



BANK FOR INTERNATIONAL SETTLEMENTS

When is macroprudential policy effective?

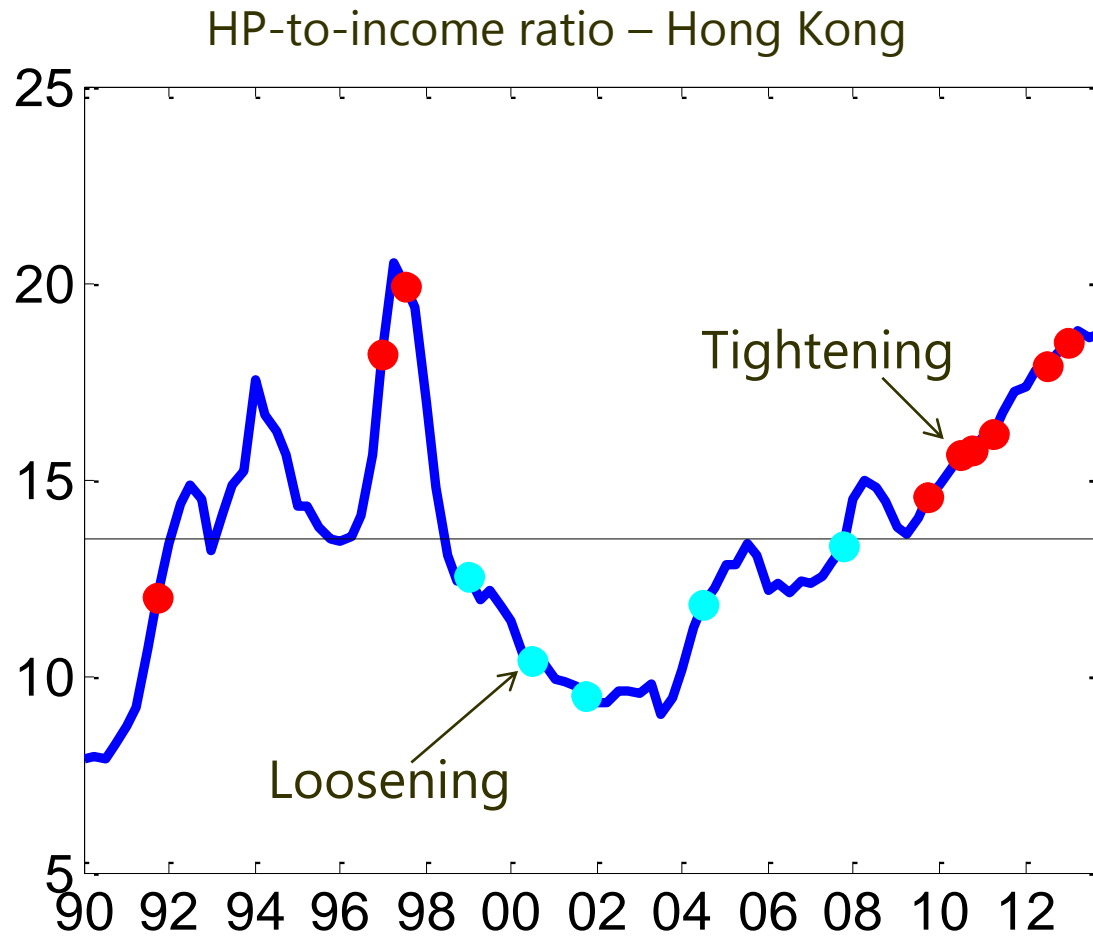
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13 November 2014



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Are LTV/DTI changes effective over the cycle?



