Consequences of Loan-to-Value Ratio Policies for Business and Credit Cycles

Tim Robinson
University of Melbourne

Fang Yao[1]
RBNZ

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[1]The views expressed here are those of the authors and do not necessarily reflect the position of the Reserve Bank of New Zealand.

Motivation I

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  - Financial cycles are typically longer than business cycles.

  - Recessions associated with financial disruptions tend to be longer and deeper than other recessions.

- There has been increased usage of macroprudential policies in many countries, with the aim of promoting financial stability.

Question

What are the consequences of macroprudential policy in terms of cyclical behaviors of business and credit cycles?

Literature

- A large volume of DSGE literature are being developed to evaluate macroprudential policies in terms of social welfare.

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- An emerging literature uses business-cycle dating methods (Bry and Boschan, 1971) to examine economic cycles and studies the effects of macro policies on those cycles.

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- This approach allows researchers to examine cyclical consequences of macroprudential policy in the lights of empirical evidence that motivated those policies.

This paper

- develops a DSGE model to replicate the cyclical characteristics of business and credit cycles.
- estimates the model using 8 US time series and compute the cyclical behaviors of the simulated data.
- studies consequences of Loan-to-Value Ratio (LVR) Policy on business and credit cycles and their interactions.

Preview of results

- The LVR policy rules face the trade-off between the amplification and frequency of recessions.
- We find that a LVR rule responding to house prices generates the best trade-off among rules investigated.
- Credit-to-GDP ratio is not a good indicator of LVR policy, because credit is a slow-moving variable relative to GDP.

Cyclical Characteristics

Empirical Approach

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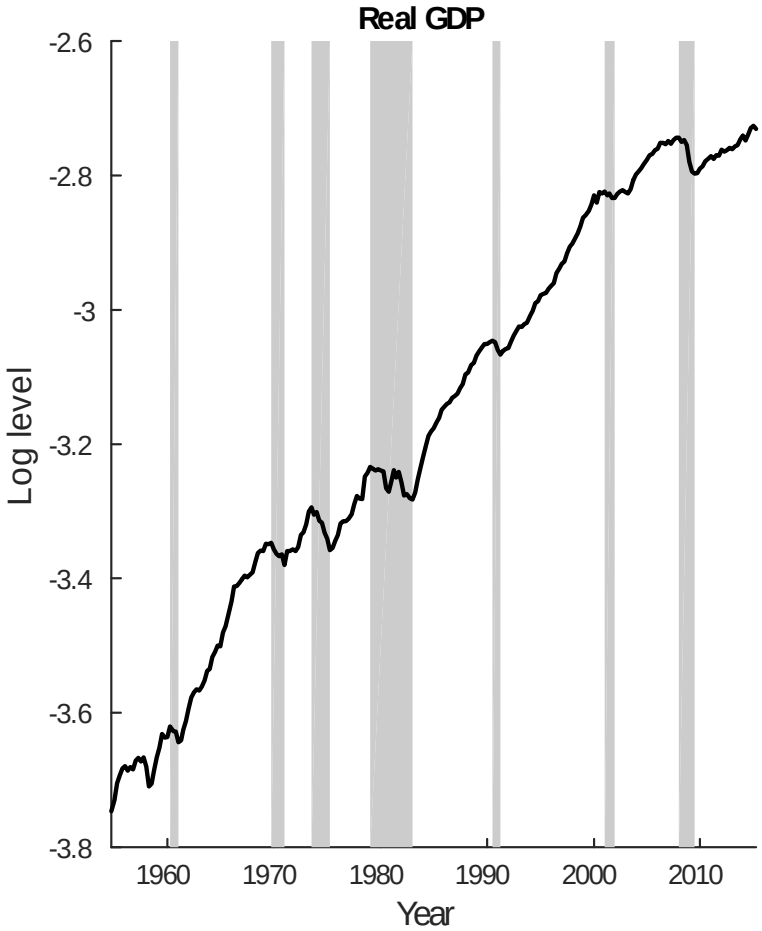
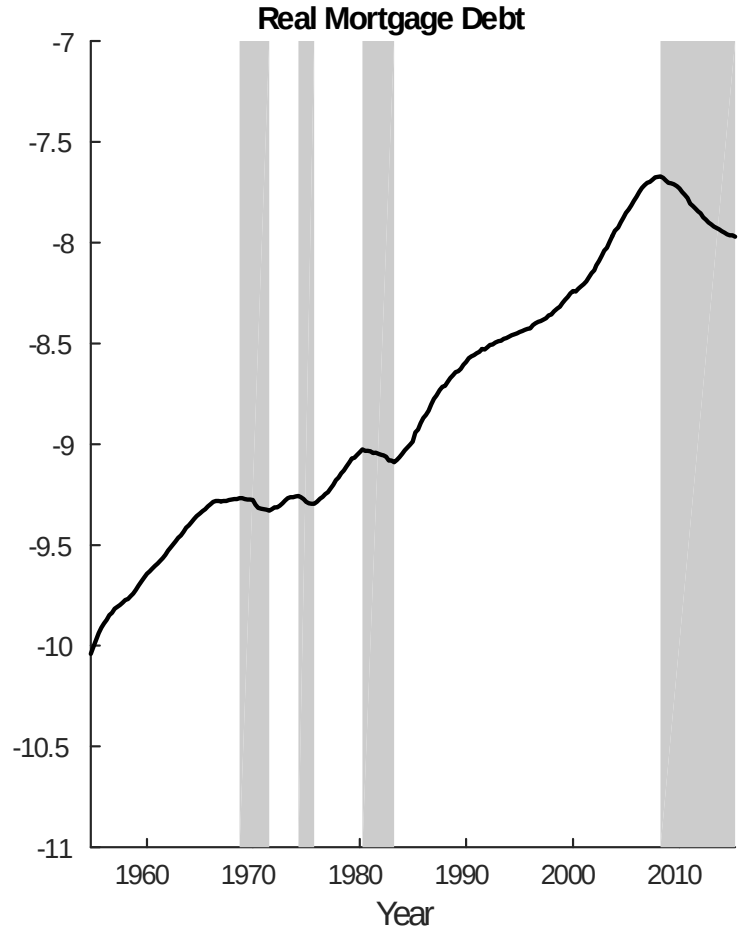
Empirical Approach

- By the cycle we mean the *classical* cycle - fluctuations in the *level* of economic activity.
- Harding and Pagan (2002) develop an algorithm, drawing on Bry and Boschan (1971), that identifies *turning points* in the level of GDP.
- By focusing on turning points it is not necessary to extract the low frequency components (such as HP filter).

