The effectiveness of loan-to-value ratio policy and its interaction with monetary policy in New Zealand: an empirical analysis using supervisory bank-level data[1]

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Abstract

In this paper, we quantify the effect of loan-to-value ratio (LVR) policy, as implemented in New Zealand between 2013 and 2016, in containing mortgage loan growth and credit risk at the bank level. We use the empirical strategy proposed by the BIS and find first that the effect of the LVR policy has, on average, a 2 percentage point negative impact on housing loan growth in the six months after implementation. Controlling for bank characteristics, we find that larger banks and more stably funded banks are less affected by the LVR policy. In addition, we also find evidence that the LVR policy has a statistically significant negative impact on the non-performing loan ratio, although the economic magnitude is rather small. These results suggest that the LVR policy achieved the intended effect of restricting risky lending and containing credit risk of small and less stably funded banks.

1. Introduction

Macroprudential policy is intended to reduce vulnerabilities in the banking and household sectors, which if left unchecked could worsen the impact of adverse shocks on the financial system and the real economy. This paper contributes to the growing body of empirical research on the effect of macroprudential policy internationally, by analysing the impact of loan-to-value ratio (LVR) restrictions in New Zealand. To fully capture the reaction of banks to such regulatory changes, we use a combination of prudential supervisory data and macroeconomic controls to construct a panel data set of banks, covering the period from 2010 to 2018.

As shown in Figure 1, in response to financial stability risks associated with rapidly rising house prices, the Reserve Bank of New Zealand (RBNZ) implemented three rounds of restrictions on high-LVR lending between 2013 and 2016. The first round of LVR policy was imposed nationwide in October 2013, with the goal of helping to "slow the rate of housing-related credit growth and house price inflation, thereby reducing the risk of a substantial downward correction in house prices that would

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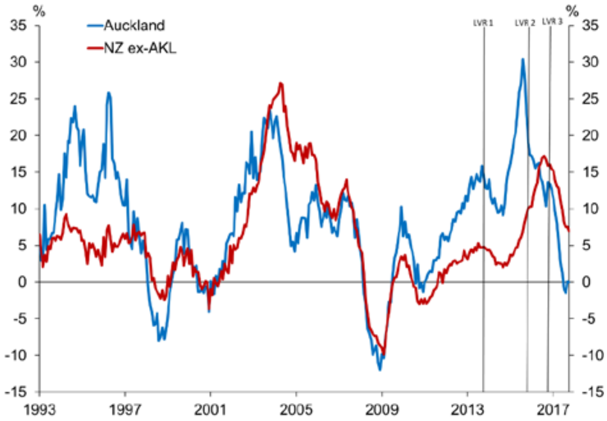
damage the financial sector and the broader economy" (Wheeler (2013)). This policy had a notable effect on house price inflation in both Auckland and the rest of New Zealand for around six months. Subsequent rounds of LVR policy changes were implemented in November 2015 and October 2016, and were more focused on regions and borrower groups viewed as being of particular risk to financial stability.[3] A recent regulatory review by the Reserve Bank of its LVR policy shows that the policy has been effective in reducing house price inflation and credit growth, and in improving the resilience of the banking system (Lu (2019)).

House price inflation in Auckland and the rest of New Zealand — Figure 1



Sources: RBNZ; REINZ.

In this paper we quantify the effect of LVR policy, as implemented in New Zealand between 2013 and 2016, in containing mortgage loan growth and credit risk at the bank level. We use the empirical strategy proposed by the BIS and find the following results. First, the LVR policy, on average, reduced housing loan growth by 2 percentage points over the two quarters following each policy announcement. Controlling for bank characteristics, we find that larger banks and more stably funded banks are less affected by the LVR policy. These results together show that LVR policy achieves the intended effect of restricting risky lending by small and less stably funded banks. Second, both the LVR policy and monetary policy have significant negative effects on mortgage lending growth. However, when they are used in the same direction, the policy effects are reinforced. Third, controlling for business and financial cycles, we find that both business cycle booms and growth of the credit-to-GDP gap weaken the LVR policy's effect on loan growth. This result suggests that the impact of the LVR policy is mitigated to a large extent by prior growth in buyers' existing housing equity in the upturn phase of the business cycle. In addition, we also study the effect of the LVR policy on non-performing loans (NPLs). We find evidence that the LVR policy has a significant negative impact on the NPL ratio, although the magnitude is rather small. The long-run elasticity of the NPL ratio with respect to the LVR policy is about a 0.16 percentage point reduction of the mean NPL ratio.

