Neglected part of shadow banking in China

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CONTENTS

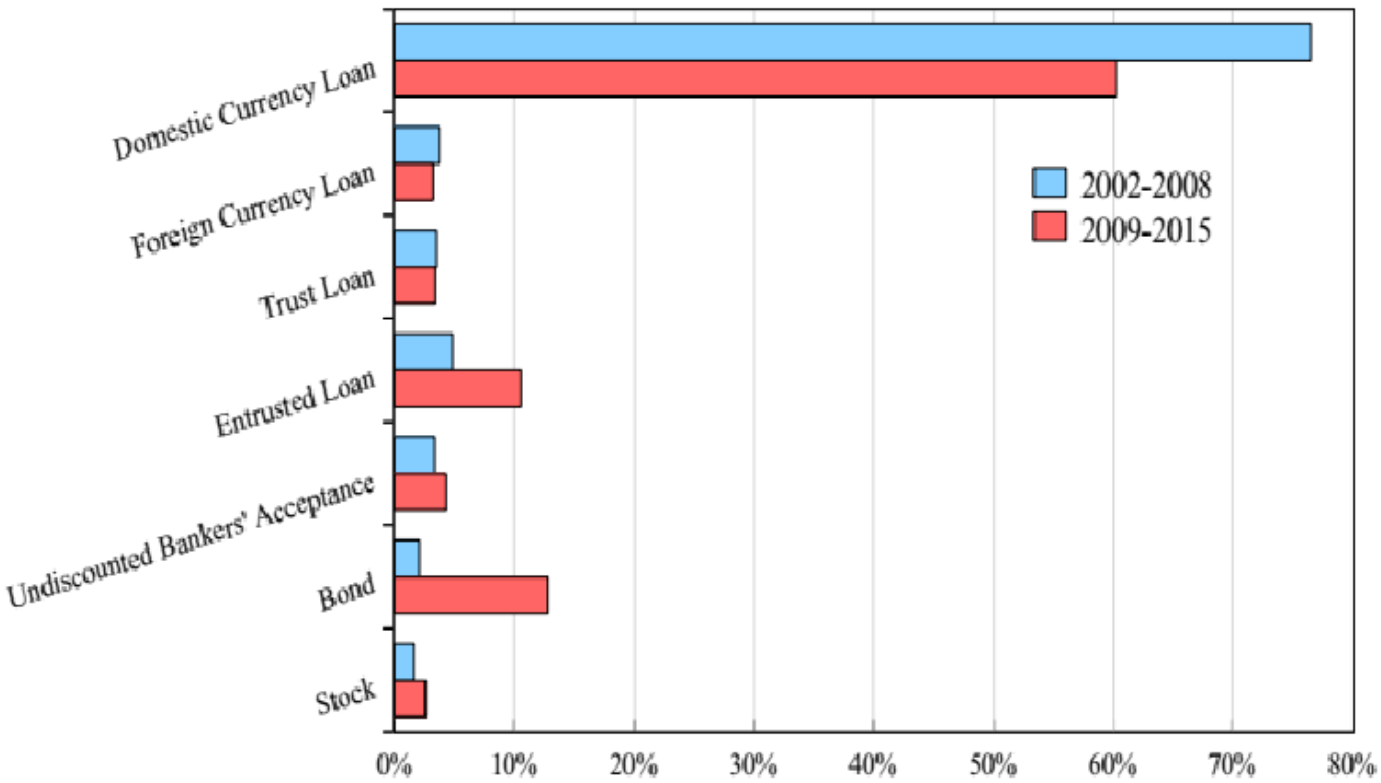
Introduction

Background

Considering the rapid development of China's shadow banking since 2010 and haunted by the severe crisis in the US financial system in 2008, more and more research concerning on China's shadow banking system. But the definition of shadow banking still debating, especially for China.

The "undiscounted bankers' acceptance" (BA), an important component of China's shadow banking was neglected due to data unavailable. It deserves seriously research.

