Reserve Requirements as a Financial Stability Instrument

6th Annual Conference of the BCC programme
Coping with spillovers from policy normalization in advanced economies

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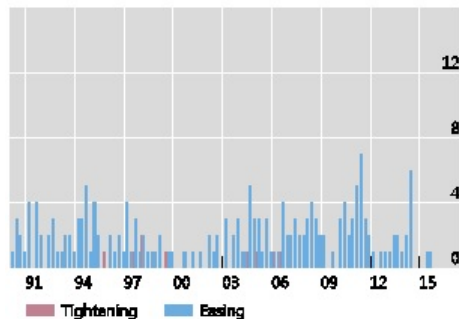[1]Bank for Interational Settlements

[2]Central Reserve Bank of Peru

27-28 September, 2018
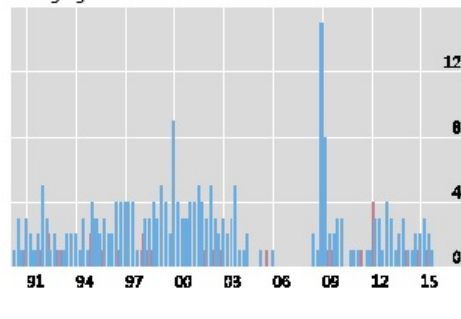
Motivation

Reserve requirement index

Number of countries

Advanced economies

Emerging market economies

Tightening   Easing

Source: Federico, Vegh and Vuletin (2014); author's calculations.

Non-technical Summary

Focus
What is the trade-off between using reserve requirements (RR) as a macroprudential tool to prevent the buildup of financial vulnerabilities vs using it as a financial policy tool to smooth credit cycles?

Contribution
We estimate the impact of RR through a cost-benefit analysis that considers financial cycle smoothing and financial risk build-up. First, we calculate the expected losses after a tightening of RR. Then we compare it to the benefit in terms of the reduction in financial risk buildup as determined by the expected credit/output gains as a result of lower probabilities of financial distress.

Findings
1. The trade-off gives more weight to the lower incidence and frequency of financial distress compared to the cost of reducing credit growth through the cycle.
2. RR have a greater effect for emerging markets (EME) than for advanced economies (AE).
3. Single RR and RR by maturity have a greater effect than RR by currency.

Data

- Sample: 28 countries (5 AE/23 EME), data from 1996Q1 to 2015Q3.
- RR index constructed with legal changes.[1]

RR Index

Average RR index
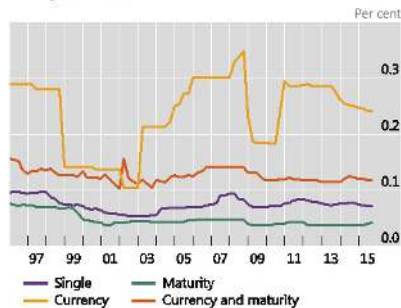
RR by type

Single	Currency & Maturity	
Bangladesh	Argentina	Poland
China	Costa Rica	Romania
Colombia	Turkey	
Ecuador	**Currency**	**Maturity**
India	Croatia	Brazil
Indonesia	Peru	Czech Rep
Lithuania		France
Malaysia		Germany
Pakistan		Hungary
Philippines		Latvia
Singapore		Portugal
Thailand		S. Africa
		Spain

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[1] Federico, Vegh and Vuletin (2014)

Motivation: Theoretical models

- Fernandez and Guidotti (1996): changes in RR affects bank funding structure (mix between capital and deposits)
- Glocker and Towbin (2011): increase RR as tax on deposits
    - fall in deposit rate, deposits and increase in consumption. Lower bank funding leads to lower credit and investment.
    - In a SOE, lower capital inflows, exchange rate depreciation, higher net exports.
- Aikman et al (2016) tightening of MaPP tool reduces credit growth and the probability of financial crisis.

Related Literature

- Behn et al (2016): empirical cost-benefit analysis of using capital based MaPP at the bank level for EU countries.
- Cordella et al (2012): RR as an effective instrument for countercyclical policies when there are concerns of effects of MP on exchange rates.
- Montoro and Moreno (2011): use of RR in Latin America, tightening of financing conditions without attracting capital inflows.

Smoothing of credit cycles

We estimate the following VAR:[2]

$$Y_t = a_0 + \sum_{i=1}^{p} A_i Y_{t-i} + \sum_{i=1}^{p} B_i X_{t-i} + U_t, \quad E(U_t U_t') = \Sigma \tag{1}$$

- $Y_t = IPI_t, CPI_t, BC2GDP_t, REER_t{}^3, IR_t, RR_t, CBRes_t, Cap_t$
- $X_t = GRisk_t, GLiq_t, GIR_t, GCommP_t$

- Financial costs are given by the response of bank credit over GDP ($BC2GDP$) to a one standard deviation shock in RR.
- Macroeconomic costs are given by the response of industrial production (IPI) to a one standard deviation shock in RR.