The remainder of the paper is organised as follows. Section 2 discusses our data and the methodology employed. Section 3 presents the empirical findings. Finally, we conclude and provide implications for future policy in Section 4.

[3] For more details on the LVR policy in New Zealand, see Armstrong et al (2019).

2. Data

The analysis in this paper uses supervisory data at the individual bank level, macroeconomic data, and regulatory data on macroprudential policy. We use a quarterly panel data set on 15 banks covering the period between the March quarters of 2010 and 2018.

Detailed supervisory data related to individual banks' balance sheets are confidential. Therefore, we do not disclose summary statistics on individual bank data. Within our supervisory data set, real housing credit, real consumer credit to households and the NPL ratio serve primarily as dependent variables for our analysis, while the remainder of the bank data serve as controls. In the suite of bank controls, the total asset size captures the scale of the bank, while the Tier 1 capital ratio, the liquidity ratio and the deposit-to-liability ratio capture the financial resilience of the bank. Not all supervisory data are available for the whole sample period, because not all the banks were operating for the entire sample period.

We use a number of macroeconomic variables as control variables to help isolate the impact of macroprudential policy changes on banks. These macroeconomic controls are summarised in Table 2 and are relatively intuitive. Among these, one of the less intuitive series is the credit-to-GDP gap, which expresses the deviation in the credit-to-GDP ratio from its long-term trend in percentage terms, and is intended to capture the stage of the financial credit cycle.

Finally, we have a set of policy dummies, including the signalling of macroprudential policy changes, the adjustment to macroprudential policy, and the adjustment to baseline capital requirements. For each series, the dummy takes a value of 1 if the Reserve Bank tightens the LVR policy in the quarter, or signals the imminent tightening of policy. The dummy takes the value of zero if there are no adjustments to policy or no signals, and –1 if the policy is loosened or is signalled to loosen.

We removed around half a dozen data points in banks' prudential indicators for analytical purposes, because we consider these to be outliers. We did not consider any macroeconomic data to be outliers. To qualify as an outlier under our method, a data point must satisfy three independent criteria. First, the data point must be the start of a time series or be adjacent to another outlier, which means that only the relatively early data points of a time series will be outliers. Second, the data point must be associated with an absolute percentage change that is over five times the average absolute percentage change in the series. Last, the value of the data point in level terms must be at least five times the average. The data pre-processing is necessary, especially for the data of small banks, which tend to be volatile immediately after they come into existence. Such volatility may reflect the fact that these lenders have not yet established a robust reporting system or lending strategy. Our methods help to deal with that issue, but also ensure that idiosyncratic shocks that have prudential effects will generally be reflected in the analysis.

3. Empirical results

In this section, we report our empirical results from the benchmark specifications.[4] First, we discuss findings on the effects of LVR restrictions on mortgage lending. Second, we summarise empirical results on bank credit risks.

3.1 Impact on mortgage lending to households

In Tables 2–3, we report empirical results regarding the effects of the LVR policy on the growth of mortgage lending. The dependent variable is the quarterly change in mortgage loans extended by bank b to households in real terms ($\Delta log\ Loans$). In Table 2, we run the benchmark regression and add interaction terms between the macroprudential policy indicator and bank characteristics variables to control for the differential effects on the type of banks. In column I, we find that the lagged terms of the dependent variable are highly significant, but not very persistent. The estimate (0.228) indicates that the effect of the LVR policy on mortgage lending is likely to die out in about two quarters. The coefficient on $\sum_{j=0}^{k} \beta_j\ \Delta MaP_{t-j}$ is the main estimate of interest. It summarises the overall policy effect on mortgage lending. As expected, the estimate suggests that the LVR policy, on average, reduces housing loan growth by 2 percentage points in the following two quarters. Among the macroeconomic variables, GDP growth appears to have a positive effect on loan growth, while the real interest rate has a negative effect.

In column II of Table 2, we further control for the types of bank by interacting the LVR indicator with the bank characteristics variables. We find that larger banks and more stably funded banks are less affected by the LVR policy. The former is measured by real total assets, the latter by the ratio of non-market funding over total liabilities. This finding confirms some of insights from the bank lending channel literature. In order to discriminate between loan supply and loan demand movements, the literature has focused on cross-sectional differences between banks.[5] This strategy relies on the hypothesis that certain bank-specific characteristics (for example, size, liquidity, the deposit-to-total funding ratio and capitalisation) influence only loan supply movements, while a bank's loan demand is independent of these characteristics. Broadly speaking, this approach assumes that after a macroprudential tightening, the ability to shield loan portfolios is different among banks. In particular, small or less capitalised banks, which suffer a high degree of informational friction in financial markets, face a higher cost of raising non-secured deposits and are more constrained in increasing their lending.