US Cycles





Data source: Federal Reserve of St Louis database

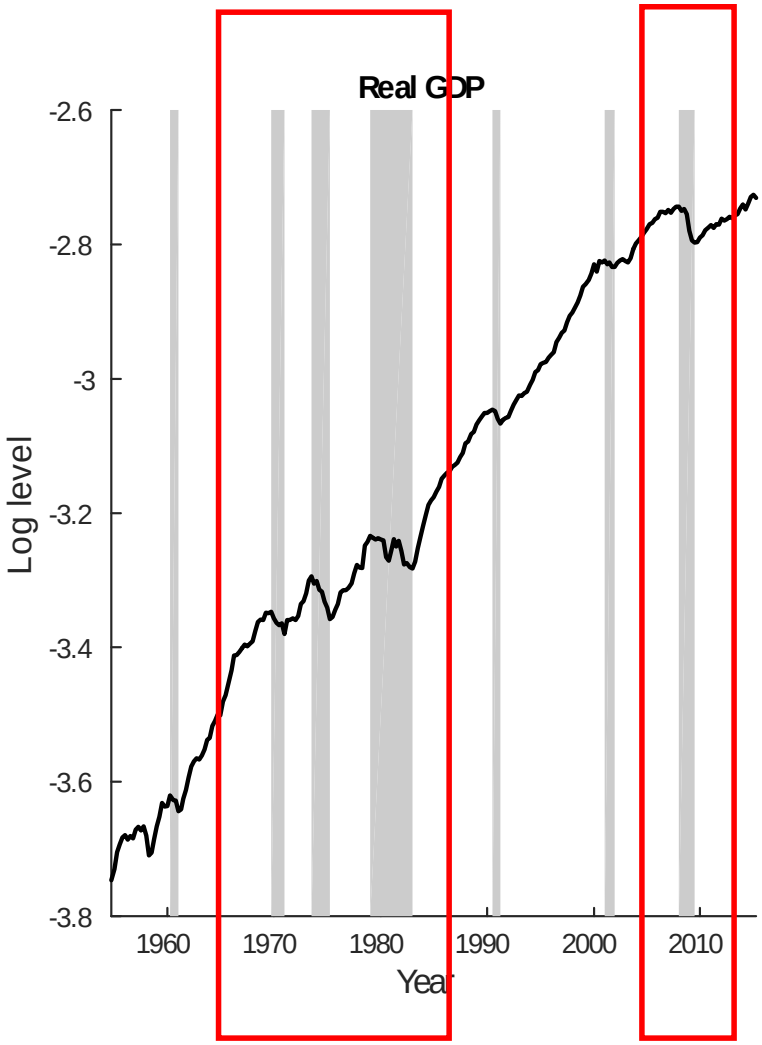
Cyclical Characteristics

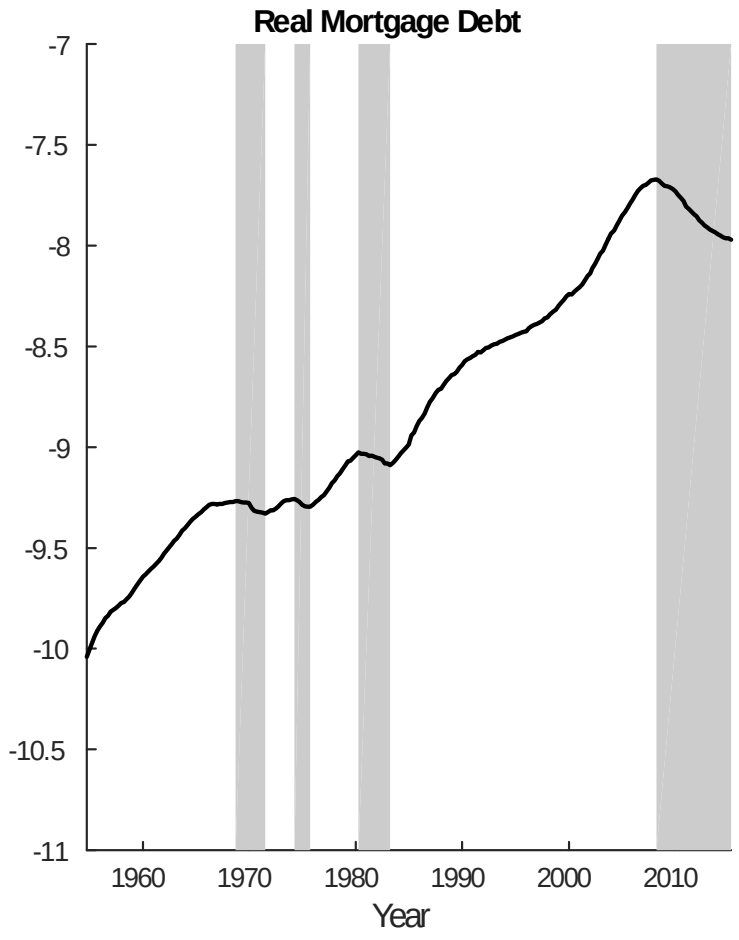
Recession	Our Data		Claessens *et al.* (2012)*	
	Output	Credit	Output	Credit**
Duration	6.28	9.66	3.88	5.39
Amplitude	-3.59%	-5.62%	-2.17%	-4.38%

Note: * Claessens's data: 21 OECD countries, 23 EM countries from 1960:1 - 2010:4.