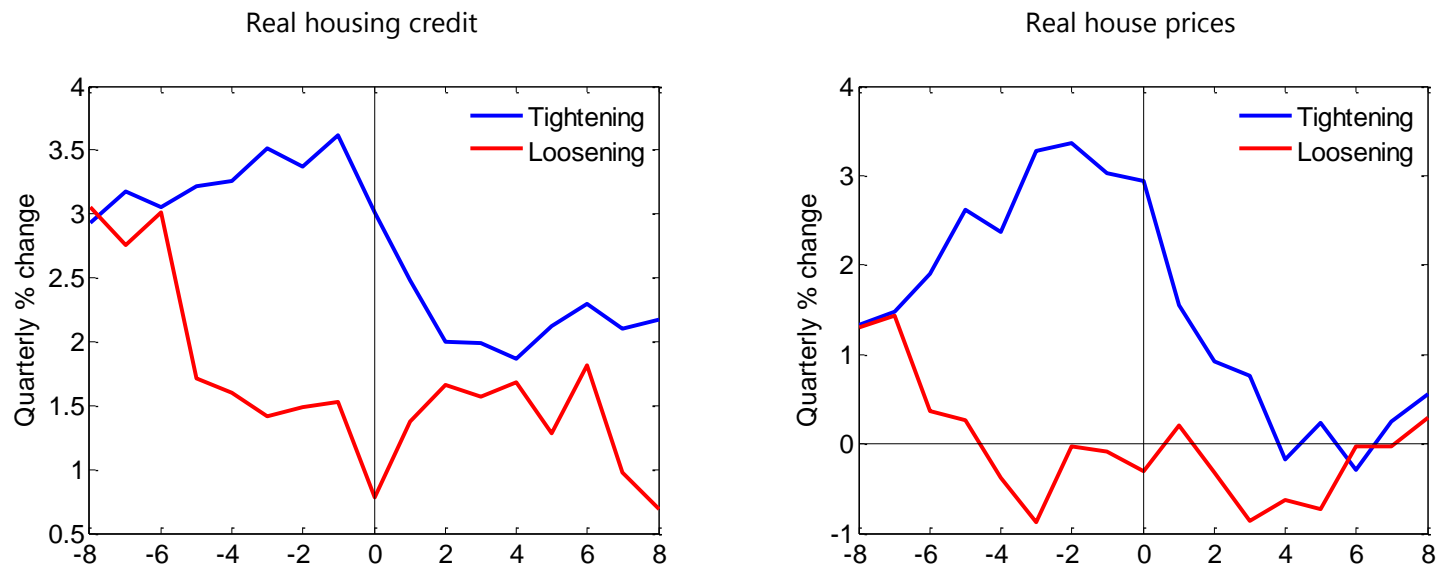
Key points from related research

- LTV/DTI limits can help to stabilise housing markets
 - Kuttner and Shim (2013) and Crowe et al (2011)
- Biggest persistent (or long-run) effects are during booms
 - Classeans et al (2013): bank-level data
- Tightening has negative effects, loosening is not so obvious
 - Kuttner and Shim (2013) and Igan and Kang (2012)

Are LTV/DTI changes effective?

Housing credit growth and house price inflation before and after policy changes

Figure 1



Notes: This shows the mean quarterly growth of real housing credit and real house prices X-quarters before and after policy changes.

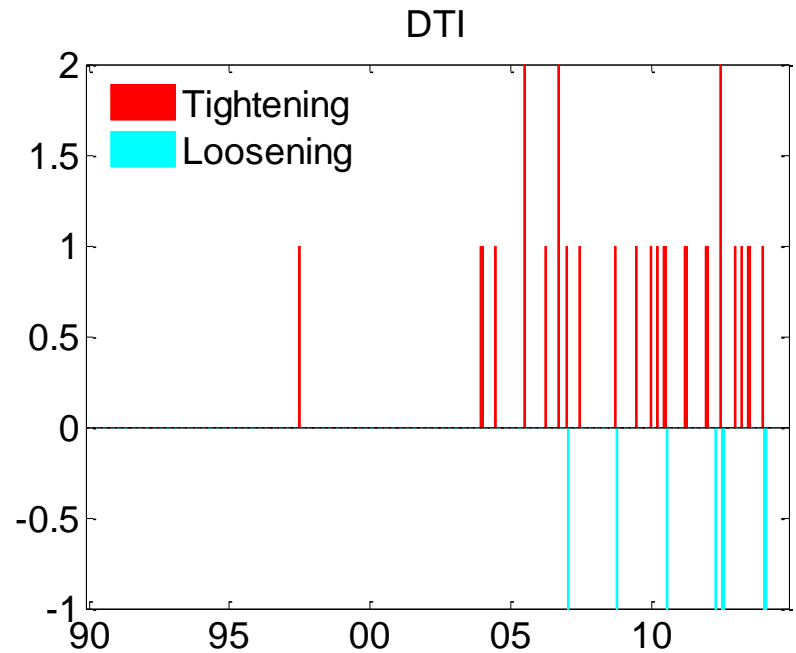
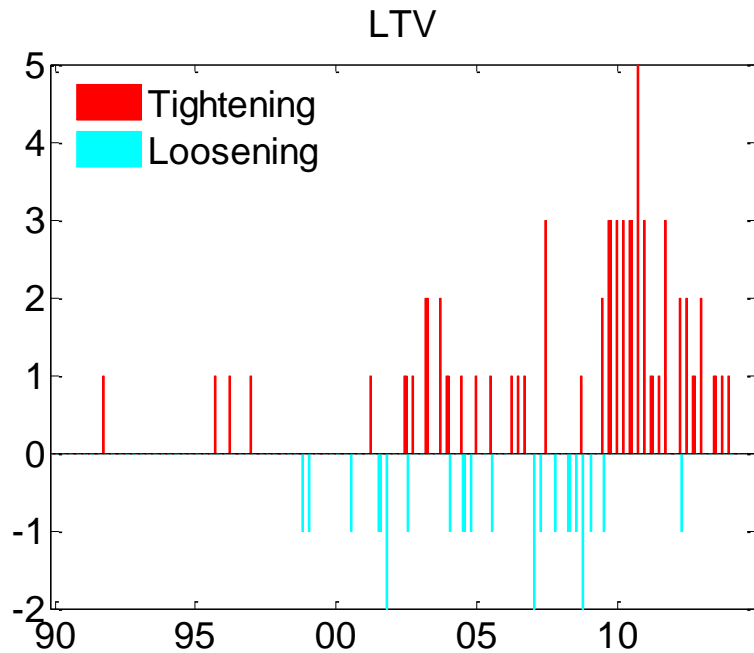
This paper's contribution