In column III of Table 2, we further investigate the asymmetric effects of macroprudential tools, which are documented by Kuttner and Shim (2012, 2016) and Bruno et al (2015). However, in New Zealand's context, we have only one loosening policy change so far. Therefore, the empirical findings in the first two columns of Table 2 are mainly driven by the tightening changes in the LVR. This is confirmed by the estimates in column III, where we separate negative from positive policy changes. Our

4 For the detailed specification, refer to the paper by Cantú et al in this volume.

5 For a review of the literature on the distributional effects of the bank lending channel, see, amongst others, Gambacorta (2005).

benchmark findings largely remain the same for policy tightening, while coefficients on loosening policy are insignificant.

Table 3 studies how is the effect of macroprudential tools affected by monetary policy conditions, and economic cycles. We can test this hypothesis by introducing additional interaction terms, which combine macroprudential dummies and monetary policy conditions *r* (real interest rate). The goal of this test is to verify the effectiveness of macroprudential tools when monetary policy pushes in the same or opposite direction (see Bruno et al (2015) for details). The test is on the overall significance of $\sum_{j=0}^{k} \rho_j$. The empirical finding in column (I) and (II) confirms that both the LVR policy and monetary policy have significant negative effects on mortgage lending growth. However, when they are used in the same direction, the policy effects are reinforced.

In column (III) - (VI), we ask whether the effects of macroprudential policies vary over the business or financial cycle. We test this hypothesis by introducing additional interaction terms which combine macroprudential dummies and real GDP growth (or GDP gap), as a measure of the business cycle; or the credit-to-GDP gap (the difference between the credit-to-GDP ratio and its trend),[6] as a measure of the financial cycle. The goal of this test is to verify the possible presence of endogeneity between real GDP and macroprudential tools: their effect may be higher when GDP is high or vice versa. The test is on the overall significance of the sum of interaction terms. Overall, we find that controlling for business cycles, the boom phase is found to weaken the LVR policy's effect on loan growth. The magnitude seems quite large compared to the effect of LVR policy. This result may suggest that the impact of the LVR policy is mitigated to a large extent by prior growth in buyers' existing housing equity, which tends to be correlated with the upturn phase of the business cycle. Controlling for financial cycles, on the other hand, shows that the LVR policy's effect is also weakened by the growth of the credit-to-GDP gap. The magnitude of the offsetting effect, however, is much smaller than the business cycle effect. This result is not surprising because, in New Zealand, GDP growth is highly correlated with house price growth. Housing cycles synchronise more with the business cycle than with credit cycles. Because the effect of the LVR policy crucially depends on how house prices develop during the policy impact periods, rising house prices during the business cycle boom phase help borrowers to evade LVR restrictions and therefore weaken the policy effect on bank lending.

3.2 Effects on bank risk (non-performing loans)

Ultimately, macroprudential policies are designed to contain systemic risk. By using macroprudential tools, policymakers aim to limit banks' risk-taking and the probability of the occurrence of a financial crisis. This means that, ideally, we should be interested in how macroprudential policies influence systemic risk. Measuring systemic risk is, however, difficult and still at an early stage. Alternatively, a compromise could be to evaluate how macroprudential tools have an impact on a specific measure of bank risk such as the ratio of NPLs over total assets.

[6] In line with the Basel III guidelines for the countercyclical capital buffer, credit-to-GDP gaps are derived as the deviations of the credit-to-GDP ratios from their one-sided (real-time) long-term trend. Trends are calculated using a one-sided Hodrick-Prescott filter with a smoothing factor (lambda) of 400,000, taking account only of information up to each point in time. For more details, see Drehmann (2013). These credit-to-GDP gap series are available from the BIS website and also upon request for many countries.