** Credit: aggregate claims on the private sector by deposit money banks.

US Cycles


Real GDP
Log level
-2.6
-2.8
-3
-3.2
-3.4
-3.6
-3.8
1960
1970
1980
1990
2000
2010
Year


Real Mortgage Debt
-7
-7.5
-8
-8.5
-9
-9.5
-10
-10.5
-11
1960
1970
1980
1990
2000
2010
Year

Conditional Cyclical Characteristics

	Recessions	
	with credit downturn	without credit downturn
Duration	8.5	3.33
Amplitude	-4.96%	-1.77%

The Model

The Model

- Medium scale DSGE model with a housing collateral constraint, drawing on Iacoviello and Neri (2010).
- Two groups of household:
  - Patient - savers
  - Impatient - borrowers, subject to a collateral constraint.
- Mortgage loans
  - Long-term mortgage loan (Garriga, Kydland and Sustek, 2013)
  - Fixed mortgage rates (Alpanda and Zubairy, 2014)
- Labour augmenting technology follows a unit root with drift.
- Monetary policy is set via a Taylor rule.
- Permanent LVR changes and countercyclical rules

Parameterization

Parameterization

- We use 8 observed series from 1984:Q1 – 2007:Q4.

- output growth	- business investment growth
- consumption growth	- residential investment growth
- federal Funds rate	- inflation
- real wage growth	- mortgage loan growth

- Calibrated parameters

Parameter	*Value*	*Ratio*	*Data*	*Model*
β, β'	$0.993, 0.985$	$\frac{D}{Y}$	1.40	1.58
ξ_h, ξ_h'	$0.14, 0.14$	$\frac{C}{Y}$	0.637	0.622
δ_h, δ_k	$0.01, 0.013$	$\frac{I}{Y}$	0.125	0.123
η_k, η_l	$0.17, 0.4$	$\frac{X}{Y}$	0.047	0.063
η_h, η_w	$7.6, 7.6$	$\frac{K}{Y}$	7.06	6.95
m	0.9	$\frac{H}{Y}$	4.28	4.33
Notes:	Average over 1984:Q1 - 2007:4.			

Parameterization

Parameter	Prior	Mean	90 Per Cent HPD
κ_w	$N(130, 20^2)$	143.23	116.16 - 168.10
ι_w	$B(0.3, 0.1)$	0.1622	0.07 - 0.25
κ_p	$N(130, 20^2)$	154.48	125.43 - 183.15
ι_p	$B(0.3, 0.1)$	0.13	0.06 - 0.1945
κ_h	$N(5, 2^2)$	0.013	0.0019 - 0.0246
κ_k	$N(5, 2^2)$	6.15	3.99 - 9.75
ς_c	$B(0.5, 0.25)$	0.12	0.080 - 0.17
ς_n	$B(0.5, 0.25)$	0.52	0.35 - 0.67
r_r	$B(0.8, 0.1)$	0.67	0.60 - 0.77
r_π	$N(1.5, 0.25^2)$	1.89	1.54 - 2.32
$r_{\Delta y}$	$N(0.25, 0.1^2)$	0.38	0.26 - 0.51
r_y	$N(0.25, 0.1^2)$	0.27	0.17 - 0.39

Notes: Beta(a,b) denotes the Beta distribution with mean a and standard deviation b.

Parameterization

Parameter	Description	Prior	Mean	90 per cent HPD
ρ_m	Monetary	$B(0.5, 0.15)$	0.64	0.50 - 0.78
ρ_p	Prices Cost-push	$B(0.5, 0.15)$	0.65	0.42 - 0.83
ρ_c	Preferences	$B(0.5, 0.15)$	0.88	0.85 - 0.92
ρ_{hd}	Housing Demand	$B(0.5, 0.15)$	0.13	0.04 - 0.23
ρ_{ah}	Housing Technology	$B(0.5, 0.15)$	0.89	0.84 - 0.94
ρ_{ak}	Investment Technology	$B(0.5, 0.15)$	0.75	0.66 - 0.85
ρ_g	Fiscal	$B(0.5, 0.15)$	0.98	0.97 - 0.99
ρ_w	Wages cost-push	$B(0.5, 0.15)$	0.19	0.09 - 0.29
ρ_z	Technology	$B(0.5, 0.15)$	0.79	0.75 - 0.83
σ_m	Monetary	IG(0.1,0.5)	0.16	0.13 - 0.20
σ_p	Cost-push	IG(1,1.5)	2.80	1.62 - 3.94
σ_c	Preferences	IG(1,1.5)	2.43	2.0 - 2.8
σ_{hd}	Housing Demand	IG(1,1.5)	28.19	20.6 - 37.19
σ_{ah}	Housing Technology	IG(1,1.5)	2.8	1.95 - 3.46
σ_{ak}	Investment Technology	IG(1,1.5)	33.1	19.6 - 48.7
σ_g	Fiscal	IG(1,1.5)	1.6	1.45 - 1.96
σ_z	Technology	IG(1,1.5)	0.18	0.15 - 0.21
σ_w	Wages Cost-push	IG(1,1.5)	15.9	12.06 - 19.37

Notes: IG the Inverse Gamma distribution. The arguments arethe mean and standard deviation.

Applying BBQ to the DSGE model

- We do a long stochastic simulation from the model and then pass simulated series through the BBQ algorithm to identify turning points.

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Applying BBQ to the DSGE model

- We do a long stochastic simulation from the model and then pass simulated series through the BBQ algorithm to identify turning points.