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[2]All variables in yoy growth rates, except IR and GIR in deviations
[3]Appreciation=Increase, Depreciation = Decrease

Impulse Response Functions: RR shock

Impulse response of a shock on reserve requirements

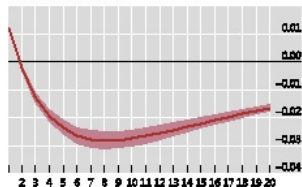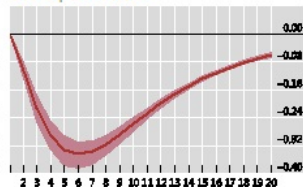Percentage points   Graph 2
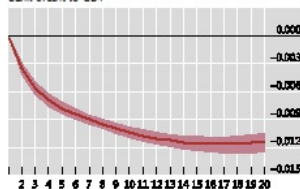
Source: Author's calculations.

Impulse Response Functions: MP shock

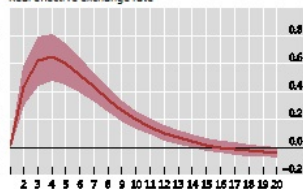Impulse response of a shock on interest rate

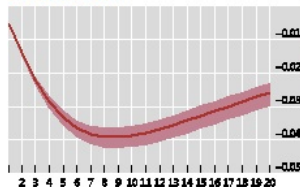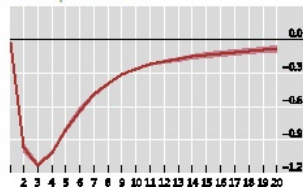Percentage points

Graph 1 Annex

Bank credit to GDP

Real effective exchange rate

Central bank reserves

Industrial production index

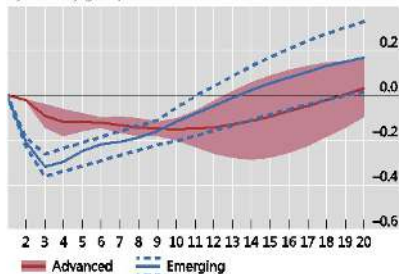Source: Author's calculations.

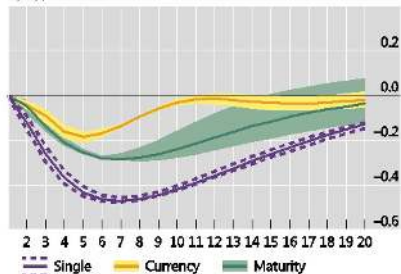# Financial costs by group and type of RR
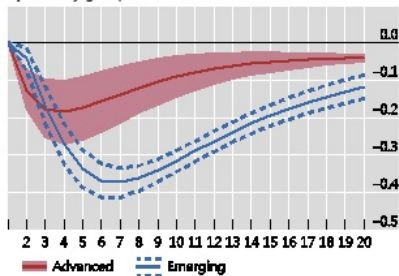

Response to a one s.d. shock of RR

Macroeconomic costs by group and type of RR
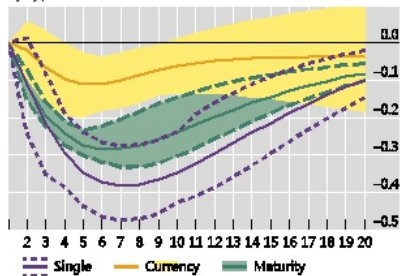

Response of the annual growth of industrial production index to generalized one s.d. shock of RR

Graph 3

By country group

By type of RR

Advanced — Emerging

Single — Currency — Maturity

Impact of global financial factors on domestic variables in EME

1. Global risk generates an exchange rate depreciation (capital outflows/flight to quality?), lower output growth, higher inflation
2. MP normalistaion in AE: lower global liquidity and higher MP rates in AE
   1. Lower liquidity in global financial markets: exchange rate depreciation and reduction in IPI growth,f lower external funding for domestic banking sector in EME.
   2. Increase in MP rates: Exchange rate depreciation, lower external funding to EME, lower credit growth and IPI growth.
   3. RR are expected to be used as a complement to domestic MP by reacting countercyclically to smooth credit cycles while MP reacts to contain inflationary pressures coming from XR passthrough to inflation.

Impact of global financial factors on domestic variables in EME

Table: Effect of global variables on domestic variables

	Grisk	GIR	GLiq	GGrowth	GCommP
IPI	$-0.009*$	$-0.546*$	$0.264*$	$0.439*$	$0.040*$
REER	0.000	$-0.788*$	$0.003*$	$0.127*$	$0.018*$
Credit to GDP	0.000	$-0.001*$	0.000	0.000	0.000
Interest rate	$0.005*$	$0.140*$	$0.040*$	$-0.082*$	$-0.003*$
RR index	0.000	$-0.001*$	0.000	0.000	0.000

$*, **, ***$ refer to $P-value < 1\%$, 5% and 10%, respectively.