Monthly average share of main components of AFRE



Main contents

- First of all, we present a remarkable cyclical behavior of guaranteed OBS: it grew stably from 2008 to 2010, but experienced supernormal fast growth during 2011–2014, then dropped sharply since 2015.
- After that, we investigate the mechanism behinds this cyclical behavior through a dataset we constructed, and get three main empirical conclusions.

Main empirical conclusions

- Chinese commercial bank's guaranteed OBS business has a stable long-run substitute relation with commercial loan business.
- contrary to existing research about China's shadow banking, Desirability Lending Policy (DLP), introduced by PBC to control commercial loan growth during 2011–2014 is the unique fundamental driving force; rather than traditional constraints, such as "capital adequacy ratio", "reserve requirement ratio" or "loan-to-deposit ratio", which were blamed for main reasons of shadow banking growth in China.
- guaranteed OBS growth is also influenced by macroeconomy, risk and return factors of itself, operation efficiency and creditworthiness of the bank.

Part 2

Related literature

Literature of shadow banking

- why does shadow banking exist
- how does shadow credit intermediation work
- why does shadow credit intermediation need to be regulated
- how should shadow credit intermediation be regulated

Literature of OBS development

- regulation avoidance theory
- moral hazard theory
- risk diversification theory
- market power theory
- scale economy theory

Part 3

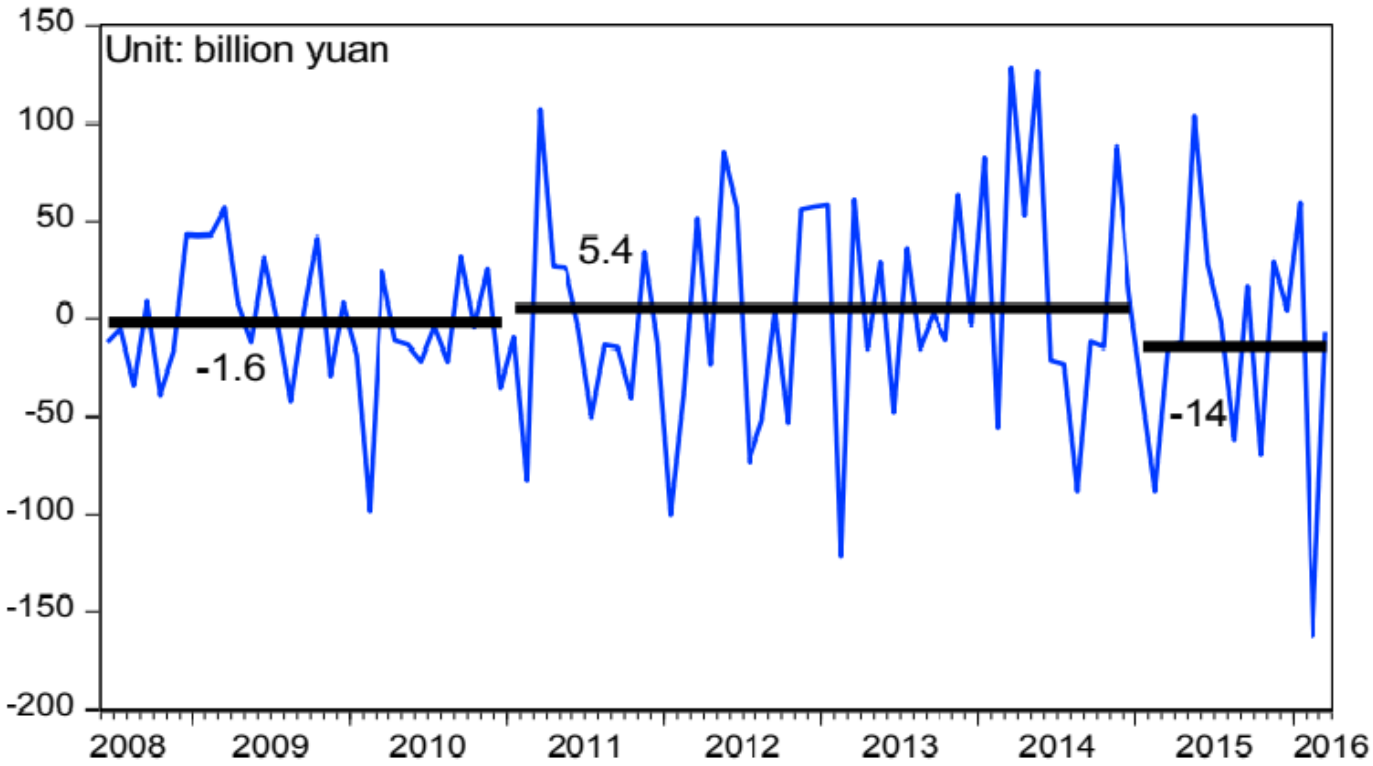
Stylized facts and institutional background

