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RUSSIAN FEDERATION

SELECTED ISSUES

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European Department

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THE EXCHANGE RATE VS. INTEREST RATE VOLATILITY TRADE-OFF: THE ROLE OF INFLATION TARGETING[1]

This chapter analyzes the impact of the adoption of inflation targeting (IT) on exchange rate volatility. The experience in more than a dozen inflation-targeting countries suggests that after controlling for the exchange rate regime, the adoption of IT has been often associated with a reduction in exchange rate volatility. Overall, the adoption of IT tends to partly or fully offset the increase in exchange rate volatility associated with the adoption of a floating exchange rate regime, which is usually followed by inflation-targeting countries. There are two main channels for the volatility-reducing effect of IT: (1) IT helps reduce unexpected shocks by making monetary policy transparent and predictable; (2) the introduction of IT tends to reduce pass-through from the exchange rate to domestic prices.

A. Introduction

1. Theory does not suggest a definite prediction about the relationship between exchange rate and interest rate volatility. There is widely believed to be a trade-off, with higher interest rate volatility resulting from a monetary policy geared towards stabilizing the exchange rate, in particular if there is a high pass-through from exchange rates to prices. Indeed, Mohanti and Klau (2004) find support for the "fear of floating" hypothesis in emerging economies, in as much as the exchange rate features prominently in monetary policy makers' reaction function, with interest rates responding strongly to exchange rate changes. Another source of interest rate volatility, however, would be unanchored inflation and exchange rate expectations, reflecting a low degree of monetary policy credibility. Thus, the degree of interest rate volatility depends on both the policymakers' reaction function and their degree of credibility (Calvo and Rheinhard 2002).

2. The role of the exchange rate for macroeconomic performance is generally higher in emerging and transition countries than in advanced economies. It has a higher impact on inflation, trade, economic activity, and financial stability, due to a generally higher degree of pass-through of the exchange rate to inflation; a stronger effect on the competitiveness of the tradable sector owing to a less diversified and advanced production base; and higher foreign exchange exposures in the financial, corporate, and household sectors. For a discussion of emerging economies' experiences with alternative exchange rate and monetary policy regimes, see Frankel (2002); Mohanti and Klau (2004); Ca'Zorzi, Hahn, and Sánchez (2007); and Ostry, Ghosh, and Chamon (2012), among others.

3. Historically, most emerging economies have used the exchange rate as the nominal anchor and adopted rigid exchange rate regimes—more or less firm pegs or at least strongly

[1] Prepared by Holger Floerkemeier (EUR).

managed exchange rates. Since the 1990s, however, many countries have moved towards more flexible exchange rate regimes. In many cases, this development has coincided with the adoption of inflation targeting (IT) monetary policy regimes, with the latter relying on short-term interest rates as the main monetary policy instrument.

4. The coincidence of IT and flexible rates has provoked considerable controversy over the "fear of floating": Some degree of exchange rate flexibility is a requirement for a well-functioning IT regime, because in a world of capital mobility, independent monetary policy is incompatible with a pegged exchange rate regime. This connection between IT and exchange rate flexibility has led some authors to argue that since IT requires a floating exchange rate regime, it necessarily results in higher exchange rate volatility. Thus, higher exchange rate volatility would be the price for achieving lower interest rate volatility. It is important, however, to separate the effects of IT, on the one hand, and of a more flexible exchange rate regime, on the other, on exchange rate volatility (Edwards, 2006).

5. This paper examines the interrelation of exchange rates, price levels, and IT via two routes: First, what has been the impact of adopting IT on the volatility of exchange rates? Second, how has the adoption of IT impinged on the magnitude of pass-through from exchange rates to domestic inflation? To this end, it reviews the experiences in a large number of inflation targeting countries, both advanced and emerging economies.

6. Gali and Monacelli (2005) find a trade-off between the stabilization of the nominal exchange rate and terms of trade on the one hand, and the stabilization of domestic inflation and the output gap on the other hand: domestic inflation targeting implies a substantially greater volatility in the nominal exchange rate and terms of trade than it would be the case under alternative policy regimes. Demiroz (2001) finds negative cross relationships between the volatilities of foreign exchange and interest rates in Turkey for the period 2000–2001. Duarte et al. (2008) find a trade-off between exchange rate volatility and interest rate differential volatility in Portugal during participation in the Exchange Rate Mechanism of the European Monetary System.