- We study the properties of business and credit cycles:

Recessions	Data		Model	
	with CD	without CD	with CD	without CD
Duration	8.5	3.33	8.46	6.16
Amplitude	-4.96%	-1.77%	-9.83%	-6.43%

Effects of LVR on Cycles

Policy Analysis

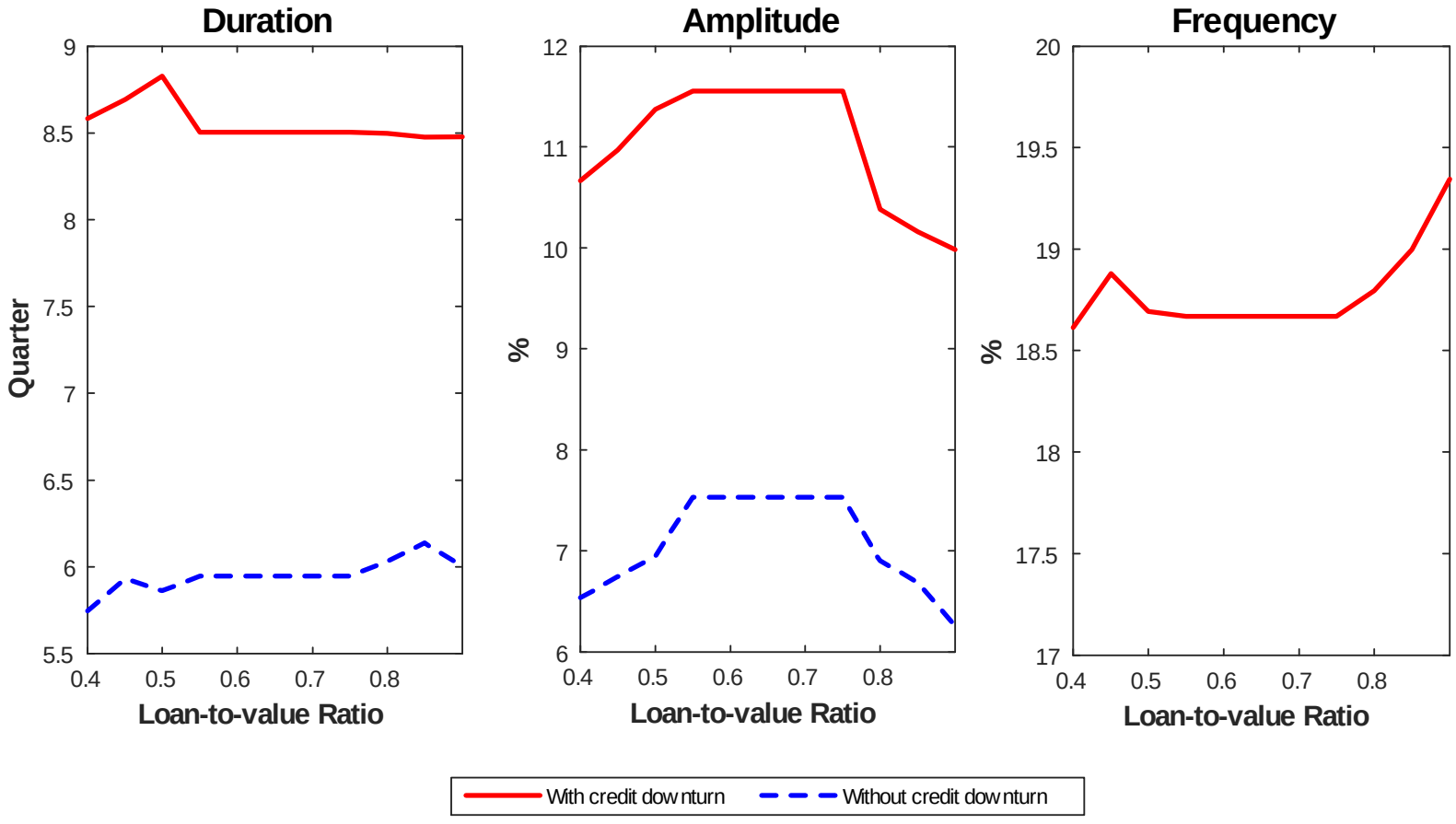
- We consider both permanent changes in LVR and countercyclical LVR response rules.
- The permanent LVR rule is a one-off change in the steady state level of LVR in the economy.
- For the countercyclical LVR rule, we model the absolute deviation of the LTV from its steady-state, $\hat{m}_t$, as:

$$\hat{m}_t = \eta_{LVR} \tilde{f}_t,$$

- where η_{LVR} is a negative coefficient governing the reaction to the variable $\tilde{f}_t$:
  - house price
  - credit-to-GDP ratio