1. Do policy changes have different effects over the cycle?
 - Short-run impacts of policy changes
 - Macro-level
 - Several measures of the cycle
2. Are tightening and loosening symmetric?
 - Control for where they are implemented in the cycle

What policy changes are included?

- BIS macroprudential dataset 1990-2012, updated to end of 2013
- 17 countries (11 from Asia and 6 others)
- LTV limits (including loan prohibitions) and DTI limits
- Time series → +1 tightening, -1 loosening, 0 elsewhere

Tightening and loosening of LTV/DTI limits



Together there are 71 tightening and 25 loosening measures

Method: panel regression

- Model is based on Kuttner and Shim (2013)
 - Dependent variable: real housing credit growth
 - Controls: lagged credit growth, real interest rates, GNI per capita growth, HP-to-income ratio, country-fixed effects

$$\Delta Credit_{j,t} = A_j + B(\text{controls})_{j,t-i} + C(\text{policy changes})_{j,t-i} + \text{residual}_{j,t}$$

- Policy effects → what's left in the residuals after accounting for the controls
- 1990Q1 to 2014Q1 , estimated using OLS

Baseline regression

Baseline regression

Table 1

Variables	Real housing credit	
Real housing Credit growth {-1}	0.69*** (0.07)	} Controls
Real interest rate {-1}	-0.30*** (0.07)	
Real interest rate {-2}	-0.03 (0.12)	
Real GNI per capita growth {-1}	0.30* (0.17)	
Real GNI per capita growth {-2}	-0.10 (0.18)	
HP-to-income ratio {-1}	-1.69 (1.58)	
LTV four-quarter effect	-2.25** (0.97)	} Effect on level of housing credit
DTI four-quarter effect	-1.70 (1.09)	
Observations	1203	
Adjusted r2	0.59	

Notes: Robust standard errors are in parenthesis. Standard errors on the four-quarter effects are constructed using the delta method. Lag length is shown in curly brackets; all the control variables are lagged at least one quarter to account for endogeneity. */**/** represents statistical significance at the 10/5/1 percent levels.

Do policy changes have different effects over the cycle?

Estimating the effects of policy changes over the cycle

1. Split policy changes into two groups based on part of cycle

$$\Delta Credit_{j,t} = A_j + B(\text{controls})_{j,t-i} + C(\text{policy changes above } X)_{j,t-i} + D(\text{policy changes below } X)_{j,t-i} + \text{residual}_{j,t}$$