7. Other studies have not found a trade-off between exchange rate and interest rate volatility: Sarno (1997) concludes that the greater exchange rate stability in the European Monetary System did not generate any "volatility transfer" onto interest rates (and even finds some reduction in interest rate volatility in some countries). Schmidt-Hebbel and Tapia (2002) suggest that the volatility of nominal exchange rates has been no higher under inflation targeting than in other countries with floating exchange rate regimes. Edwards (2006), covering seven countries, shows that IT did not result in an increase in exchange rate volatility, emphasizing that IT helps reduce unexpected shocks by making monetary policy transparent and predictable. Prasertnukul, Kakinaka, and Kim (2008) come to similar results examining four Asian economies (Indonesia, Korea, the Philippines, and Thailand).

8. Finally, Russ (2011) finds positive correlation between exchange rate volatility and interest rate volatility—with an increase in monetary volatility increasing exchange rate volatility. Studying the case of Turkey, Berument and Gunay (2003) examine the effect of exchange rate risk on interest rates, and find a positive relationship for the period December 1986 to January 2001.

9. The relationship between exchange rate, interest rate, and inflation volatilities depends not least on the degree of pass-through from exchange rate changes to domestic prices. The degree of inflationary inertia plays an important role in determining the magnitude of pass-through. Studying 25 OECD countries, Campa and Goldberg (2002) find that pass-through tends to be lower for countries with low inflation as well as low exchange rate variability. Examining 20 industrial countries, Gagnon and Ihrig (2004) also suggest that stabilizing inflation reduces the pass-through. Consistent with these results, Choudri and Hakura (2006), covering 71 countries, find a positive relation between pass-through and the average inflation rate. Prasertnukul, Kakinaka, and Kim (2008) indicate that the degree of pass-through declined with the adoption of IT for either the PPI or the CPI in Korea and Thailand; while Ito and Sato (2006) find that pass-through to the consumer price index (CPI) is relatively low compared with that to the producer price index (PPI) in Indonesia, Thailand, Malaysia, Singapore, and South Korea.

10. The following empirical investigation confirms that while the move to a floating exchange rate regime can be expected to increase exchange rate variability, there is some evidence that the adoption of IT has reduced exchange rate volatility in many cases. This is consistent with the empirical results of Edwards (2006), Rose (2007), and Prasertnukul, Kakinaka, and Kim (2008), contradicting the model-based simulations by Gali and Monacelli (2005). Empirically, there is evidence that the volatility-increasing effect of moving to a more flexible exchange rate regime and the volatility-reducing effect of moving to IT by and large cancel each other out in many countries. Hence, IT could be effective in stabilizing price levels and lowering inflation volatility through both reduced exchange rate pass-through and reduced exchange rate volatility.

B. Empirical Analysis

11. In a first step, a Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model is used to examine the effect of IT on exchange rate volatility. In a second step, we analyze how the introduction of IT impacts the exchange-rate pass-through. In both cases, we follow the approaches taken by Edwards (2006) or Prasertnukul, Kakinaka, and Kim (2008). Model specifications are discussed in Appendix I. Figure 1 gives an overview of NEER volatility in periods before and after adoption of flexible exchange rate regimes and inflation targeting. IT adoption dates are taken from Rogers (2009).

Figure 1. Nominal Effective Exchange Rates (log differences), Exchange Rate Regime, and Inflation Targeting