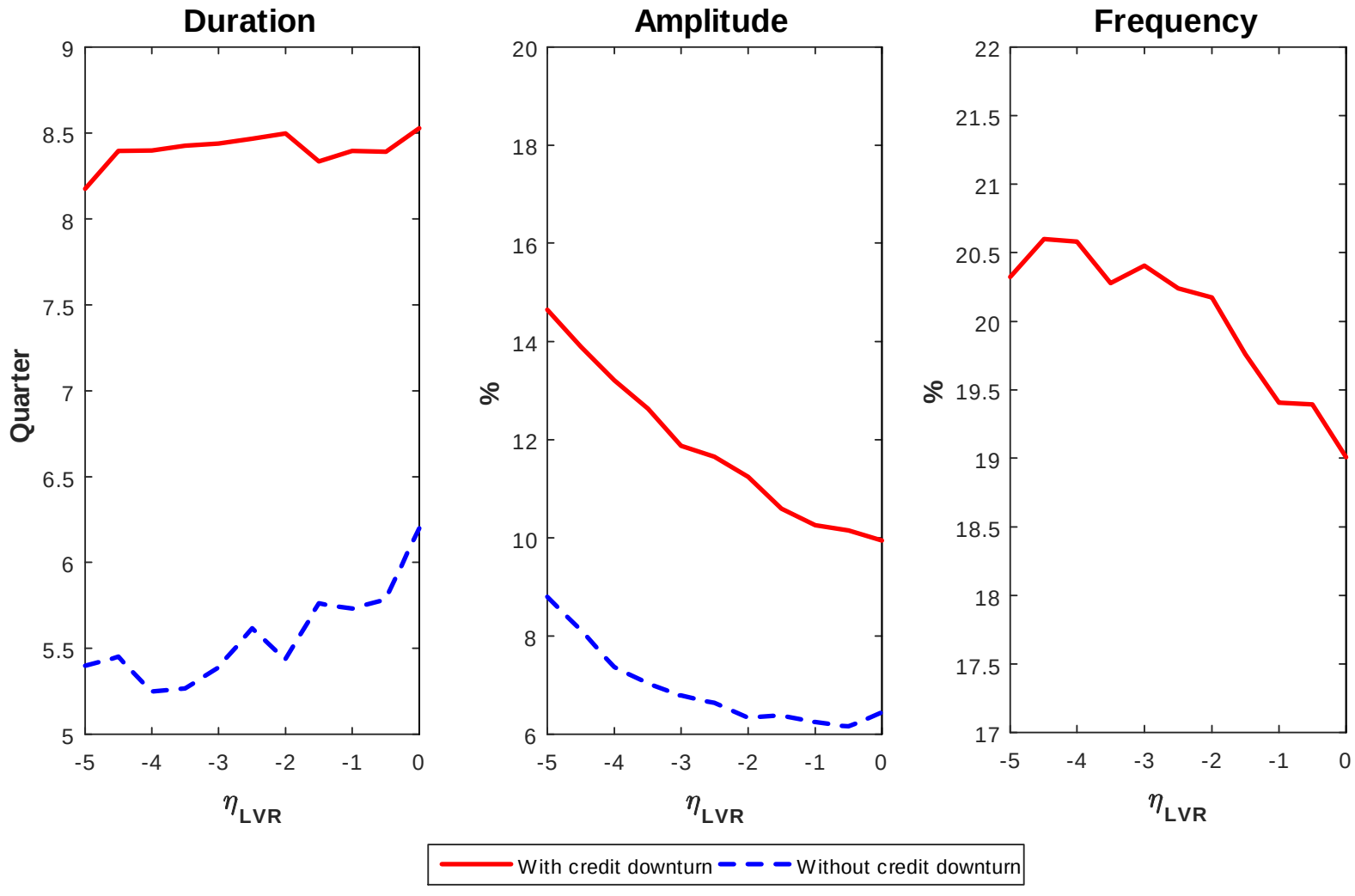
Permanent LVR Changes

- Normal v.s. Financial-downturn recessions



Countercyclical LVR rule - Credit-to-GDP ratio

- Normal v.s. Financial-downturn recessions



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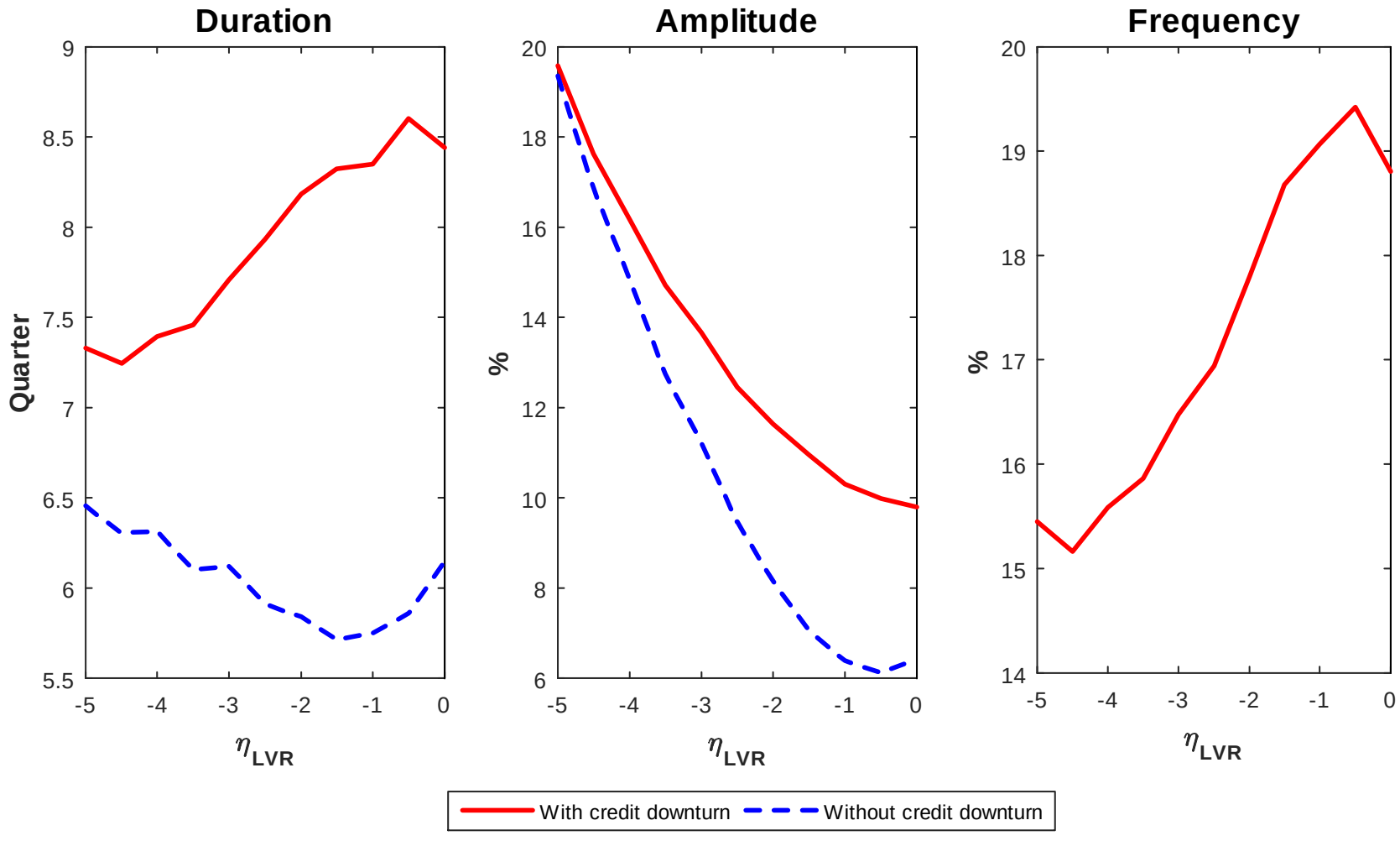
