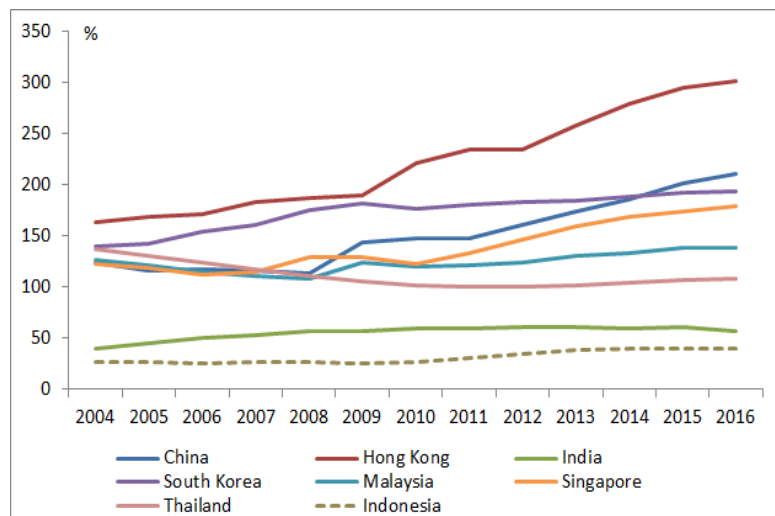# Interlinks of macro-prudential policy, banking characteristics, and the bank lending channel in Indonesia and other major Asia economies

The views expressed in this paper are of the author's only and do not necessarily reflect those of Bank Indonesia. All errors are the author's only.
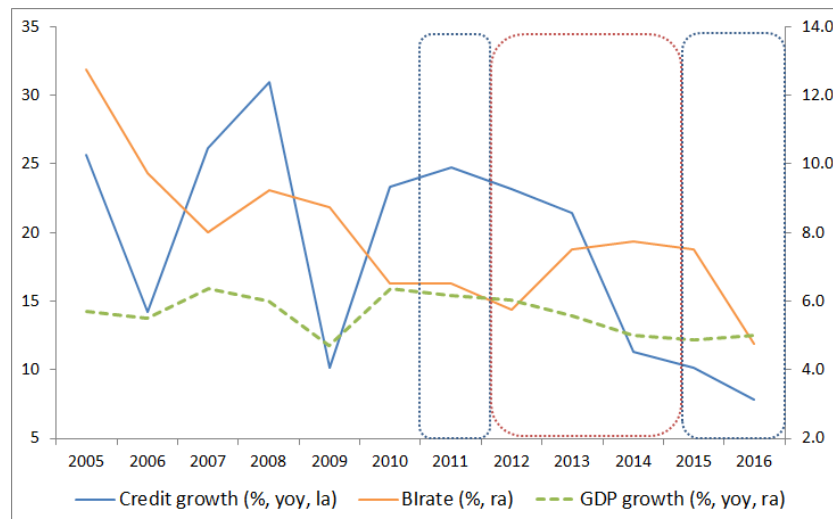
Motivation

- Credit growth is a key driver for economy growth.

- Low credit growth may hamper the economy growth, but excessive growth may fuel greater risks for macro and financial stability.

- Effectiveness of monetary and macro-prudential polices to manage credit growth.

Graph 1. Credit/GDP Major Asia Countries

Graph 2. Indonesia credit, GDP growth, CB rate

Sources: BIS statistics and Bank Indonesia

The blue rectangular boxes represent loosening periods while the red rectangular box indicates tightening periods of macro-prudential policy.

Objective & Research questions

What factors drive credit growth in Indonesia and Asian economies?

- Funding liquidity ?

- Capitalization?

- Stability sources of funding?

- Off-b/s (credit commitment) activities?

- Monetary interest rate policy (bank lending channel)?

- Macro-prudential policy?

- Interaction of banking characteristics with monetary and macro-prudential policy?

- Interaction of monetary and macro-prudential policy?

Literature review

- Credit growth & monetary policy (bank lending channel)

  → Bernanke&Blinder (1992), Kashyap&Stein (1994), Morris&Sellon (1995), Gambacorta & Marques-Ibanez (2011).

- Credit growth & macro-prudential policy

  → cross countries evidence: Claessens, *et al* (2011), Lim, *et al* (2011), Zhang&Zoli (2014), Cerutti, *et al* (2017),

  → case study of a country: Igan&Kang (2011), Wong, *et al* (2011), Jimenez, *et al* (2012), Aiyer, *et al* (2014).