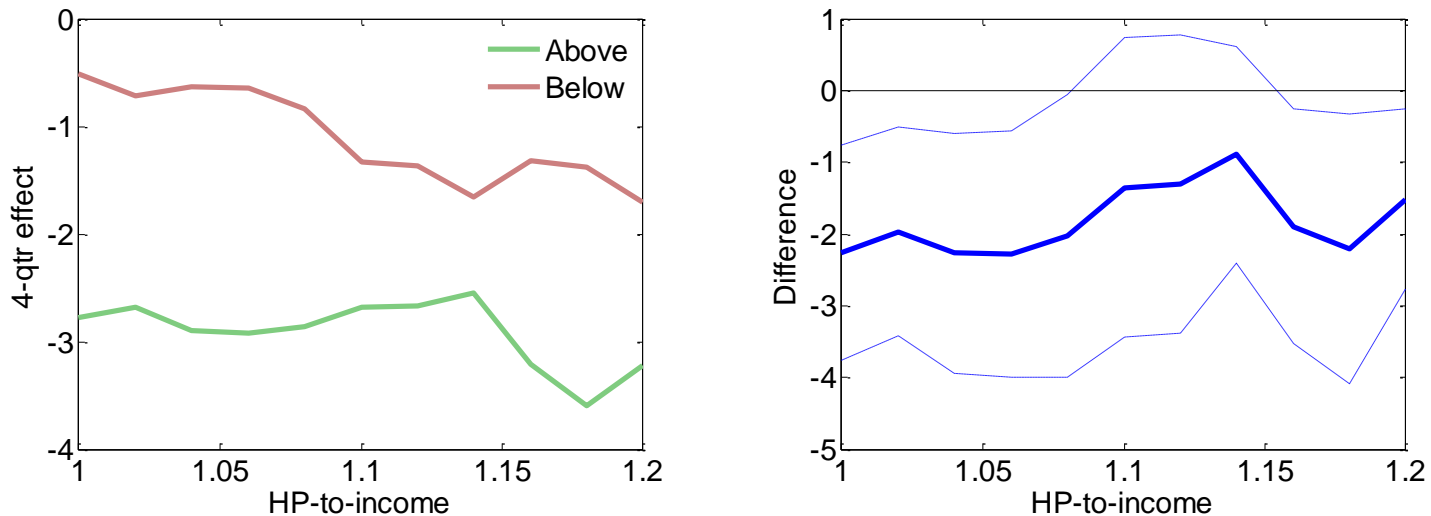
2. Estimate policy effects with an interaction term

$$\Delta Credit_{j,t} = A_j + B(\text{controls})_{j,t-i} + C(\text{policy changes})_{j,t-i} + D(\text{policy changes} \times \text{cycle})_{j,t-i} + \text{residual}_{j,t}$$

1) Split sample: HP-to-income ratios (relative to average)