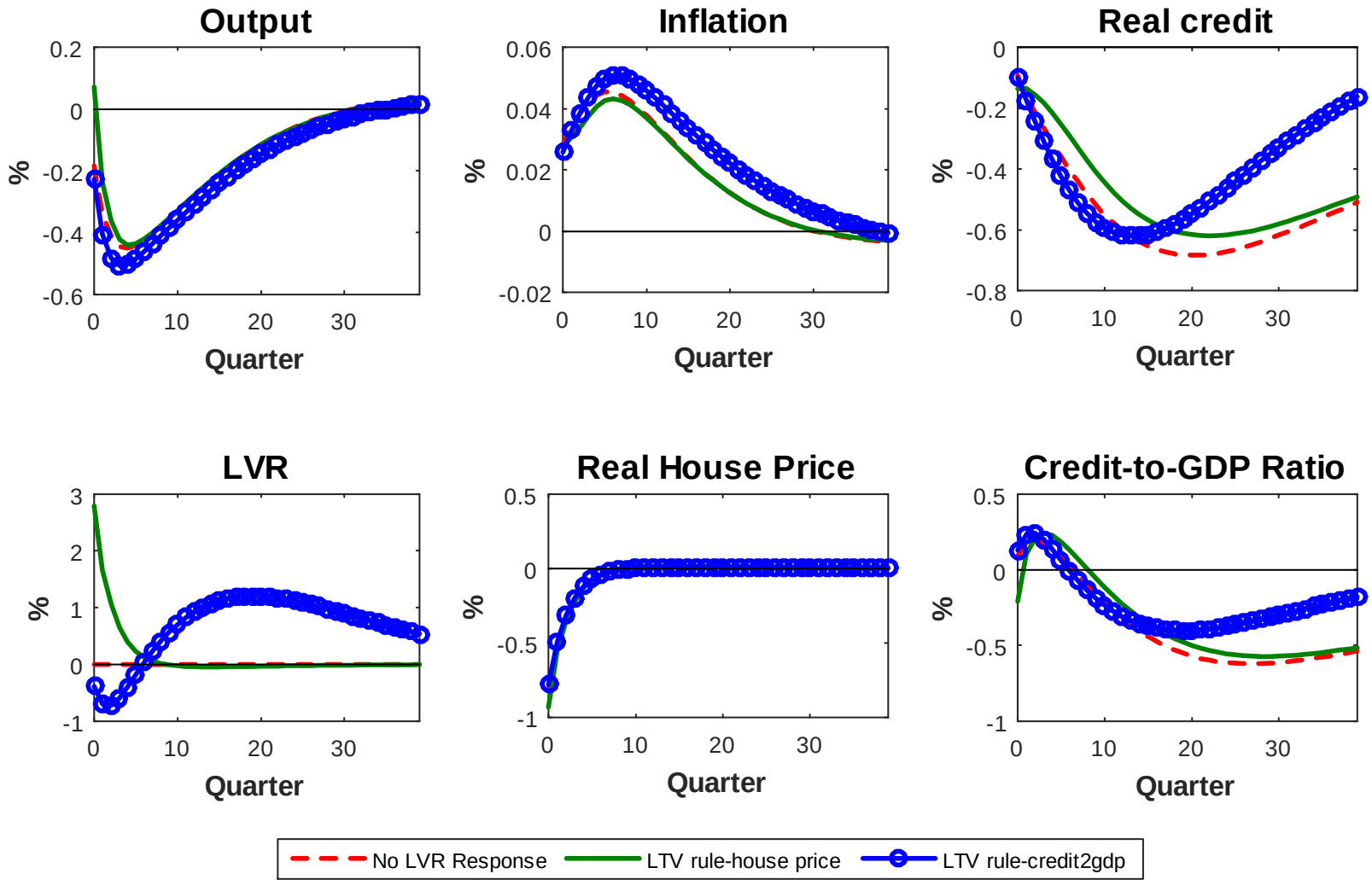


LVR Policy Trade-offs

	Normal recessions		Financial-downturn recessions		
	Duration	Amplitude	Duration	Amplitude	Frequency
Permanent LVR	no	no	no	up	down
LVR_Credit-GDP	down	up	no	up	up
LVR_House price	no	up	down	up	down