- Credit growth & banking characteristics (liquidity, off-b/s activities, sources of financing, capital)

  → Bernanke & Lown (1991), Peek & Rosengreen (1995), Kashyap, et al (2002), Cornett, et al (2010), Gambacorta & Marques-Ibanez (2011), Kapan & Minoiu (2013), Berrospide & Meisenzahl (2015).

Data

▸ **Indonesia case:** quarterly macro-economic and individual data of 94 Indonesian commercial banks over the period of 2005-2016.

▸ **Other Asia case:** annual macro-economic and individual data for 74 banks in China, India, South Korea, Hong Kong, Singapore, Thailand, Malaysia, and Philippine over 2004-2015.

▸ **Dummy variables of macro-prudential policy (MPI):**

- Indonesia case, MPI = 1 for loosening periods, -1 for tightening, and 0 otherwise

- Other Asia case, MPI=1 for tightening periods and -1 for loosening periods.

Date	Macro-prudential measures in Indonesia
March 2011	initial implementation of RRLDR to increase credit growth within manageable liquidity risk, tolarable LDR range:78%-100%
September 2012	initial implementation of loan-to-value ratio (LTV) with upper limit at 70%
September 2013	tightening LTV (for second, third, etc house purchases) to contain high house price growth
December 2013	decreasing upper bound of the RRLDR due to high liquidity pressure in banking system, tolarable LDR range : 78%-92%
June 2015	loosening LTV from 70% to 80%
August 2016	increasing lower bound of RRLDR to increase credit growth, tolarable LDR range: 80%-92%
	loosening LTV from 80% to 85%

	Loosening periods	Tightening periods
Singapore	2004-2009	2010-2015
HongKong	2004-2008	2009-2015
Malaysia	2008-2009	2004-2007, 2010-2015
China	2008-2009, 2014-2015	2004-2007,2010-2013
India	2009	2004-2008, 2010-2015
South Korea	2008, 2010, 2014-2015	2004-2007, 2009, 2011-2013
Thailand	2008-2009	2004-2007, 2010-2015
Philippine	2008-2010	2004-2007, 2011-2015

Methodology (1)

- Expanding/ modifying Kashyap & Stein (1994), Gambacorta & Marques-Ibanez (2011)

$$\Delta log(credit)_{ijt} = \theta \Delta log(credit)_{ijt-1} + \gamma \Delta log(GDP)_{jt-k} + \alpha \Delta log(CPI)_{jt-k} + \varphi MPI_{jt-k} + \left(\beta + \beta^* MPI_{jt-k}\right) \Delta CB_{jt-k} + \left(\delta + \delta^* MPI_{jt-k}\right) X_{ijt-k} + \pi X_{ijt-k} \Delta CB_{jt-k} + \varepsilon_{ijt}$$

(1)

- For Indonesia, two-period implementation of loosening MP policy: MPI1(Q1 2011-Q2 2012) and MPI2(Q3 2015 - Q4 2016)

$$\Delta log(credit)_{it} = \theta \Delta log(credit)_{it-1} + \gamma \Delta log(GDP)_{t-k} + \alpha \Delta log(CPI)_{t-k} + \varphi_1 MPI1_{t-k} + \varphi_2 MPI2_{t-k} + \left(\beta_1 + \beta_1^* MPI1_{t-k}\right) \Delta CB_{t-k} + \left(\beta_2 + \beta_2^* MPI2_{t-k}\right) \Delta CB_{t-k} + \left(\delta_1 + \delta_1^* MPI1_{t-k}\right) X_{it-k} + \left(\delta_2 + \delta_2^* MPI2_{t-k}\right) X_{it-k} + \pi X_{it-k} \Delta CB_{t-k} + \varepsilon_{it}$$

(2)

Methodology (2)

Independent variables	Variables' description	Expected sign
LA/D	Ratio of liquid assets (cash, placement at the central bank, and high-grade securities) to deposit (%).	+
Committed credit	Ratio of undisbursed committed loan to sum of total asset and undisbursed committed loan (%).	+/-
NC/D	Ratio of unstable funds or non-core deposit (wholesale funds, short- term debts or market-based funding) to stable funds (deposit) (%).	-
Cap_buffer	Deviation of realized Capital Adequacy Ratio (CAR) to regulatory minimum capital requirement ratio (%). It is ratio of equity to total asset Eq/TA for other Asia economies.	+/-
Δlog(GDP)	The quarterly change of log of gross domestic product.	+
ΔCB	The quarterly change of monetary policy interest rate.	-
Δlog(CPI)	The quarterly change of log of Consumer Price Index	+/-
MPI	Indonesia: loosening phase 1 & 2 of macro-prudential policies are coded 1, tightening phase is coded -1. Other Asia: tightening phases are coded 1, loosening ones are -1.	Indonesia: + Other Asia: -

Methodology (3)

▸ Dynamic panel model: Two-step Arellano-Bover/Blundell-Bond Generalized Method of Moments (GMM).