Effects of policy changes on credit by HP-to-income ratios

Figure 3

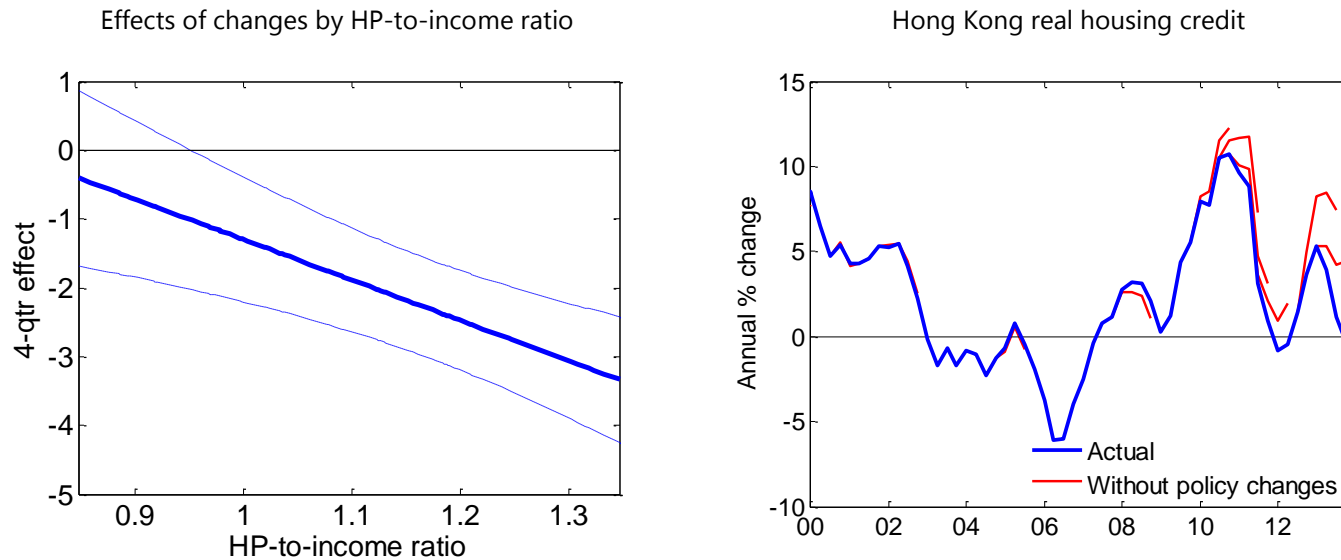


Notes: The plot on the left shows the four-quarter effects of LTV and DTI changes grouped as either above and below the x-axis value. The difference between these effects and the 90 percent confidence interval are on the right. Standard errors are calculated using the delta method.

2) Policy effects by HP-to-income ratios – interactions

Effects of changing LTV and DTI limits on housing credit

Figure 4



Notes: In the left plot, the dashed lines show the 90 percent confidence interval and the HP-to-income ratio is relative to each economy's average. In the right plot, each red line shows the impact of an individual policy change. These effects are only estimated for up to 1 year after each policy change.

Interacting policy effects with other cyclical measures

Interactions between the effects policy changes on credit and cyclical measures

Table 2

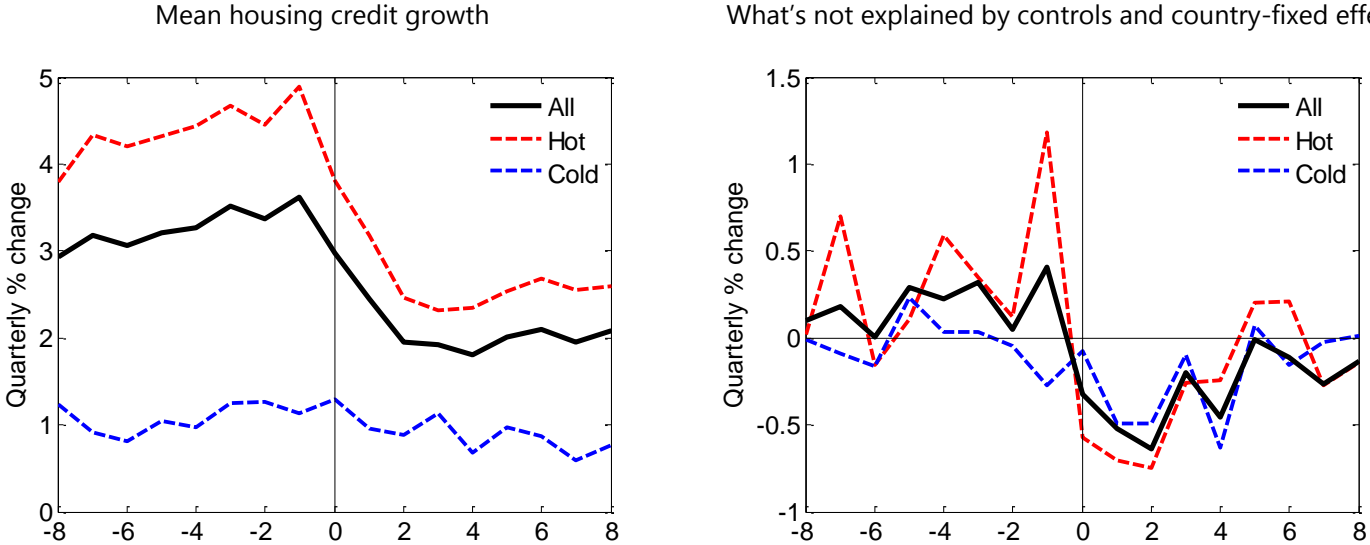
Groupings	Cyclical variables	All changes	Tightening only
Baseline	HP-to-income ratio – relative to average	-0.59*** (0.20)	-0.43 (0.36)
Housing	HP-to-income ratio – absolute level	-0.26** (0.12)	-0.32*** (0.11)
	Annual housing credit growth	-0.11*** (0.02)	-0.07** (0.03)
	Annual house price inflation	-0.07* (0.04)	-0.10 (0.07)
	Housing credit gap	-0.09 (0.18)	0.04 (0.19)
Others	Annual CPI inflation	-0.22 (0.21)	-0.59 (0.37)
	Annual GNI growth	-0.30* (0.16)	-0.44*** (0.17)
	GNI gap	-0.32 (0.27)	-0.42* (0.24)
	Real interest rate	-0.11 (0.16)	0.24 (0.27)

Notes: Standard errors in parenthesis. */**/** represents statistical significance at the 10/5/1 percent levels.