Stylized facts

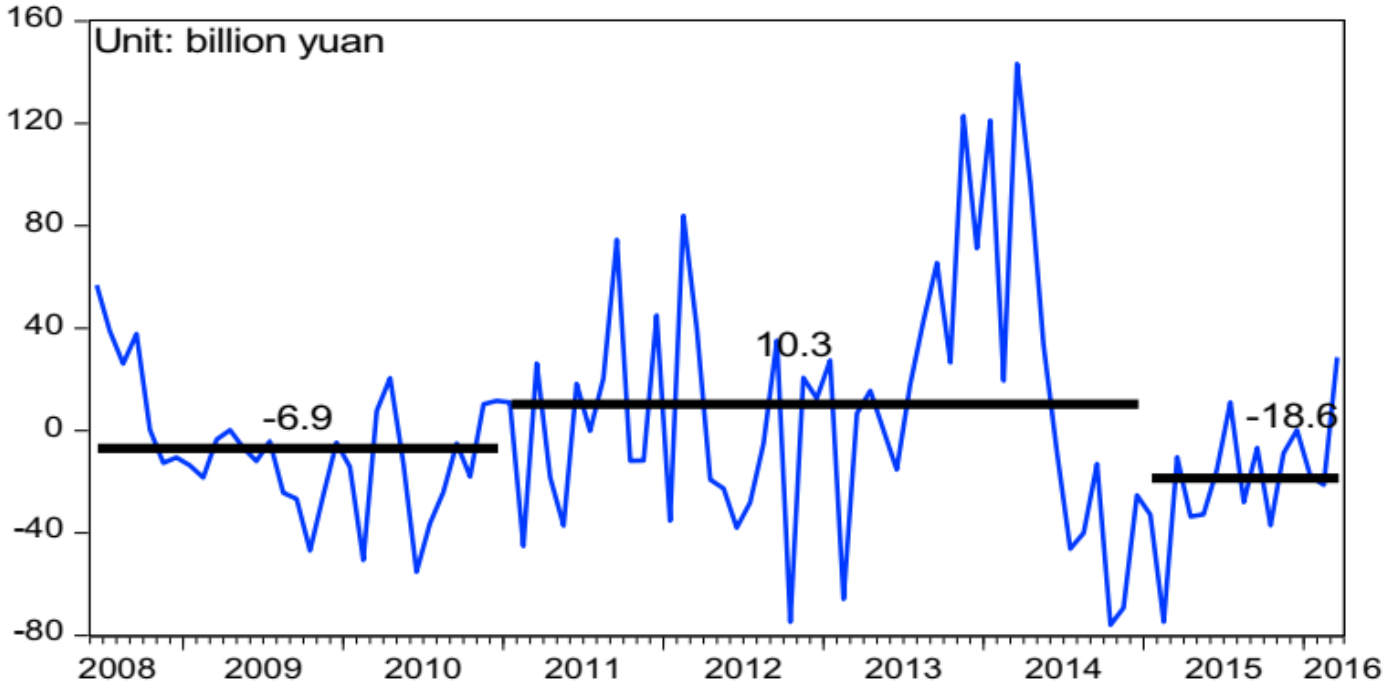
We find a remarkable cyclical behavior of new grant BA, L/C and L/G monthly data in Qingdao.