▸ A consistent estimator, subject to θ of $\Delta log(credit)_{it-1}$ of GMM lies between those of FELS (downward bias) and OLS (upward bias) (Bond (2002), Roodman (2006)).

▸ Otherwise, utilize FELS with Nickel bias $\frac{1}{T-1}$

　▸ For large T, dynamic panel bias is insignificant,

　▸ Number of instruments tend to explode with T (Roodman, 2006).

▸ Endogeneity : utilizing lagged of explanatory variables

Indonesia case

	Dependent Variable: Δlog (credit)		
	GMM Arrelano-Bover/Blundell-Bond	OLS	FELS
	All banks	All banks	All banks
Δlog (credit) (-1)	0.047	0.243***	0.182***
LA/D (-2)	0.855**	0.658***	1.033***
NC/D(-4)	-1.090***	-0.341***	-0.901***
Committed credit (-4)	-1.160**	-0.547***	-0.255
Cap_buffer (-2)	1.832***	0.575***	0.771***
ΔCB (-2)	-0.572*	-0.611***	-0.497***
Δlog(GDP) (-1)	0.292***	0.257***	0.258***
Δlog(CPI) (-2)	0.240**	0.227***	0.164
MPI1 (-1)	0.596	0.788***	0.664**
MPI1 (-1)*ΔCB (-2)	-2.955***	-3.084***	-3.221***
MPI1 (-1)*LA/D (-2)	1.426	0.706**	0.981**
MPI1 (-1)*NC/D (-4)	-0.472	0.117	-0.021
MPI1 (-1)*Committed_credit (-4)	-0.883	0.021	0.048
MPI1 (-1)*Cap_buffer (-2)	-1.306	-0.678***	-1.009***
MPI2 (-1)	-1.452**	-1.548***	-1.690***
MPI2 (-1)*ΔCB (-2)	3.638**	3.400***	3.266***
MPI2 (-1)*LA/D (-2)	-2.817*	-1.196***	-1.605***
MPI2 (-1)*NC/D (-4)	-0.080	-0.600***	-0.559*
MPI2 (-1)*Committed_credit (-4)	-0.883	-0.540**	-0.469
MPI2 (-1)*Cap_buffer (-2)	-1.306	0.356	0.405
ΔCB (-2)*LA/D (-2)	0.010	-0.098	-0.080
ΔCB (-2)*NC/D (-4)	-0.232	-0.440**	-0.413**
ΔCB (-2)*Committed_credit (-4)	0.035	-0.294*	-0.286*
ΔCB (-2)*Cap_buffer (-2)	0.069	-0.084	-0.093
cons	2.815***	2.019***	2.377***
Time fixed effect	No	No	No
Bank fixed effect	No	No	Yes
R-sqr		0.17	0.15
No obs	3621	3621	3621

Note: *, **, *** indicate statistical significance at the level of 10%, 5%, and 1%, respectively

# Indonesia case: credit risk (NPL) & price efficiency (NIM)

	Dependent Variable: Δlog (credit)	
	All banks	**All banks**
Δlog (credit) (-1)	0.167***	0.164***
LA/D (-2)	1.062***	1.072***
NC/D(-4)	-0.840***	-0.747***
Committed credit (-4)	-0.210	-0.176
Cap_buffer (-2)	0.897***	0.843***
NPL (-2)	-1.084***	-1.044***
NIM (-2)	-0.743***	-0.703***
ΔCB (-2)	-0.500***	-0.670***
Δlog(GDP) (-1)	0.288***	0.277***
Δlog(CPI) (-2)	0.221**	0.200**
MPI1 (-1)	0.716**	0.741*
MPI1 (-1)*ΔCB (-2)	-2.893***	-2.841***
MPI1 (-1)*LA/D (-2)	0.834*	0.782*
MPI1 (-1)*NC/D (-4)	0.008	
MPI1 (-1)*Committed_credit (-4)	0.079	
MPI1 (-1)*Cap_buffer (-2)	-0.957**	-0.927***
MPI1 (-1)*NPL (-2)		0.529
MPI1 (-1)*NIM (-2)		-0.318
MPI2 (-1)	-1.519***	-1.384***
MPI2 (-1)*ΔCB (-2)	3.253***	2.892***
MPI2 (-1)*LA/D (-2)	-1.476***	-1.324**
MPI2 (-1)*NC/D (-4)	-0.555**	
MPI2 (-1)*Committed_credit (-4)	-0.457	
MPI2 (-1)*Cap_buffer (-2)	0.502	0.343
MPI2 (-1)*NPL (-2)		-0.605
MPI2 (-1)*NIM (-2)		0.636*
ΔCB (-2)*LA/D (-2)	-0.152	-0.122
ΔCB (-2)*NC/D (-4)	-0.393**	
ΔCB (-2)*Committed_credit (-4)	-0.324**	
ΔCB (-2)*Cap_buffer (-2)	-0.106	-0.124
ΔCB (-2)*NPL (-2)		0.096
ΔCB (-2)*NIM (-2)		0.250**
cons	2.217***	2.305***
Time fixed effect	No	No
Bank fixed effect	Yes	Yes
R-sqr	0.17	0.16
No obs	3565	3567