Before and after tightening measures

Housing credit growth before and after policy tightening

Figure 5



Notes: Hot is when annual housing credit growth was above 8 percent at t-1. The regression used to construct the right-hand plot includes the policy variables advanced up to 8 quarters, contemporaneously, and lagged up to 8 quarters.

Before and after tightening measures

Residual housing credit growth before and after tightening measures				Table 3
	Observations	Year before	Year after	Difference
All measures	71	1.53*** (0.64)	-3.12*** (0.82)	-4.65*** (1.11)
Hot				
Strong prior credit growth	41	3.04*** (0.85)	-3.94*** (1.04)	-6.98*** (1.47)
High HP-to-income	39	1.80 (1.11)	-4.50*** (0.62)	-6.30*** (1.46)
Cold				
Weak prior credit growth	30	-0.15 (0.72)	-2.82*** (1.01)	-2.67*** (0.84)
Low HP-to-income	32	0.54 (0.62)	-1.07 (1.03)	-1.61 (1.06)

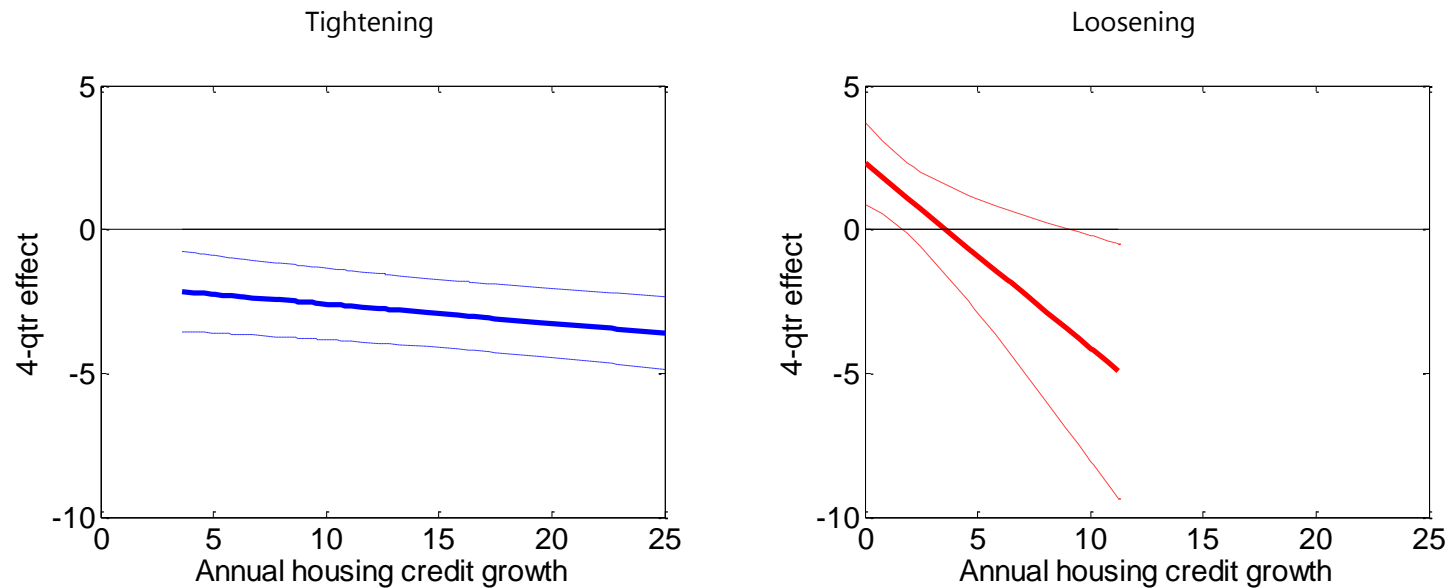
Notes: Standard errors in parenthesis. */**/** represents statistical significance at the 10/5/1 percent levels. Strong prior credit growth is above 8 percent and high absolute HP-to-income ratios are above 10.6. These regressions include four lags and four leads of the policy variables. The “Year before” column shows the four-quarter effect on (or residual movement in) the level of housing credit from t-4 to t-1, where t is the quarter that tightening occurs. The “Year after” column shows the four-quarter effect on housing credit from t+1 to t+4.