All these activities grew stably from 2008 to 2010, but experienced supernormal fast growth during 2011–2014, then dropped sharply since 2015.

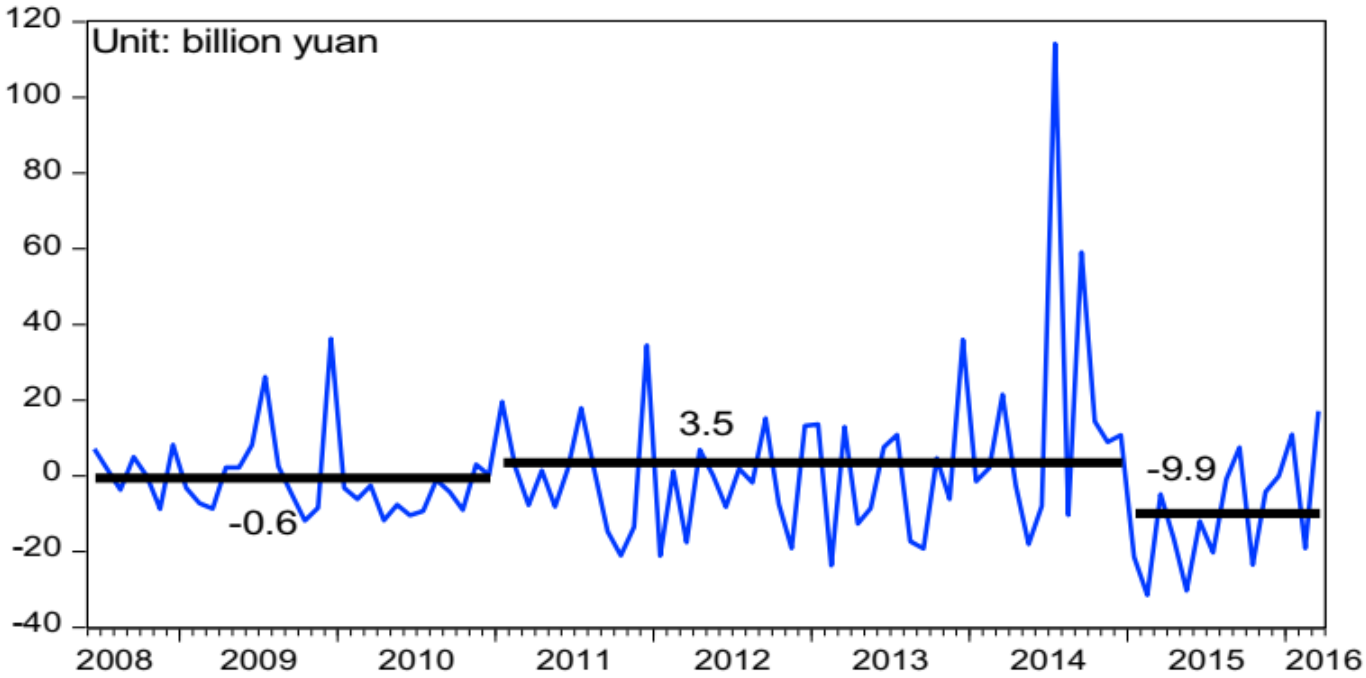
Cyclical behavior of bankers' acceptance in Qingdao



Cyclical behavior of letter of credit in Qingdao



Cyclical behavior of letter of guarantee in Qingdao



institutional background

The answer to the phenomenon is the "differentiated reserve requirement dynamic adjustment mechanism", a new macroprudential policy tool introduced by PBC at the beginning of 2011 and fade away around the end of 2014.