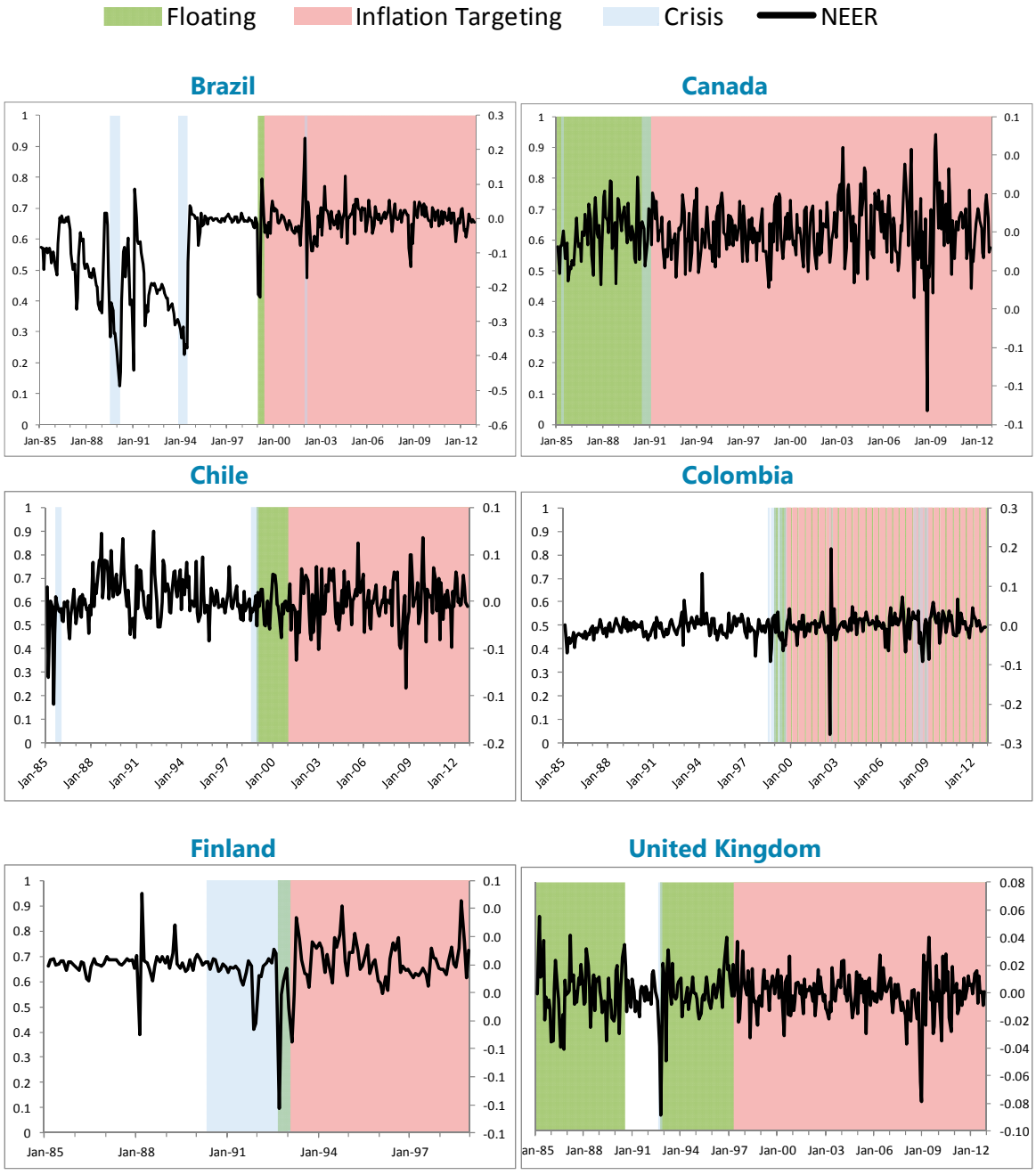
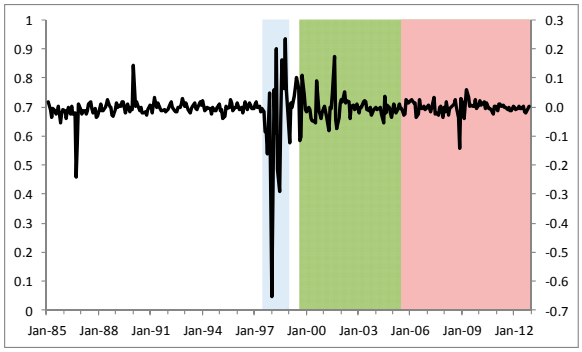
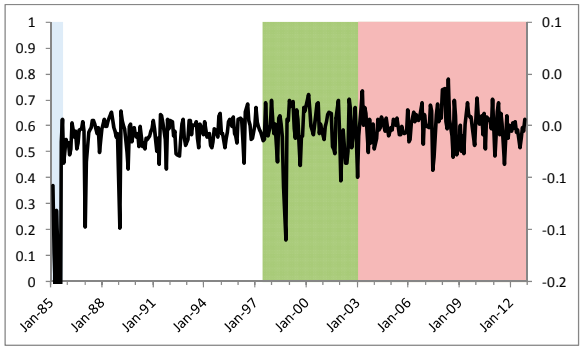


Figure 1. Nominal Effective Exchange Rates (log differences), Exchange Rate Regime, and Inflation Targeting (Concluded)