Note: FELS result. *, **, *** indicate statistical significance at the level of 10%, 5%, and 1%, respectively
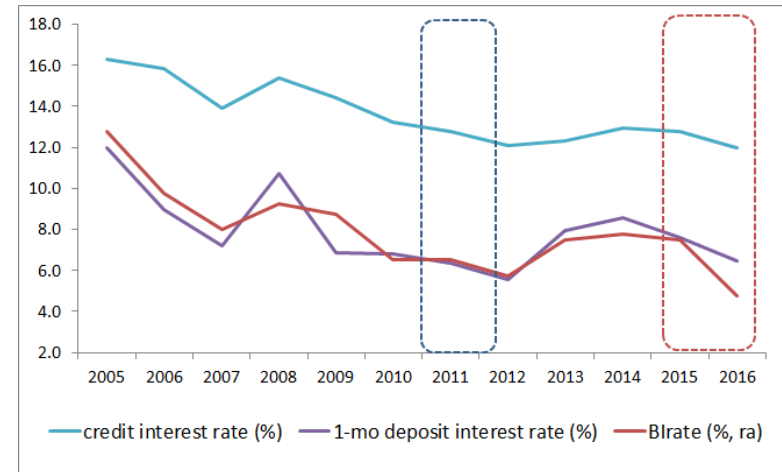
Indonesia case: *A rise of risk-averse behaviour due to liquidity and credit risk pressure leads to lower credit growth*

Graph 3. Liquidity, credit risk, & credit growth

Legend: LA/D (%, la) — Credit growth (%, la) — NPL (%, ra)
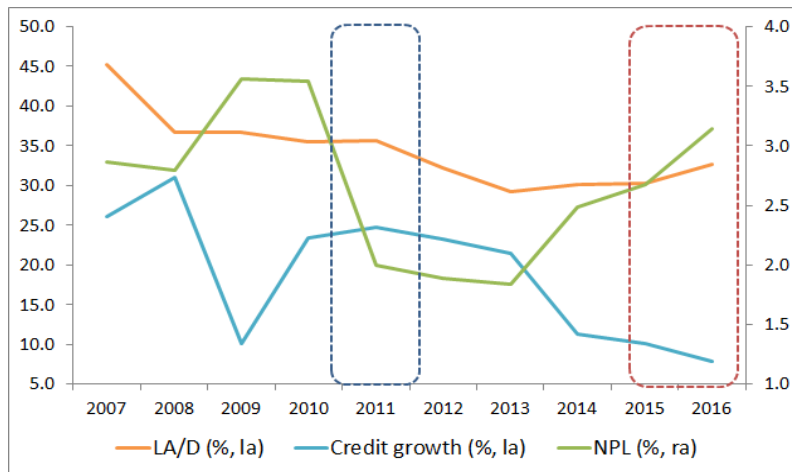
Graph 4. Retail interest rates and monetary (BI) rate

Legend: credit interest rate (%) — 1-mo deposit interest rate (%) — BIrate (%, ra)

Data sources: Bank Indonesia and OJK

The blue rectangular box represents phase I of MP while the red rectangular box indicates phase II of MP policy.