In Tables 4, we report empirical results regarding the effects of the LVR policy on NPLs. Overall, we find evidence that the LVR policy has a significant negative impact on the NPL ratio, although the magnitude is rather small (columns (I) and (II)). Given the logit transformation used in the regression equation, we have to convert the estimates into economic terms. Based on the estimates shown in Table 4, we calculate the long-run elasticity of NPLs with respect to the LVR policy to be about a 0.16 percentage point reduction of the mean NPL ratio.[7] In our sample, the mean of the LVR ratio is about 1%. Our estimate suggests that the LVR policy implemented in New Zealand will bring the long-run NPL ratio down to 0.84%. In columns (III)-(VI), we also find a significant role of the business cycle in dampening the effect of the LVR policy on the NPL ratio. A possible explanation of this result is that in the short run, recessions coincide with housing downturns, which causes both a loosening in the LVR policy and increasing NPLs.

4. Policy implications and conclusion

This paper contributes to the international policy debate on the effectiveness of macroprudential policies. We use New Zealand bank-level data to evaluate the effect of loan-to-value ratio (LVR) restrictions on mortgage loan growth and non-performing loans.

We draw a number of lessons based on our empirical results for the conduct of borrower-based macroprudential policy, including the LVR instrument. We do not generalise these implications to bank-based macroprudential tools, for example a countercyclical capital buffer.

Our finding that a tightening in the LVR restrictions does have a significant effect in restraining mortgage lending provides policymakers with greater confidence in the tool's effectiveness. There has been some uncertainty about whether there is a major restrictive impact of the LVR policy on mortgage credit, because a fall in borrower LVRs will reduce the minimum amount of capital banks need to hold against their mortgage assets under the capital requirement regime in New Zealand, an effect which permits banks to lend more. Our findings eliminate this uncertainty by showing that borrower-based policy can effectively dampen the credit cycle, and supports the conclusion of a recent New Zealand study (Bloor and Lu (2019)) that the LVR policy has improved the resilience of the banking system and reduced risky lending.

That said, the LVR restrictions may need to be tightened on a regular basis to maintain the policy's effectiveness during the upswing of the business and credit cycles. This is because, first, the impact of each LVR tightening on mortgage lending growth is temporary, largely limited to the two quarters after the policy change. Second, the LVR policy's effectiveness in restraining credit is weaker in the boom phase of an economic cycle, because house price inflation tends to be strong during this time and boost the housing equity of borrowers, increasing their access to credit.

7 The long-run elasticity of NPLs with respect to LVR policy is given by the following equation: $\frac{\Delta NPL}{\overline{NPL}} = \frac{\theta}{1+\widetilde{NPL}}$, where $\theta = \frac{\sum_{j=0}^{k}\widehat{\beta}_k}{\sum_{j=1}^{k}\widehat{\gamma}_j}$, $\overline{NPL} = mean(NPL\,ratio)$ and $\widetilde{NPL} = mean(NPL\,ratio/(1 - NPL\,ratio))$. For details, see Chavan and Gambacorta (2018).

Fortunately, the effect on the credit cycle of an LVR policy change would be reinforced by monetary policy moving in the same direction. This means that in a typical economic upswing associated with increasing credit demand, a tightening in monetary policy to address rising inflationary pressures can also be expected to support the LVR policy in dampening the credit cycle. However, in the less common case where the credit cycle and the inflation outlook move in opposite directions, monetary policy may come into tension with macroprudential policy, and decision-making by central bankers will need to consider such trade-offs.

Finally, the LVR policy should be complemented by a debt-service-to-income (DSTI) ratio tool if financial stability risks are high. Our results suggest that the LVR policy has a small impact in reducing the NPL ratio, possibly because the need to meet the LVR requirement has reduced the debt amount, and therefore the serviceability burdens of some borrowers. The main benefit of the LVR policy for bank resilience is in ensuring that borrowers can withstand a fall in house prices without negative equity, and that in the case of borrower distress, banks can recoup the full loan value in a mortgagee sale. The relatively small effect of the LVR policy on the NPL ratio suggests that, if vulnerabilities in the housing market are high, the LVR policy should be complemented with other macroprudential tools that more effectively reduce serviceability risks and the NPL ratio, such as a DSTI instrument. The combination of the two instruments would be more effective in boosting the resilience of both households and banks than either tool deployed alone.