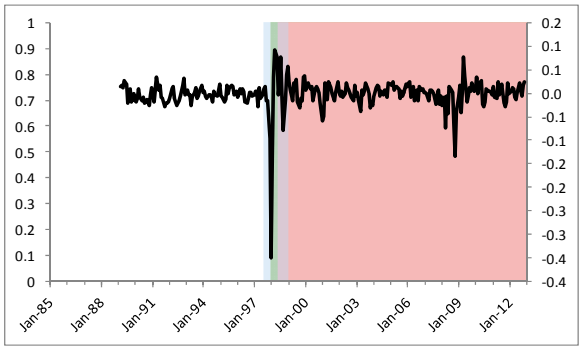
Indonesia



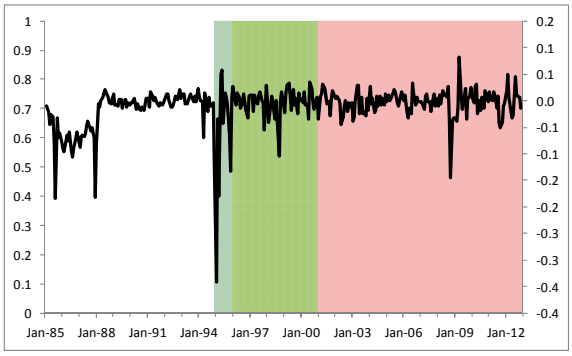
Israel



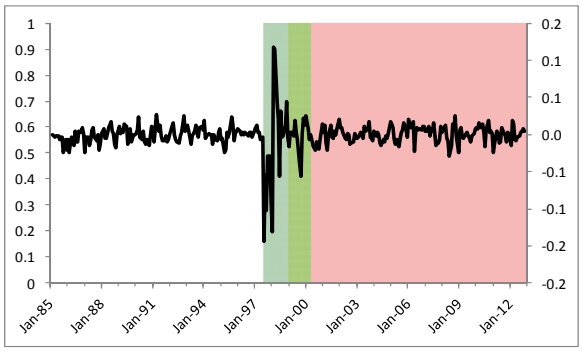
Korea



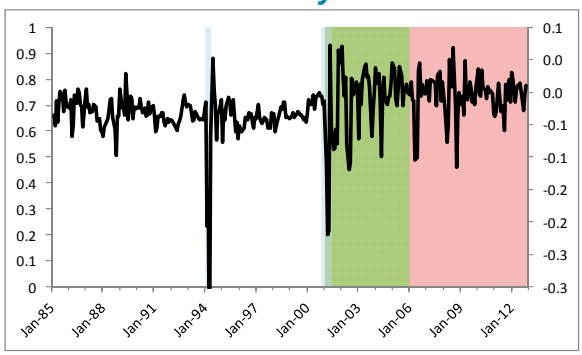
Mexico



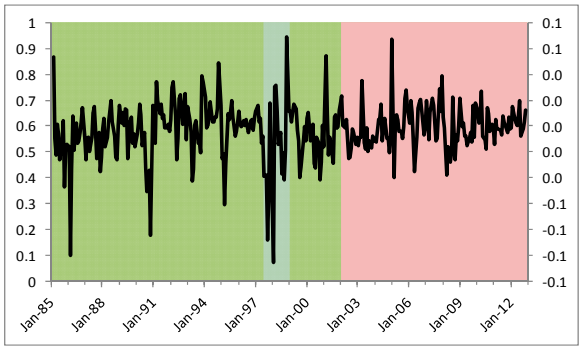
Thailand



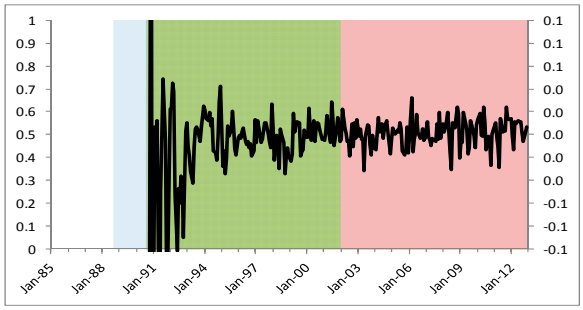
Turkey



Peru



Philippines



C. Exchange Rate Regime, Inflation Targeting, and NEER Volatility

12. The observation period for GARCH estimations is January 1990 to December 2007, using monthly data. Periods of hyperinflation (e.g., Peru 1990–92) are omitted in the regressions, as is the more recent period 2008–12 in order to avoid the major disturbances during the global financial crisis. Crisis dummies were employed in individual equations to take account of various regional crises (Finland 1991–93; EMS crisis 1992–93; Mexico 1994; East Asia 1997–98, etc.). We focus our attention on two dummy variables, DIT and FLT, which are included in the variance equation to capture the impact of IT and floating exchange rate regimes, respectively. Estimation results are summarized in Table 1.

13. Unsurprisingly, the introduction of a floating exchange rate regime has increased exchange rate volatility in almost all observed countries. (The FLT dummy was omitted in the cases of Canada, Peru, and Philippines, which had floating rate regimes throughout the observation period). The exception is Poland, which experienced a period of significant macroeconomic stabilization prior to the implementation of floating rates. The effect on exchange rate volatility is generally larger in emerging market economies, while it is insignificant in the case of most advanced economies.

14. The sign of the inflation targeting dummy, on the other hand, is negative in eleven out of 15 countries, and significantly so in seven cases. Again with the exception of Poland, all other positive coefficient values (CAN, GBR, and IDN) are insignificant. Interestingly, the DIT coefficient values are broadly in the same range as the FLT coefficient values, suggesting that the introduction of IT tends to compensate for most of the higher exchange rate volatility induced by moving to floating exchange rate regimes.