Model and propositions

Model

$$\pi(x,y,d) = (r+\tau)f(x,y) - r\theta(d+\mu x) - FC = (r+\tau)[a_1x^{\rho} + a_2y^{\rho}]^{\frac{1}{\rho}} - r\theta(d+\mu x) - FC$$

$$\max \pi(x,y,d)$$

$$s.t.\ \frac{K}{m(1-\mu)x + ny} \geq \delta$$

$$\frac{y}{d+\mu x} \leq R$$

CASE I

when $\rho \to 0$

$$y^* = \Phi x^* \qquad \frac{a_2 \lambda m(1-\mu)}{a_1(r\theta/R+\lambda n)} \equiv \Phi$$

$$x^* = \frac{K/\delta}{m(1-\mu)+n\Phi}$$

$$y^* = \frac{\Phi(K/\delta)}{m(1-\mu)+n\Phi}$$

CASE II

when $\rho \to -\infty$

$$y^* = x^*$$

$$x^* = y^* = \frac{K/\delta}{m(1-\mu)+n}$$

DLP constraint

DLP constraint can be written as $y \leq \overline{C}$

Then

$$x_r^* = \frac{K/\delta - n\overline{C}}{m(1-\mu)}$$

$$y_r^* = \overline{C}$$

$$d_r^* = \frac{\overline{C}}{R} - \mu x_r^*$$

Proposition 1

No matter what the value of ρ is, only if the minimum capital adequacy ratio σ does not change, then DLP will be the unique constraint has effect on optimal guaranteed OBS and commercial loan scale.

Proposition 2

Proposition 2-A. When $\rho \to 0$, commercial loan and guaranteed OBS exhibits substitute relation, if central bank wants to cool the economy and inflation rate by desirability lending restriction $y_r^* = \overline{C} < y^*$, then $x_r^* > x^*$ holds, thus the guaranteed OBS increase.

Proposition 2-B. When $\rho \to -\infty$, commercial loan and guaranteed OBS exhibits complement relation, if central bank wants to cool the economy and inflation rate by desirability lending restriction $y_r^* = \overline{C} < y^*$, then $x_r^* < x^*$ holds, thus the guaranteed OBS decrease.

Part 5

Empirical results

Data and method(Data sources)

Firstly, determine commercial banks and the time span included in the research.

Secondly, determine variables included in the econometric model.

commercial banks

Banks included in data.

Abbreviation of Bank Name	Bank Type	Numbers
ICBC, ABC, BOC, CCB, BCM	National big bank	5
China CITIC Bank, CEB, HXB, CMB, PAB, SPDB, HFB, CMBC, CIB	National medium bank	9
BQD, QLB, WFB, WHCCB, BRZ, BHB, QRCB	City bank	7

Variables in time series dataset

Main statistics of time series variables.

Group	Variable (Abbr., Unit)	Main Statistics				
		Max.	Min.	Mean	Median	Std. Dev
Commercial Loan and Guaranteed OBS	Commercial loan increment per month (loan, billion yuan)	28	−6	9	8	6
	Guaranteed OBS granted per month (offb, billion yuan)	104	20	54	55	19
Macroeconomy and Financial Environment	GDP (gdp, billion yuan)[7]	562	265	411	418	95
	Total retail sales of consumer goods (cons, billion yuan)	230	77	149	151	48
	Investment in fixed assets(inv, billion yuan)	371	106	221	212	78
	Total value of imports & exports (trade, billion dollars)	99	8	36	38	14
	CPI mom (cpi, %)	6.70	−0.60	2.49	2.30	1.58
	PPI mom (ppi, %)	9.24	−6.60	0.00	−0.74	3.60
	RMB effective exchange rate index (fxdex, 2010 = 100)	131	94	111	108	11
	Mid-price of RMB against Dollar (fx,¥/$)	6.85	6.10	6.45	6.35	0.28
Country-level Policy	**Dummy Variables (Abbr.)**	**Definition**				
	Desirability lending policy (DLP)	DLP = 1, Jan. 2011-Dec.2014				
		DLP = 0, Others				
	4 trillion fiscal stimulus packages (fiscal)	fiscal = 1, Nov.2008-Dec.2010				
		fiscal = 0, Others				