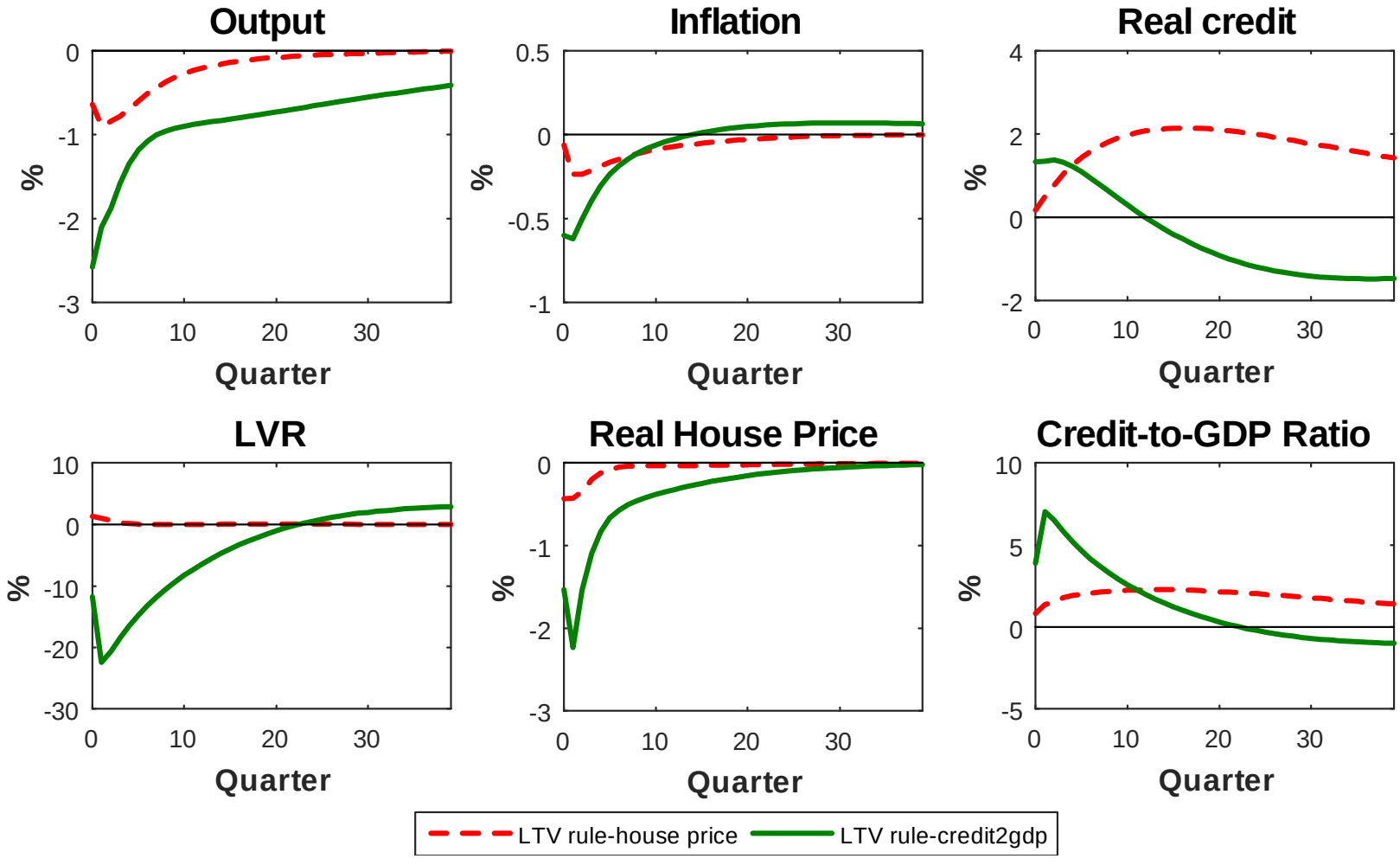
Intuition

- Impulse responses to housing demand shocks



Intuition

- Impulse responses to financial shocks



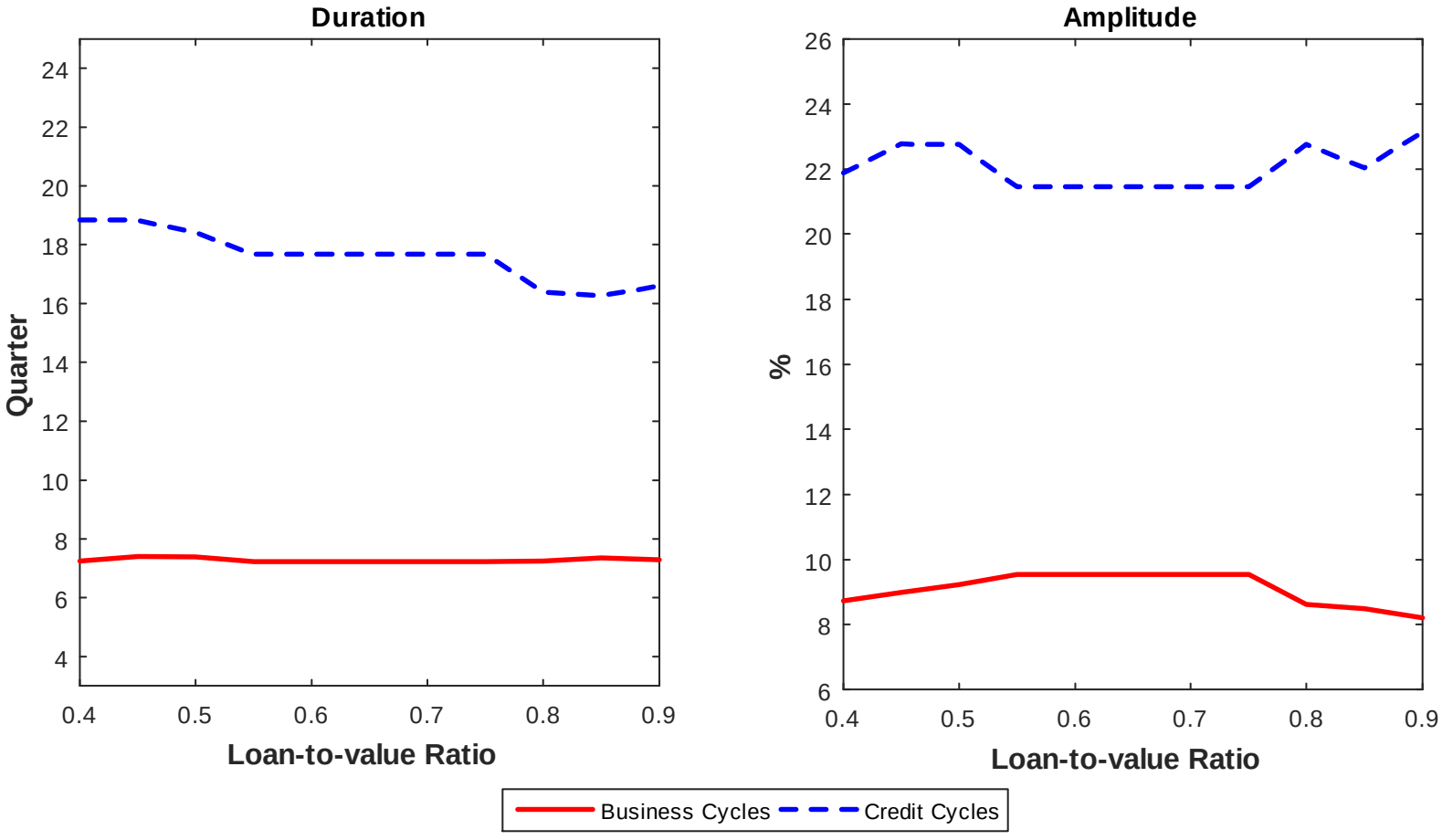
Conclusion

- We use business cycle dating methods to examine what are the macroeconomic effects of LVR policies.
- The LVR policy rules face the trade-off between the amplification and frequency of recessions.