15. Presumably, the adoption of IT reduces exchange rate volatility only over time, as the monetary authorities gradually obtain policy credibility through building a track-record of inflation-fighting credentials. Therefore, estimation results for the IT dummy might be stronger if we would allow for a lagged instead of coincident impact of this variable. However, such lags would likely differ widely between countries, depending on the degree of monetary policy credibility already obtained at the time of the official announcement of the move towards IT, and the choice of lag may remain somewhat arbitrary in a cross-country context. Ideally, any gradual strengthening of the IT impact might be discernible via rolling GARCH estimations.

16. Like Russia, many countries which already have adopted IT are exporters of natural resources (for example, Australia, Canada, Indonesia). This potentially introduces a (spurious) correlation between exchange rate volatility and IT adoption. In principle, this could be dealt with by controlling for natural resource intensity—however; such a variable would be largely time-invariant and therefore not suited for inclusion in a time-series context. Instead, we capture this issue by including changes in the oil price as a control variable in the model—with the rationale that in natural resource-intensive economies, macroeconomic variables such as exchange rates, money, and GDP are closely linked to natural resource price developments.

Table 1. GARCH Estimates of Floating Rate and Inflation Targeting Regime Dummies

	FLT	*DIT*
BRA	4.27 ***	-3.23 ***
	0.001	*0.010*
CHL	2.53 ***	-2.21 **
	0.000	*0.038*
COL	0.25	-0.59
	0.795	*0.548*
FIN	3.90 ***	-3.59 ***
	0.000	*0.000*
GBR	0.45	0.13
	0.573	0.789
IDN	0.52	0.22
	0.279	*0.742*
ISR	1.10 ***	-1.28 ***
	0.003	*0.003*
KOR	5.59 ***	-5.44 ***
	0.000	*0.000*
MEX	1.41 ***	-1.08 ***
	0.000	*0.000*
POL	-1.50 ***	1.39 ***
	0.000	*0.000*
THA	3.36 ***	-3.19 ***
	0.000	*0.000*
TUR	2.27 ***	-0.32
	0.000	*0.395*
CAN	...	0.28
		0.883
PER	...	-0.22
		0.643
PHL	...	-0.07
		0.823

Notes: ***, **, and * denote significance on the 1 percent, 5 percent, and 10 percent level, respectively. Value of z-statistics in italics. FLT is a dummy for periods with floating exchange rate regimes, and DIT is a dummy for periods with inflation targeting. Canada, Peru, and Philippines had (de facto) floating exchange rate regimes throughout the observation period (1990M1 to 2007M12, with the exception of Peru: 1992M1 to 2007M12).

D. Exchange Rate Regime, Inflation Targeting, and Exchange Rate Pass-Through

17. This section examines in how far the adoption of inflation targeting is likely to affect the effectiveness of nominal exchange rates as shock absorbers. The consumer price index (CPI) is used as a proxy for the domestic price of nontradables, and producer prices (PPI) as a proxy for the domestic price of tradables. Hence, the ratio PPI/CPI would be a measure of the real exchange rate. The observation period is generally 1985Q2 to 2012:Q4, or shorter for some countries (1991:Q1 for Romania; 1991:Q2 for Brazil; 1993:Q2 for Czech Republic).

18. The magnitude of pass-through has implications not only for domestic inflation, but also for the effectiveness of the nominal exchange rate as a shock absorber (Edwards, 2006). Regarding the first notion, a lower pass-through is welcome as it reduces external inflation pressures. In the latter context, it is important to distinguish between tradables and nontradables prices, and the impact of nominal exchange rate changes on the real exchange rate. While a high pass-through to nontradables reduces the effectiveness of the nominal exchange rate as a shock absorber, a high pass-through for tradables will enhance its effectiveness.

19. Pass-through tends to be much lower in advanced countries with low and stable inflation than in emerging markets with historically high inflation (Table 2). In most countries, the pre-IT short-term pass-through coefficient in the CPI and PPI equations is positive, and unsurprisingly it is usually higher for tradables (PPI) than nontradables (CPI). In the pre-IT period, due to a significant degree of inflation inertia, long-term pass through is also generally higher than short-term pass-through. The interaction terms $\Delta lnE_t \times DIT$ are not significant in most cases, suggesting that short-term pass-through has not been substantially affected by the adoption of inflation targeting. The estimated coefficients for the interaction term $\Delta lnP_{(t-1)} \times DIT$ are mostly negative, but significant only in the CPI equations. This suggests that in many countries long-run pass-through to non-tradable prices (and thus inflation inertia) has declined in the post-IT period.