Variables in panel dataset

Group	Variable (Abbr., unit)	All Sample		National Big Commercial Bank		National Medium Commercial Bank		City Commercial Bank	
		Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Scale of Guaranteed OBS	Guaranteed OBS granted per month (offb, million yuan)	2486	1803	3721	1977	2639	1516	1171	1041
Risk & Return Factors of Guaranteed OBS	Margin deposit of guaranteed OBS per month (guardep, million yuan)	51	539	62	552	57	651	32	266
	Charge of guaranteed OBS per month (cha, million yuan)	5	7	7	5	6	8	2	3
	Risk exposure of guaranteed OBS per month (risk, million yuan)	50	997	50	1532	60	881	34	392
Scale of Commercial Loan	Commercial loan increment per month (loan, million yuan)	313	851	644	1114	186	802	225	523
Risk & Return Factors of Commercial Loan	Retrun of assets (roa,%)	0.89	0.70	1.04	0.75	0.86	0.69	0.79	0.65
	Non-performance loan ratio (nplr,%)	1.54	1.76	1.91	1.47	1.11	1.22	1.90	2.44
	Loan loss reserves increment per month (llr, 10 thousands yuan)	995	10871	2063	19889	459	4427	906	5507
Bank Type	**Dummy Variable (Abbr.)**	**Definitions**							
	Ownership type (owner)	owner = 0, National big commercial bank owner = 1, Others							
	Operation region (region)	region = 0, National banks region = 1, City banks							

Data and method(Econometric method)

- For time series data, we adopt VAR model to estimate the effect of DLP on guaranteed OBS growth.
- For panel data, this data set is a typical time-series-cross-section (TSCS) data.So Considering time dimension, we establish ADL model to capture the dynamic relationship between main variables. Considering cross-section dimension, there're two problems in practice: individual heterogenous problem and contemporaneous interdependence errors. In general, for the first problem we use FE estimation and for the second problem we use SUR estimation.

DLP's quantitative effect(VAR model)

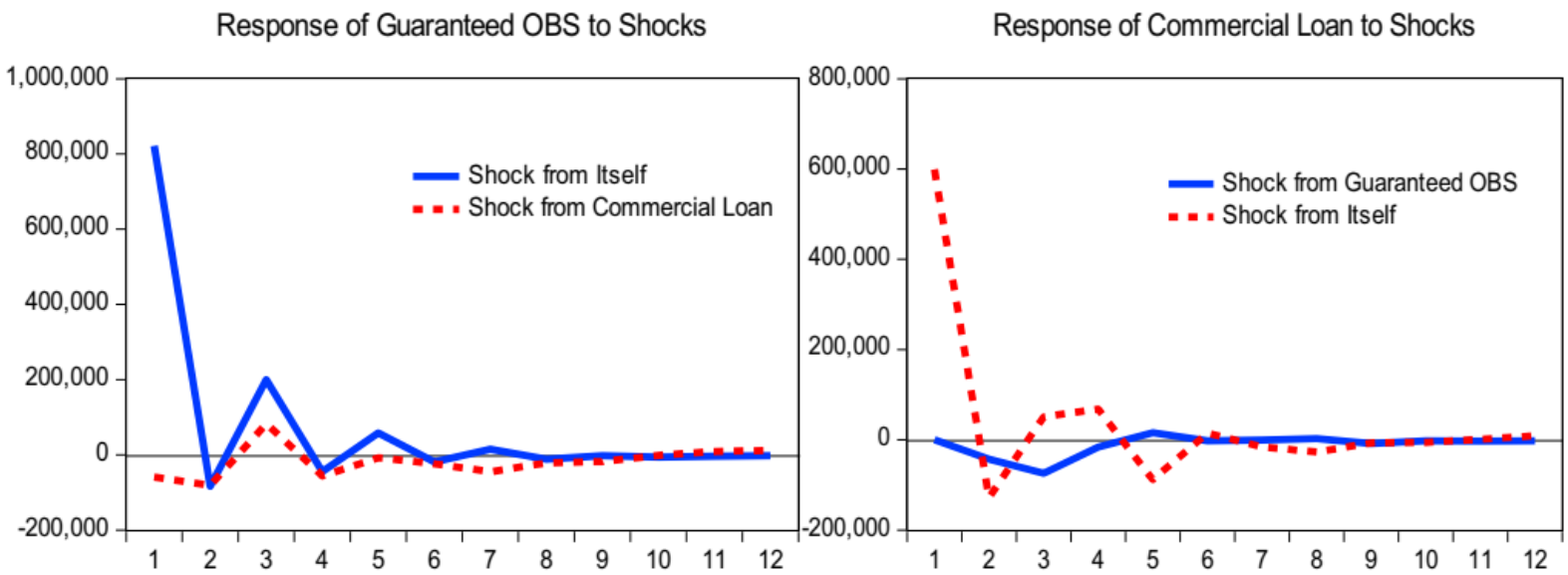
$$\begin{bmatrix} offb_t \\ loan_t \\ GDP_t \\ CPI_t \end{bmatrix} = \begin{bmatrix} a_{1,0} \\ a_{2,0} \\ a_{3,0} \\ a_{4,0} \end{bmatrix} + \sum_{l=1}^{p} \begin{bmatrix} a_{1,1} & \cdots & a_{1,4p} \\ \vdots & \ddots & \vdots \\ a_{4,1} & \cdots & a_{4,4p} \end{bmatrix} \begin{bmatrix} offb_{t-l} \\ loan_{t-l} \\ GDP_{t-l} \\ CPI_{t-l} \end{bmatrix} + \beta_1 DLP_t + \beta_2 fiscal_t + \beta_3 fxdex_t + \varepsilon_t$$