Buildup of Financial Risk

1. For each country i date financial stress episodes $y_{it} = 1$.
2. Estimate a logistic-based early warning system model

$$P(y_{it} = 1) = \frac{exp(\alpha_i + X'_{it}\beta)}{1 + exp(\alpha_i + X'_{it}\beta)} \qquad (2)$$

$X_{it} = RR$, Credit to GDP gap, GDP, inflation, policy rate, exchange rate, plus global and banking sector controls.
3. Benefit = -Δ prob * credit (IPI) loss

Financial Distress Index

Index of financial distress in stock market (STX)

$$VSTX = \frac{\sum_{i=0}^{19} |\Delta log(r\tilde{STX}_{t-i})|}{20}, \quad CSTX_t = 1 - \frac{rSTX_t}{max_{i=0}^{521} rSTX_{t-1}} \qquad (3)$$

Index of financial distress in exchange rate market (FX)

$$VFX = |\Delta log(R\tilde{EER}_t)|, \quad CFX_t = |REER_t - REER_{t-6}| \qquad (4)$$
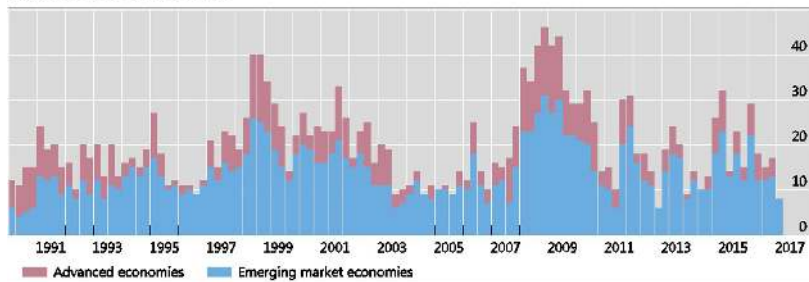
Aggregation

$$\hat{Z} = F_n(Z_t < Z) \quad Z_t \in VSTX, CSTX, VFX, CSTX$$
$$I_{STX} = \frac{VSTX + CSTX}{2} \quad I_{FX} = \frac{VFX + CFX}{2}$$

Financial distress index (FSI)

$$FSI_t = I_t \cdot C_t \cdot I_t' \qquad I_t = [I_{STX}, I_{FX}] \qquad (5)$$

Financial Distress Episodes

Financial distress episodes

Advanced economies   Emerging market economies

Logistic Early Warning System Model[4]

Marginal effects on the probability of a financial distress episode						
	By country group			By type of RR		
	All	EMEs	Advanced	Single	Maturity	Currency
Reserve Requirements (t-1) (Easing)	-2.498	-2.316	2.651	-2.013	-2.797	-0.783
Reserve Requirements (t-8) (Tightening)	-0.960	-1.135	8.648	-1.740	-0.575	0.404
Credit to GDP gap (t-1)	0.74	0.47	4.56	0.48	3.57	0.50
GDP (t-1)	-1.89	-1.52	-2.64	-1.90	-1.82	-2.84
Inflation (t-1)	1.43	1.43	-0.22	1.96	1.56	1.55
Policy rate (t-8)	0.48	0.44	-0.43	0.38	0.72	0.77
Exchange rate (t-2)	-0.19	-0.19	-0.34	0.34	-0.60	-0.26
Total RR effect	-3.458	-3.451	11.299	-3.753	-3.372	-0.379

p-val<0.01; p-val<0.05; p-val<0.1

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[4]Model includes global and banking sector controls

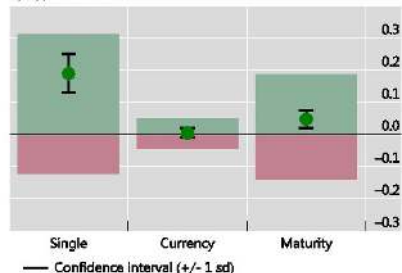# Net Benefit: preliminary results

Net benefit of using RR
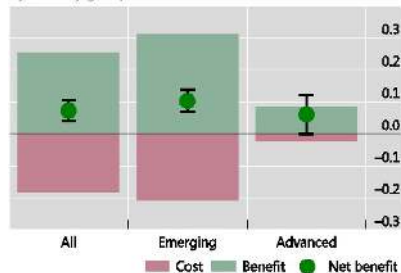
Conclusions

- The benefit of using RR is that it can reduce the build-up of systemic risk and the incidence and severity of financial distress episodes. On the other hand, the cost of using RR is associated with a reduction of credit in normal times.
- We find that the net benefits of using RR are positive. Therefore, using this macroprudential policy as a financial stability tool is quite useful.
- RR have a greater effect on EME than on AE. Single RR and RR by maturity have a greater effect than RR by currency.

To do:

- Country level calculations
- Include difference in financial distress cost between episodes where countries use RR or not

Response to a one s.d. shock of RR

Annex: Impulse Response Functions: MP shock

Response to a one s.d. shock to IR