20. The results obtained above are broadly confirmed by estimations of the pass-through using the impulse-response functions derived from a VAR model that is estimated separately for the pre-IT and post-IT periods in various countries. Following Ito and Sato (2006), we estimate a 5-variable VAR model with global inflation (proxied by ΔlnUS PPI); output gap (GAP); broad money growth (ΔlnM2); changes in the nominal effective exchange rate (ΔlnNEER); and domestic inflation (Δlnp), in this ordering. The VAR is also estimated separately using the proxies for nontradable prices (CPI) and tradable prices (PPI). Results are presented in Appendix II.

21. As in the previous regressions, the pass-through from the nominal effective exchange rate (1) is generally higher for the PPI than for the CPI, and (2) decreases after the adoption of an inflation targeting regime. Furthermore, (3) the decline in exchange rate pass-through is mostly larger for the CPI than for the PPI. In several countries, however, the exchange rate pass-through to the PPI is more pronounced in the post-IT period compared to the pre-IT period.

Table 2. Short-Run and Long-Run Exchange Pass-Through Before and After IT

	CPI				PPI			
	PRE-FLT		Post-IT		PRE-FLT		Post-IT	
	SR	LR	SR	LR	SR	LR	SR	LR
BRA	0.89	0.97	0.05	0.11	0.89	1.02	0.24	0.75
HUN	0.12	0.19	0.06	0.04	0.07	0.06	0.06	0.04
CAN	0.00	0.01	-0.01	-0.01	0.09	0.10	0.30	0.32
FIN	0.04	0.09	-0.08	-0.09	0.15	0.25	0.17	0.27
AUS	0.05	0.12	0.02	0.02	0.07	0.10	0.14	0.14
NZL	0.08	0.15	0.03	0.03	0.06	0.14	0.15	0.21
ISR	0.32	0.40	0.03	0.03	0.38	0.46	0.08	0.09
KOR	0.02	0.03	0.02	0.01	0.10	0.18	0.07	0.09
MEX	0.42	0.84	0.03	0.02	0.48	0.88	0.14	0.17
NOR	0.14	0.29	0.04	0.03	0.44	0.37	0.31	0.26
CZE	0.08	0.17	-0.04	-0.04	0.04	0.09	-0.05	-0.07
ROM	0.19	0.56	-0.01	-0.01	0.45	0.51	0.06	0.04
TUR	0.86	1.00	0.93	1.18	0.86	1.01	0.95	1.21
GBR	0.15	0.17	-0.04	-0.03	0.13	0.29	0.02	0.02

E. Conclusions

22. This chapter examined the potential trade-off between interest rate volatility and exchange rate volatility in the context of the move from an exchange rate-targeting to an inflation targeting monetary policy regime. The impact of inflation targeting on exchange rate volatility was analyzed by studying the experiences in more than a dozen countries that have adopted inflation targeting.

23. The introduction of IT appears to reduce exchange rate volatility in most countries: After controlling for the exchange rate regime, the adoption of IT has reduced nominal exchange rate volatility in many cases. Overall, the adoption of IT tends to partly or fully offset the (mechanical) increase in exchange rate volatility associated with the adoption of a floating regime**.**

24. There are two main channels for the volatility-reducing effect of IT: (1) IT helps reduce unexpected shocks by making monetary policy transparent and predictable, which serves to reduce both exchange rate and interest rate volatility; (2) the introduction of IT tends to reduce pass-through from the exchange rate to domestic prices. Regarding the latter, IT appears to also have a positive impact on the effectiveness of the nominal exchange rate as a shock absorber, as the reduction in pass-through is generally larger for nontradables than tradables prices. Furthermore, if IT reduces pass-through and exchange rate volatility, it may help not only to stabilize price levels but also mitigate the volatility of domestic prices.

25. Russia has seen an increase in exchange rate volatility in the past few years compared to the period before the global financial crisis, as the authorities have chosen to allow a higher degree of ruble exchange rate flexibility in preparation for the adoption of IT. The average of the 12-month coefficient of variation of the ruble/dollar exchange rate has increased from 2.2 percent in the period December 2005–September 2008 to around 3.7 percent in the period March 2010–June 2013.[2] Since the pass-through from the exchange rate to domestic prices remains substantial—around 0.25 in the short term and 0.5 in the long term—this increased exchange rate volatility could translate into higher volatility of domestic inflation, thus complicating the conduct of monetary policy. Swiftly putting in place the remaining building blocks of the operational framework for IT and quickly building policy credibility in the context of the new monetary regime will be of utmost importance to reap the pass-through-reducing and volatility-moderating benefits of adopting IT by 2015, as currently planned.