VAR model estimation results

Explained Variable: Guaranteed OBS (unit: billion yuan)				
Exogenous Variables	CPI Model		PPI Model	
DLP	6.600**		6.562**	
	(2.739)		(2.786)	
fiscal	1.575		1.310	
	(2.684)		(2.785)	
fxdex	−1.199*		−1.311*	
	(0.659)		(0.683)	
constant	1.609		2.378	
	(4.287)		(4.496)	
Main Statistics	Periods	90	Periods	90
	R-squared	0.258	R-squared	0.261
	AIC	30.25	AIC	30.25
	SBC	30.69	SBC	30.69

Note: Standard errors in parentheses; *** denotes significance on 1% level; ** denotes significance on 5% level; * denotes significance on 10% level.

Impulse response graphs of CPI model



Mechanism behinds the cyclical behavior(ADL model)

$$offb_{it} = \alpha_0 + A(L)\cdot offb_{it-1} + B(L)\cdot loan_{it-1} + \beta_0 \cdot loan_{it} \cdot DLP_t + \beta^T X_{it} + \varepsilon_{it}$$

ADL model estimation results

Group	Variable	LSDV		SUR	
		CPI Model	PPI Model	CPI Model	PPI Model
Scale of Commercial Loan	loan	−0.037	−0.040	−0.024	−0.027
		(0.025)	(0.025)	(0.020)	(0.019)
	loan(-1)	−0.013	−0.011	−0.019	−0.016
		(0.019)	(0.019)	(0.014)	(0.014)
	loan(-2)	0.015	0.014	0.008	0.008
		(0.019)	(0.019)	(0.014)	(0.014)
	loan(-3)	−0.031	−0.029	−0.001	0.001
		(0.019)	(0.019)	(0.014)	(0.014)
	loan(-4)	−0.049**	−0.049**	−0.042***	−0.042***
		(0.019)	(0.020)	(0.015)	(0.014)
	loan(-5)	−0.044**	−0.048**	−0.034**	−0.034**
		(0.020)	(0.020)	(0.015)	(0.015)
Country-level Policy	loan × DLP	0.076**	0.080**	0.061**	0.063**
		(0.034)	(0.035)	(0.028)	(0.027)
	fiscal	−9672.5*	−10930.3*	2746.1	3027.3
		(5464.7)	(5624.4)	(5588.0)	(5689.8)
Risk & Return Factors of Commercial Loan	nplr	−2171.7	−2361.4	−682.5	−825.0
		(2296.5)	(2318.9)	(1787.1)	(1781.5)
	llr	0.067	0.066	0.110	0.115
		(0.142)	(0.143)	(0.111)	(0.110)
	roa	11427.7***	11564.1***	7200.9***	7263.2***
		(3810.4)	(3848.2)	(2417.1)	(2410.3)
Risk & Return Factors of Guaranteed OBS	risk	0.351***	0.350***	0.340***	0.339***
		(0.025)	(0.025)	(0.020)	(0.020)
	cha	34.363***	34.690***	21.862***	21.644***
		(4.648)	(4.700)	(3.257)	(3.250)
	guardep	0.394***	0.395***	0.359***	0.359***