Other Asian Case

	Dependent Variable: Δlog (credit)			Dependent Variable: Δlog (credit)		
	GMM Arrelano-Bover/Blundell-Bond	OLS	FELS	GMM Arrelano-Bover/Blundell-Bond	OLS	FELS
Δlog (credit) (-1)	0.103*	0.283***	0.072	0.105*	0.283***	0.074*
LA/D (-1)	2.175*	0.302	0.808	2.213**	0.324	0.773
NC/D(-1)	-4.116*	-0.207	-3.525***	-3.944**	-0.181	-3.230***
Offbs (-1)	3.062**	1.345***	1.958***	2.847*	1.597***	1.845***
Eq/TA (-1)	-3.861**	-0.585	-2.531*	-3.976**	-0.598	-2.509*
ΔCB (-1)	-0.454*	-0.624***	-0.065	-0.487**	-0.632***	-0.058
Δlog(GDP) (-1)	0.287***	0.483***	0.585***	0.335***	0.488***	0.579***
Δlog(CPI) (-1)	-0.781**	-0.514**	-1.654***	-0.988***	-0.542***	-1.635***
MPI (-1)	-1.527**	-1.644***	-1.460***	-1.726**	-1.630***	-1.470***
MPI (-1)*ΔCB (-1)	0.146	-0.052	-0.077	0.118	-0.088	-0.062
MPI (-1)*LA/D (-1)	0.044	0.249	-0.014			
MPI (-1)*NC/D (-1)	-0.015	0.121	-0.105			
MPI (-1)*Offbs (-1)	0.027	0.502	-0.222			
MPI (-1)*Eq/TA(-1)	-1.450	-0.697	-0.335	-1.211	-0.585	-0.346
ΔCB (-1)*LA/D (-1)	0.401	0.274	0.094			
ΔCB (-1)*NC/D (-1)	-0.140	-0.071	-0.163			
ΔCB (-1)*Offbs (-1)	0.032	0.502	0.140			
ΔCB (-1)*Eq/TA (-1)	0.626***	0.419**	0.478***	0.649***	0.442**	0.531***
cons	14.141***	7.771***	14.958***	14.618***	7.789***	14.833***
Time fixed effect	No	No	No	No	No	No
Bank fixed effect	No	No	Yes	No	No	Yes
R-sqr		0.35	0.29		0.34	0.29
AR 1 (z-stat)	-4.726***			-4.723***		
AR 2 (z-stat)	-1.002			-1.377		
No obs	575	653	653	583	653	653

Conclusion: Indonesia case

‣ Higher credit growth is attributed to prior higher liquidity, less reliable to unstable sources of funds, higher capital buffer, and lower credit risk.

‣ The effectiveness of accommodative macro-prudential policies to improve credit growth is diminished across time.

‣ The ineffectiveness of both loosening monetary and macro-prudential policies to improve credit growth since 2015 is due to intensifying of banking risk averse behaviour:

  ➢ a prior low liquidity level encourages them to set a higher liquidity level

  ➢ rising credit risk triggers banks to keep credit interest rate relatively high.

‣ Policy challenges in Indonesia are to address a sensible balance of the trade-off between banking stability and (credit) growth.

Conclusion: Asian case

▸ Higher credit growth is attributed to prior higher liquidity, less reliable to unstable sources of funds, lower capital buffer, and intense off-b/s activities.

▸ Lower (higher) monetary interest rates leads to higher (lower) credit growth, the economic impact is somewhat small.

▸ Moderate effectiveness of tightening macro-prudential policies to curb credit growth.

Further concern

◉ Potential asymmetric impact of macro-prudential measures: are (tightening) macro-prudential measures more effective for restricting credit growth than (loosening) for promoting credit growth?

◉ Effectiveness of (loosening) policies is subject to bank's risk condition.

▸

Appendix: Descriptive statistics

Indonesia

	Δ log(credit) (%)	LA/D (%)	NC/D (%)	Committed credit (%)	Cap_buffer (%)	NIM (%)	NPL (%)	ΔGDP (%)	ΔCB (%)	ΔCPI (%)
Mean	4.66	35.04	7.54	5.05	11.95	5.97	3.02	3.45	-0.06	1.61
Median	4.13	31.46	4.60	2.44	9.85	5.37	2.21	4.40	0.00	1.55
Min	-18.24	6.22	0.00	0.00	-2.35	1.32	0.00	-2.82	-1.50	-1.26
Max	39.60	99.95	46.04	30.31	46.24	15.65	51.33	10.31	2.75	9.60
Std. deviation	7.22	15.73	8.35	5.89	8.00	2.59	3.83	3.24	0.73	1.75
No. obs	4419	4413	4286	4467	4226	4446	4438	4418	4418	4418

Other Asia

	Δ log(credit) (%)	LA/D (%)	NC/D (%)	Offbs (%)	Eq/TA (%)	ΔCB (%)	ΔCPI (%)
Mean	15.34	20.96	58.19	21.31	7.75	-0.04	3.67
Median	15.11	18.43	18.33	20.25	7.19	0.00	3.18
Min	-14.30	3.48	0.77	0.00	1.18	-12.70	-0.90
Max	64.92	71.81	1494.40	71.52	15.98	8.90	9.80
Std. deviation	12.46	22.83	180.47	13.90	2.95	2.64	2.36
No. obs	784	858	858	844	857	814	814