Are tightening and loosening symmetric?

Comparing like-with-like

Effects after tightening and loosening on housing credit

Figure 6

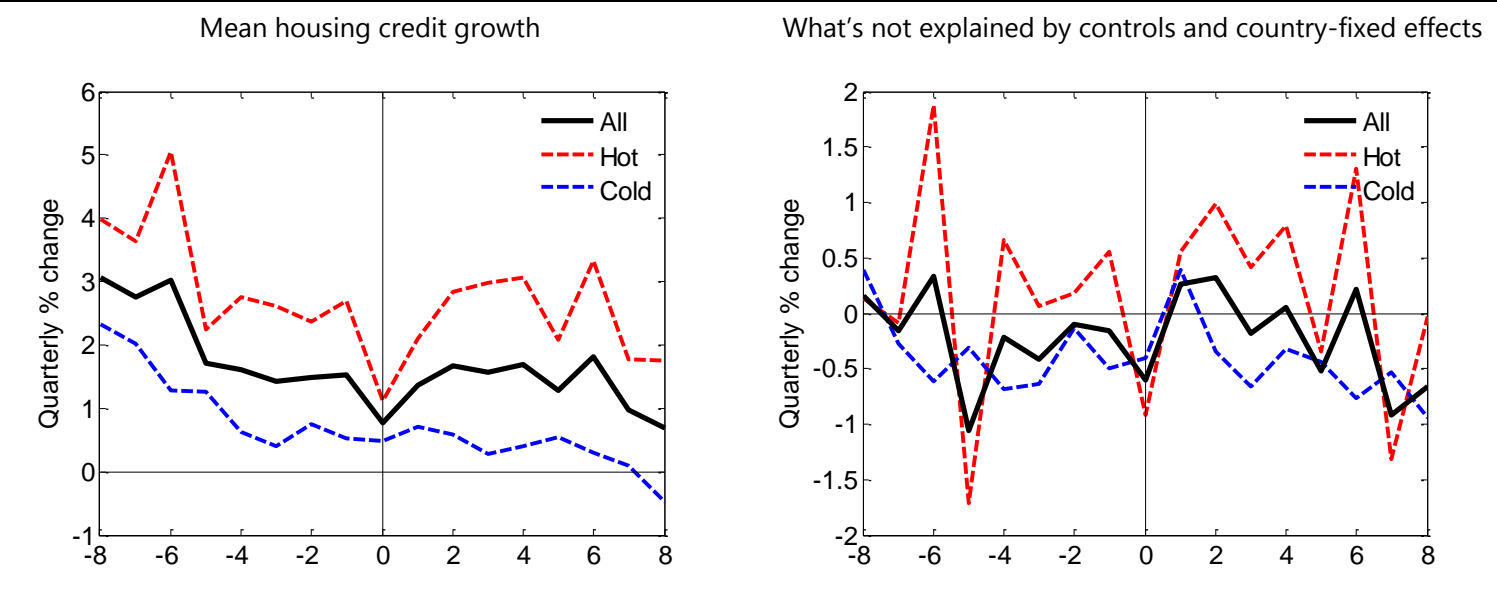


Notes: Effects are calculated between the 10th and 90th percentiles of annual credit growth from quarters when policy was tightened or loosened. The dashed lines show the 90 percent confidence intervals, where standard errors are calculated using the delta method. For loosening, a negative sign is when it stimulates housing credit growth.

Before and after loosening measures

Housing credit growth before and after policy loosening

Figure 7



Notes: Hot is when annual housing credit growth was above 8 percent at t-1. The regression underlying the right-hand plot includes the policy variables advanced up to 8 quarters, contemporaneously, and lagged up to 8 quarters.

Effects of loosening

Residual housing credit growth before and after loosening measures Table 4

	Observations	Year before	Year after	Difference
All measures	26	-1.18 (2.10)	0.60 (1.97)	1.79 (1.90)
Hot				
Strong prior credit growth	11	3.55 (3.53)	5.95* (3.35)	2.40 (4.59)
High HP-to-income	13	-3.10 (1.93)	-0.93 (2.73)	2.17 (3.15)
Cold				
Weak prior credit growth	15	-3.63*** (1.13)	-1.96*** (0.58)	1.68* (0.99)
Low HP-to-income	13	1.37 (3.15)	2.01 (2.09)	0.63 (1.89)

Notes: Standard errors in parenthesis. ***/** represents statistical significance at the 10/5/1 percent levels. Strong prior credit growth is above 8 percent and high absolute HP-to-income ratios are above 10.6. These regressions include four lags and four leads of the policy variables. The "Year before" column shows the four-quarter effect on (or residual movement in) the level of housing credit from t-4 to t-1, where t is the quarter that loosening occurs. The "Year after" column shows the four-quarter effect on housing credit from t+1 to t+4.

