 | | 0.29*** | | 0.62*** |
| quarter t+4 | | 0.06 | | 0.77 |
| ΔPolicy x Liquidity ratio | | | | |
| *Σ(four quarters)* | | -0.01 | | *-0.09*** |
| quarter t+1 | | 0.00 | | 0.00 |
| quarter t+2 | | -0.01 | | -0.00 |
| quarter t+3 | | 0.00 | | -0.02* |
| quarter t+4 | | -0.01 | | -0.06*** |
| Seasonal dummies | Yes | Yes | Yes | Yes |
| Bank fixed effects | Yes | Yes | Yes | Yes |
| Sample period | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 |
| ADIs | 28 | 28 | 28 | 28 |
| Observations | 753 | 752 | 707 | 706 |

*, ** and *** represent statistical significance at the 10, 5 and 1 per cent level.

## Table 3

**Effects of housing lending policies on housing loan growth in Australia**

Dependent variable: Quarterly change in total new housing loan approvals

| | Baseline specification | Interaction with monetary policy cycle | Interaction with business cycle |
|---|---|---|---|
| ***Policy effects*** | | | |
| *Σ(four quarters)* | *-0.16*** | *-0.13* | *-0.18*** |
| quarter t+1 | -0.06** | -0.04 | -0.06** |
| quarter t+2 | -0.01 | -0.01 | -0.02 |
| quarter t+3 | -0.04 | -0.03 | -0.05* |
| quarter t+4 | -0.05 | -0.04 | -0.05 |
| Sum Lending lags | -0.31*** | -0.32*** | -0.31*** |
| *Bank controls* | | | |
| Size | -0.08* | -0.11** | -0.09* |
| Capital ratio | -0.00 | -0.00 | 0.00 |
| Funding ratio | 0.20 | 0.16 | 0.19 |
| Liquidity ratio | -0.01** | -0.01** | -0.01** |
| *Macroeconomic controls* | | | |
| Cashrate | 0.01 | -0.00 | -0.02 |
| GDP | 0.07** | 0.08** | 0.08** |
| TWI | 0.00 | 0.00 | -0.00 |
| *Interaction with monetary policy cycle* | | | |
| ΔPolicy x cashrate | | | |
| *Σ(four quarters)* | | *-0.93* | |
| quarter t+2 | | -0.23 | |
| quarter t+4 | | -0.71 | |
| ΔCashrate | | | |
| *Σ(four quarters)* | | *0.07* | |
| quarter t+1 | | 0.02 | |
| quarter t+2 | | 0.01 | |
| quarter t+3 | | 0.01 | |
| quarter t+4 | | 0.02 | |
| *Interaction with business cycle* | | | |
| ΔPolicy x ΔGDP | | | |
| *Σ(four quarters)* | | | *0.09* |
| quarter t+2 | | | 0.04 |
| quarter t+4 | | | 0.06 |
| ΔGDP | | | |
| *Σ(four quarters)* | | | *-0.06* |
| quarter t+1 | | | -0.01 |
| quarter t+2 | | | -0.01 |
| quarter t+3 | | | -0.02 |
| quarter t+4 | | | -0.02 |
| Seasonal dummies | Yes | Yes | Yes |
| Bank fixed effects | Yes | Yes | Yes |
| Sample period | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 |
| ADIs | 28 | 28 | 28 |
| Observations | 753 | 753 | 753 |

*, ** and *** represent statistical significance at the 10, 5 and 1 per cent level.

## Table 4

**Effects of housing lending policies on housing loan growth in Australia**

| | Dependent variable: Quarterly change in new **owner-occupier** loan approvals | | | Dependent variable: Quarterly change in new **investor** loan approvals | | |
|---|---|---|---|---|---|---|
| | Baseline specification | Interaction with monetary policy cycle | Interaction with business cycle | Baseline specification | Interaction with monetary policy cycle | Interaction with business cycle |
| ***Policy effects*** | | | | | | |
| *Σ(four quarters)* | *-0.02* | *0.02* | *-0.03* | *-0.70**** | *-0.70**** | *-0.74**** |
| quarter t+1 | -0.04* | -0.03 | -0.05 | -0.14* | -0.13* | -0.16** |
| quarter t+2 | 0.01 | 0.01 | 0.01 | -0.16* | -0.13* | -0.14* |
| quarter t+3 | 0.01 | 0.02 | 0.00 | -0.22*** | 0.23*** | -0.22*** |
| quarter t+4 | 0.00 | 0.01 | 0.00 | -0.22*** | -0.21*** | -0.21*** |
| Sum Lending lags | -0.33*** | -0.34*** | -0.33*** | -0.26*** | -0.26*** | -0.26*** |
| *Bank controls* | | | | | | |
| Size | -0.08 | -0.11 | -0.09* | -0.00 | -0.02 | -0.00 |
| Capital ratio | -0.00 | -0.00 | -0.00 | 0.01 | 0.01 | 0.01 |
| Funding ratio | 0.17 | 0.12 | 0.17 | 0.25 | 0.24 | 0.24 |
| Liquidity ratio | -0.01*** | -0.01*** | -0.01*** | 0.00 | 0.00 | 0.00 |
| *Macroeconomic controls* | | | | | | |
| Cashrate | -0.02 | -0.03 | -0.05 | 0.07* | 0.17* | 0.03 |
| GDP | 0.08*** | 0.08** | 0.08*** | 0.08* | 0.08* | 0.07 |
| TWI | 0.00 | 0.00 | 0.00 | -0.00 | -0.00 | -0.00 |
| Interaction with monetary policy cycle | | | | | | |
| ΔPolicy x cashrate | | | | | | |
| *Σ(four quarters)* | | *-0.90* | | | *-0.27* | |
| quarter t+2 | | -0.25 | | | -0.03 | |
| quarter t+4 | | -0.65 | | | -0.24 | |
| ΔCashrate | | | | | | |
| *Σ(four quarters)* | | *0.09* | | | *-0.04* | |
| quarter t+1 | | 0.01 | | | -0.10 | |
| quarter t+2 | | 0.00 | | | 0.06 | |
| quarter t+3 | | 0.04 | | | -0.01 | |
| quarter t+4 | | 0.02 | | | 0.02 | |
| Interaction with business cycle | | | | | | |
| ΔPolicy x ΔGDP | | | | | | |
| *Σ(four quarters)* | | | 0.09 | | | *0.02* |
| quarter t+2 | | | 0.02 | | | 0.01 |
| quarter t+4 | | | 0.07 | | | 0.01 |
| ΔGDP | | | | | | |
| *Σ(four quarters)* | | | -0.05 | | | *-0.11* |
| quarter t+1 | | | -0.01 | | | -0.06* |
| quarter t+2 | | | -0.00 | | | -0.02 |
| quarter t+3 | | | -0.03 | | | 0.00 |
| quarter t+4 | | | -0.02 | | | -0.04 |
| Seasonal dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Sample period | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 | 2008Q1 – 2018Q4 |
| ADIs | 28 | 28 | 28 | 28 | 28 | 28 |
| Observations | 753 | 753 | 753 | 752 | 752 | 752 |

*, ** and *** represent statistical significance at the 10, 5 and 1 per cent level.