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Annex: Tables

Summary of variables in the bank panel data set — Table 1

Variable	Purpose	Unit	Source
Housing mortgage lending	Dependent variable to model banks' willingness to lend	NZ$ m	Supervisory reporting
Consumer lending		NZ$ m	Supervisory reporting
Real asset size	Captures scale of banks	NZ$ m	Supervisory reporting
Tier 1 capital ratio	Captures resilience of banks	%	Supervisory reporting
Liquidity ratio		%	Supervisory reporting
Deposit to liabilities ratio		%	Supervisory reporting
NPL ratio	Captures bank asset quality	%	Supervisory reporting
Macroprudential tightening	Main independent variables for capturing the impact on banks of regulatory changes	Dummy	RBNZ
Macroprudential signalling		Dummy	RBNZ
Baseline capital tightening		Dummy	RBNZ
Production GDP	Macroeconomic controls for isolating the impact on banks of macroprudential policy	NZ$ m	Statistics NZ
Official cash rate		%	RBNZ
90-day bank bill rate		%	RBNZ
Trade-weighted real exchange rate		Index	RBNZ
Credit-to-GDP gap		%	RBNZ calculations

Effects of macroprudential policies on household loans: aggregate macroprudential index

Table 2

	Dependent variable: quarterly change in lending to households in real terms ($\Delta log\ Loans_{bt}$)		
	(I)	(II)	(III)
$\sum_{j=1}^{k} \gamma_j\ \Delta log\ Loans_{bt-j}$	0.228*** (0.085)	0.227** (0.094)	0.231*** (0.072)
$\sum_{j=0}^{k} \beta_j\ \Delta MaP_{t-j}$	–0.021** (0.001)	–0.307* (0.177)	
$\sum_{j=0}^{k} \beta_j\ \Delta MaP\_easy_{t-j}$			–0.012 (0.011)
$\sum_{j=0}^{k} \beta_j\ \Delta MaP\_tight_{t-j}$			–0.020** (0.010)
$SIZE_{t-1}$	0.017 (0.011)	0.015 (0.009)	0.015 (0.018)
LIQ_{t-1}	0.434 (0.292)	0.406 (0.275)	0.437*** (0.125)
CAP_{t-1}	–0.099 (0.221)	–0.101 (0.256)	–0.103 (0.186)
DEP_{t-1}	0.051 (0.082)	0.072 (0.102)	0.049 (0.064)
$\sum_{j=0}^{k} \delta_j\ \Delta MaP_{t-j} * SIZE_{t-1}$		0.021* (0.011)	
$\sum_{j=0}^{k} \delta_j\ \Delta MaP_{t-j} * LIQ_{t-1}$		–0.095 (0.142)	
$\sum_{j=0}^{k} \delta_j\ \Delta MaP_{t-j} * CAP_{t-1}$		–0.690 (0.657)	
$\sum_{j=0}^{k} \delta_j\ \Delta MaP_{t-j} * DEP_{t-1}$		0.278** (0.136)	
$\Delta \log GDP_t$	0.685*** (0.179)	0.682*** (0.193)	0.725 (0.477)
$\Delta\ i_t$	–0.000 (0.002)	–0.000 (0.002)	–0.000 (0.003)
$\Delta\ REER_t$	–0.001 (0.001)	–0.001 (0.001)	–0.0004 (0.655)
Observations	234	234	234
Serial correlation test[1]	0.182	0.144	0.182
Hansen test[2]	0.625	0.406	0.631

Sample period: Q1 2010–Q1 2018. Robust standard errors are reported in brackets. The symbols *, ** and *** represent significance levels of 10%, 5% and 1%, respectively.

[1] Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second-order serial correlation. [2] Reports p-values for the null hypothesis that the instruments used are not correlated with the residuals.

Effects of macroprudential policies on household loans: monetary policy conditions and business (credit) cycles

Table 3

	Dependent variable: quarterly change in lending to households in real terms ($\Delta log\ Loans_{bt}$)					
	(I)	(II)	(III)	(IV)	(V)	(VI)
$\sum_{j=1}^{k} \gamma_j\ \Delta log\ Loans_{bt-j}$	0.287***	0.262***	0.224**	0.214**	0.232***	0.214***
	(0.094)	(0.009)	(0.082)	(0.117)	(0.095)	(0.085)
$\sum_{j=0}^{k} \beta_j\ \Delta MaP_{t-j}$	–0.027**	–0.026**	–0.028**	–0.028**	–0.021**	–0.018*
	(0.012)	(0.011)	(0.013)	(0.015)	(0.009)	(0.010)
$\sum_{j=0}^{k} \varphi_j r_{t-j}$	–0.003**	–0.001				
	(0.001)	(0.348)				
$\sum_{j=0}^{k} \rho_j\ \Delta MaP_{t-j} * r_{t-j}$	–0.013*	–0.022**				
	(0.007)	(0.009)				
$\sum_{j=0}^{k} \varphi_j \Delta logGDP_{t-j}$			0.336	0.370		
			(0.429)	(0.447)		
$\sum_{j=0}^{k} \rho_j\ \Delta \mathrm{MaP}_{t-j} * \Delta logGDP_{t-j}$			1.715**	1.692*		
			(0. 920)	(0.988)		
$\sum_{j=0}^{k} \varphi_j \mathrm{Credit}GAP_{t-j}$					0.001	–0.000
					(0.001)	(0.001)
$\sum_{j=0}^{k} \rho_j\ \Delta MaP_{t-j} * \mathrm{Credit}GAP_{t-j}$					0.013***	0.012***
					(0.002)	(0.003)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Other macroeconomic controls	No	Yes	No	Yes	No	Yes
Observations	234	234	234	234	234	234
Serial correlation test[1]	0.166	0.154	0.214	0.208	0.228	0.227
Hansen test[2]	0.573	0.641	0.508	0.533	0.625	0.658