Individual LTV and DTI effects

Individual effects of LTV and DTI changes on housing credit					Table 6
		Observations	Year before	Year after	Difference
Tightening					
LTV	All	51	2.69*** (0.95)	-3.60*** (1.07)	-6.29*** (1.69)
	Hot	33	4.04*** (0.97)	-3.85*** (1.34)	-7.89*** (2.01)
	Cold	18	-0.26 (1.06)	-2.73*** (0.97)	-2.47** (0.98)
DTI	All	20	0.27 (0.81)	-4.70*** (1.16)	-4.96*** (1.55)
	Hot	8	0.70 (1.55)	-5.00*** (1.35)	-5.70** (2.59)
	Cold	12	-1.20 (1.60)	-5.09*** (1.90)	-3.88*** (1.48)
Loosening					
LTV	All	21	-0.24 (2.57)	1.84 (2.26)	2.08 (2.81)
	Hot	11	3.95 (3.48)	6.11* (3.22)	2.16 (4.60)
	Cold	10	-4.81** (2.45)	-3.10*** (0.93)	1.72 (1.87)
DTI	All	5	-6.09*** (1.09)	-3.19*** (1.26)	2.90*** (0.97)
	Hot	0	-	-	-
	Cold	5	-6.09*** (1.09)	-3.19*** (1.26)	2.90*** (0.97)

Notes: Standard errors in parenthesis. */**/** represents statistical significance at the 10/5/1 percent levels. These regressions include four lags and four leads of the policy variables. Hot includes observations when annual credit growth was above 8 percent in the quarter before the policy change. The "Year before" column shows the four-quarter effect on (or residual movement in) the level of housing credit from t-4 to t-1, where t is the quarter that the policy change occurs. The "Year after" column shows the four-quarter effect on housing credit from t+1 to t+4.

Key findings

- The effects of tightening measures are related to
 - Annual housing credit growth
 - HP-to-income ratios
- Tightening has bigger effects during booms
 - Reduces credit by 4-7% in booms and 1-3% in downturns
- Loosening has smaller effects than tightening
 - Downturns → raise credit by 0.6-1.7%

Additional slides

House prices

Residual house price movements before and after policy changes

Table 5

	Observations	Year before	Year after	Difference
Tightening	71	4.68*** (1.41)	-1.71* (0.99)	-6.40*** (2.11)
Hot Strong prior credit growth	41	5.20*** (1.49)	-2.75* (1.78)	-7.95*** (2.80)
High absolute HP-to-income	39	4.69*** (1.80)	-3.24*** (0.97)	-7.93*** (2.53)
Cold Weak prior credit growth	30	3.78** (1.77)	-0.60 (1.01)	-4.37** (1.76)
Low absolute HP-to-income	32	3.96*** (1.37)	-0.06 (0.71)	-4.02*** (1.54)
Loosening	26	-1.23 (1.16)	-1.88 (1.78)	-0.65 (2.08)
Hot Strong prior credit growth	11	-5.02 (4.02)	2.87 (2.55)	7.89* (4.17)
High absolute HP-to-income	13	-1.95 (1.43)	-0.35 (1.88)	1.59 (2.88)
Cold Weak prior credit growth	15	0.64 (1.51)	-4.70* (2.65)	-5.34 (3.92)
Low absolute HP-to-income	13	-0.70 (2.29)	-4.01 (3.84)	-3.32 (4.42)

Notes: Standard errors in parenthesis. */**/** represents statistical significance at the 10/5/1 percent levels. Strong prior credit growth is above 8 percent and high absolute HP-to-income ratios are above 10.6. These regressions include four lags and four leads of the policy variables. The "Year before" column shows the four-quarter effect on (or residual movement in) the level of house prices from t-4 to t-1, where t is the quarter that the policy change occurs. The "Year after" column shows the four-quarter effect on house prices from t+1 to t+4.