		(0.034)	(0.034)	(0.028)	(0.028)
Macroeconomy Environment	GDP	−59.335	−75.3	−178.7**	−226.9***
		(73.688)	(77.4)	(80.5)	(83.9)
	CPI/PPI	−5173. 5***	−78.4	−3781.7**	390.0
		(1617.0)	(499.3)	(1757.1)	(538.8)
	fxdex	−2081.4**	−1745.7*	−2181.9**	−2320.0**
		(934.0)	(961.8)	(1004.7)	(1025.0)
Bank Type	owner			−24292.6***	−24131.3***
				(5616.0)	(5616.5)
	region			−16192.1***	−16234.2***
				(3701.0)	(3701.1)
Others	constant	57707.6***	59735.3***	44580.1***	46055.4***
		(8713.8)	(8858.8)	(9422.8)	(9544.6)
	trend	yes	yes	yes	yes
Main Statistics	Obs = 1747	Adj-R^2 = 0.839	Adj-R^2 = 0.837	Adj-R^2 = 0.794	Adj-R^2 = 0.793
		F-Stat = 216.99	F-Stat = 214.43	F-Stat = 280.75	F-Stat = 279.40
		D.W. = 2.02	D.W. = 2.01	D.W. = 2.00	D.W. = 2.01

Note: Standard errors in parentheses; *** denotes significance on 1% level; ** denotes significance on 5% level; * denotes significance on 10% level.

Robustness tests(ECM estimation results)

Variables	CPI Model	PPI Model
Long-run Equilibrium Relation		
loan	−0.184**	−0.171**
	(0.077)	(0.076)
Short-run Dynamic Relation		
Error-Correction term	−0.691***	−0.719***
	(0.072)	(0.070)
loan × DLP	0.203***	0.203***
	(0.041)	(0.040)
nplr	−6076.9	−3405.7
	(8429.8)	(8246.6)
roa	24917.9**	32626.9***
	(10138.1)	(8642.4)
risk	0.356***	0.346***
	(0.047)	(0.046)
cha	224.9**	227.0**
	(89.8)	(90.8)
guardep	0.445***	0.441***
	(0.072)	(0.069)
GDP	23.9	24.1
	(115.7)	(125.0)
CPI/PPI	−4955.4*	−41.2
	(2762.9)	(825.4)
fxdex	−56.5	221.5
	(1695.3)	(2091.2)
constant	32176.4**	31564.9**
	(13675.9)	(14906.7)
trend	yes	yes

Conclusion

Conclusion

Different from existing research, which believe traditional regulatory constraints, such as “capital adequacy ratio”, “reserve requirement ratio” or “loan-to-deposit ratio”, are main forces deriving China’s shadow banking. In this paper, we prove the DLP, a macroprudential policy tool introduced by PBC, is the unique fundamental reason.

The policy implication of this paper is obvious. It proves that directly manage commercial loan growth to cool the overheat economy is ineffective.

The End!Thanks!