Sample period: Q1 2010–Q1 2018. Robust standard errors are reported in brackets. The symbols *, ** and *** represent significance levels of 10%, 5% and 1%, respectively.

1 Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second-order serial correlation. 2 Reports p-values for the null hypothesis that the instruments used are not correlated with the residuals.

Effects of macroprudential policies on non-performing loans: Table 4

	Dependent variable: non-performing loan ratio (NPL_{bt})					
	(I)	(II)	(III)	(IV)	(V)	(VI)
$\sum_{j=1}^{k} \gamma_j \mathrm{NPL}_{b,t-j}$	0.696*** (0.048)	0.699*** (0.045)	0.683*** (0.058)	0.670*** (0.056)	0.698*** (0.048)	0.694*** (0.052)
$SIZE_{t-1}$	–0.753** (0.394)	-0.746** (0.389)	–0.622 (0.543)	–1.108*** (0.368)	–0.772* (0.468)	–0.832** (0.402)
LIQ_{t-1}	3.964** (1.785)	3.959** (1.789)	4.213*** (1.688)	4.562*** (1.763)	3.457*** (1.323)	3.503*** (1.263)
CAP_{t-1}	7.027 (6.027)	7.738 (6.042)	6.209 (5.963)	5.464 (5.821)	7.863 (6.583)	7.645 (6.674)
DEP_{t-1}	2.108 (2.594)	2.518 (2.544)	2.270 (2.626)	2.488 (2.807)	2.154 (2.394)	2.185 (2.561)
$\sum_{j=0}^{k} \beta_j \, \Delta MaP_{t-j}$	–0.519 (0.395)	–4.784*** (1.564)	–0.570 (0.426)	–1.129** (0.559)	–0.599* (0.341)	–0.628 (0.434)
$\sum_{j=0}^{k} \delta_j \, \Delta MaP_{t-j} * SIZE_{t-1}$		0.226*** (0.079)				
$\sum_{j=0}^{k} \delta_j \, \Delta MaP_{t-j} * LIQ_{t-1}$		1.385** (0.665)				
$\sum_{j=0}^{k} \delta_j \, \Delta MaP_{t-j} * CAP_{t-1}$		9.589*** (2.283)				
$\sum_{j=0}^{k} \delta_j \, \Delta MaP_{t-j} * DEP_{t-1}$		0.926 (0.751)				
$\sum_{j=0}^{k} \varphi_j \Delta logGDP_{t-j}$			–20.58 (19.23)	–26.34 (22.23)		
$\sum_{j=0}^{k} \rho_j \, \Delta \mathrm{MaP}_{t-j} * \Delta logGDP_{t-j}$			30.85 (27. 92)	53.44** (28.91)		
$\sum_{j=0}^{k} \varphi_j \mathrm{Credit}GAP_{t-j}$					0.041 (0.027)	0.045 (0.028)
$\sum_{j=0}^{k} \rho_j \, \Delta MaP_{t-j} * \mathrm{Credit}GAP_{t-j}$					–0.038 (0.121)	–0.034 (0.136)
Macroeconomic controls	Yes	Yes	Yes	Yes	No	Yes
Observations	138	138	138	138	138	138
Serial correlation test[1]	0.033	0.030	0.031	0.031	0.026	0.028
Hansen test[2]	0.247	0.257	0.250	0.241	0.233	0.236

Sample period: Q1 2010–Q1 2018. Robust standard errors are reported in brackets. The symbols *, ** and *** represent significance levels of 10%, 5% and 1%, respectively.

1 Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second-order serial correlation. 2 Reports p-values for the null hypothesis that the instruments used are not correlated with the residuals.