- LVR rule responding to house prices generates the best trade-off among indicator variables investigated.
- Credit-to-GDP ratio is not a good indicator of LVR policy, because credit is a slow-moving variable relative to GDP.

Figure Appendix

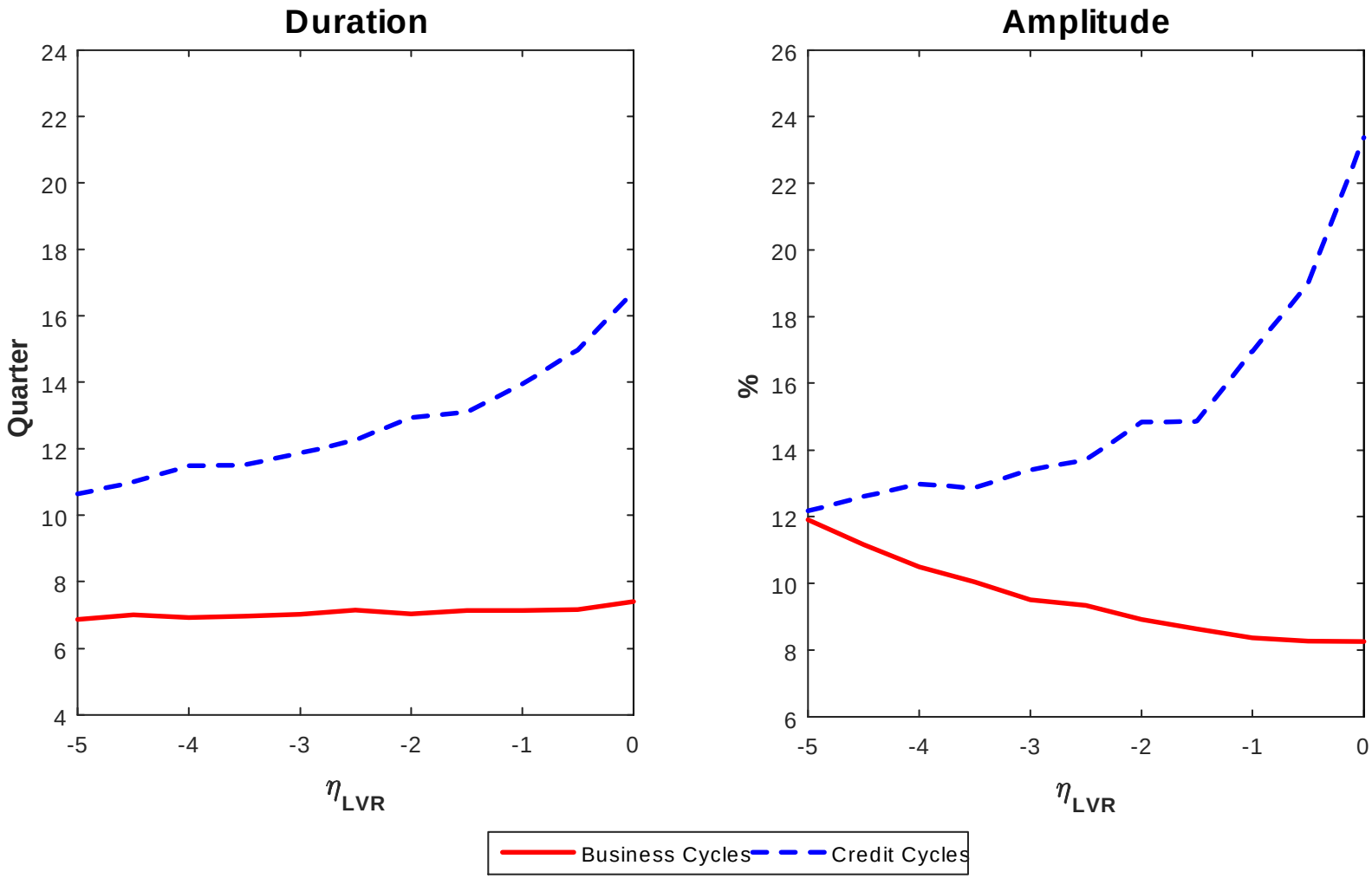
Permanent LVR Changes

- Average recessions



Countercyclical LVR rule - credit-to-GDP

- Average recessions



Countercyclical LVR rule - house price

- Average recessions