[2] The volatility of short-term interest rates, on the other hand, has seen a marked reduction, with the average 12-month coefficient of variation declining from 32 percent to below 13 percent in the same time periods.

Appendix I. Model Specifications

In a first step, a GARCH model of the following specification is used to analyze the impact of IT on exchange rate volatility.

$$\Delta \ln E_t = \alpha + \sum_{i=1}^{m} \beta_i \Delta E_{t-i} + \sum_{j=1}^{n} \varphi_j x_{j,t} + \varepsilon_t$$

$$\sigma_t^2 = \delta_0 + \sum_{i=1}^{p} \delta_i \varepsilon_{t-i}^2 + \sum_{j=1}^{q} \gamma_j \sigma_{t-j}^2 + \sum_{k=1}^{s} \theta_k y_{k,t}$$

where E_t is the nominal effective exchange rate; the x_j's represent other explanatory variables that could impact the nominal effective exchange rate (domestic inflation; US inflation; oil price changes; interest rate differential domestic/US; crisis dummy variables); the ε_t is a disturbance with the properties of zero mean and conditional variance σ_t^2; and the y_k's are the other control variables that affect exchange rate volatility: two dummy variables, *DIT* and *FLT*, are included in the variance equation to capture the inflation-targeting and floating exchange rate regimes, respectively.

In a second step, we analyze the impact of IT on the exchange rate pass-through from changes in the nominal exchange rates to domestic prices, using the following model:

$$\Delta lnP_t = \beta_0 + \beta_1 \Delta lnE_t + + \beta_2 \Delta lnP_t^* + \beta_3 \Delta lnP_{t-1} + + \beta_4 \Delta lnE_t \times FLT$$
$$+ \beta_5 \Delta lnP_{t-1} \times FLT + \beta_6 \Delta lnE_t \times DIT + + \beta_7 \Delta lnP_{t-1} \times DIT + \sum \beta_8 x_i + \varepsilon_t$$

where P_t, E_t and P_t^* denote a domestic price index (consumer or producer price index), the nominal effective effective exchange rate, and the index of foreign prices, respectively. The x_i's are other control variables expected to capture a change in price levels (lagged consumer price inflation; US producer price inflation as a proxy for world inflation; output gap measure based on industrial production or GDP; monthly change in the global oil price average); and ε_t is a disturbance term with standard characteristics. All variables but the dummies are in logarithms.

The model is estimated using OLS. The choice of exchange rate is endogenous, so the estimations likely suffer from simultaneity bias. However, given that there don't seem to be viable instruments for the exchange rate, simultaneous equation methods such as two-stage least squares and generalized method of moments will not be able to address this issue satisfactorily (see Meese and Rogoff (1983) and Edwards (2006)).

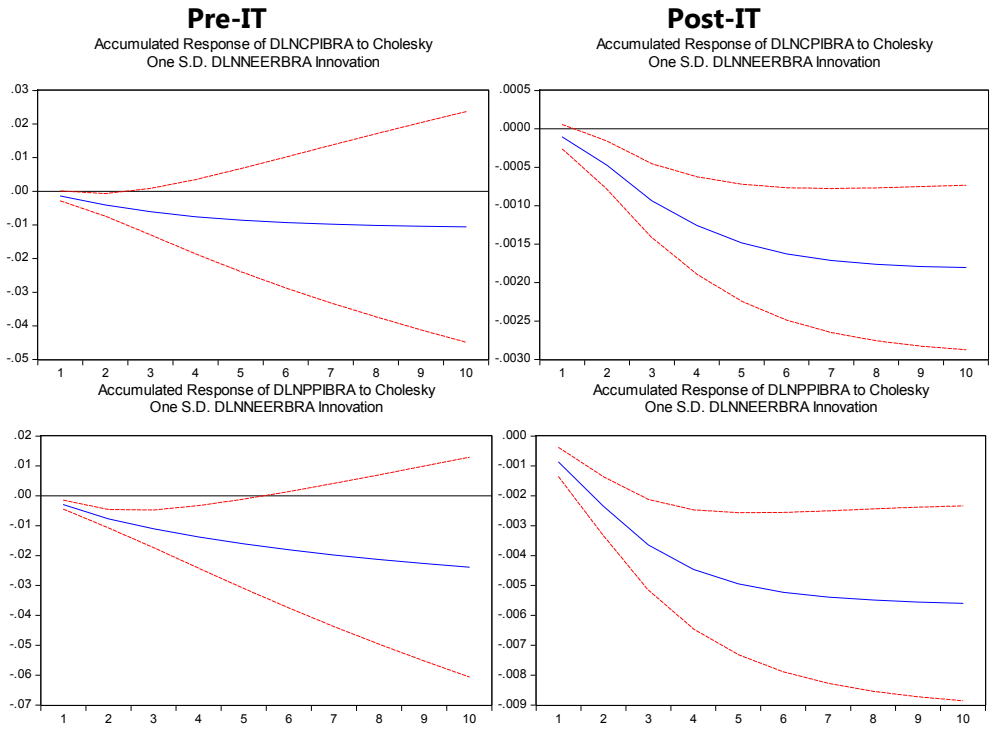
DIT and FLT dummies are again used to capture the effects of IT and floating exchange rate regimes. Short-run and long-run pass-through coefficients are derived as follows:

	Short-run pass-through	Long-term pass-through
Before floating	β_1	$\beta_1/(1-\beta_3)$
Under floating	$\beta_1 + \beta_4$	$(\beta_1 + \beta_4)/(1-\beta_3-\beta_5)$
Under IT	$\beta_1 + \beta_4 + \beta_6$	$(\beta_1 + \beta_4 + \beta_6)/(1-\beta_3-\beta_5-\beta_7)$

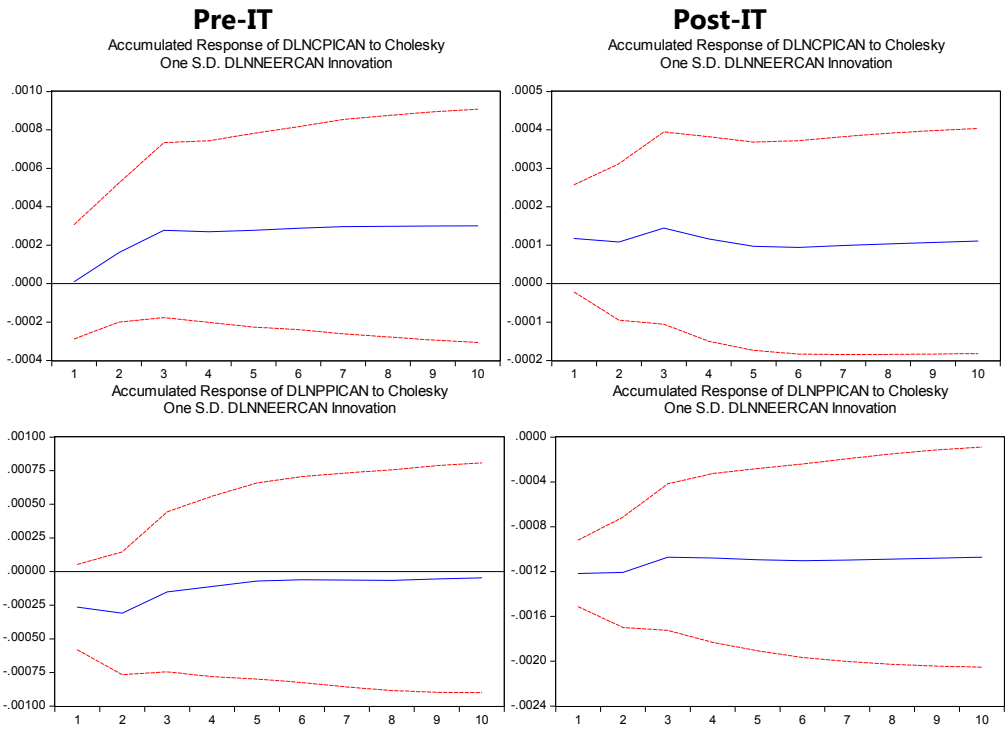
Alternatively, the exchange rate pass-through is estimated using a 5-variable VAR model (separately for pre-IT and post-IT periods) with the following variables: global inflation (proxied by $\Delta \ln$*US PPI*); output gap (*GAP*); broad money growth ($\Delta \ln$*M2*); changes in the nominal effective exchange rate ($\Delta \ln$*NEER*); and domestic inflation ($\Delta \ln p$).

Appendix II. Impulse-Response Functions NEER to CPI and PPI, Pre- and Post-IT

Brazil



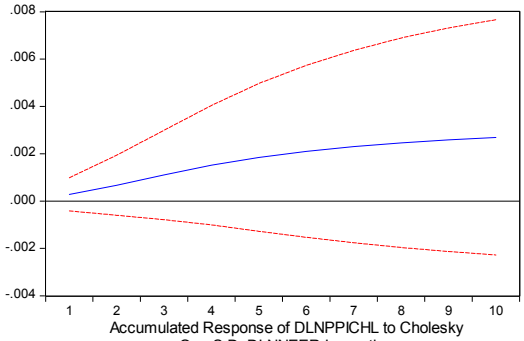
Canada



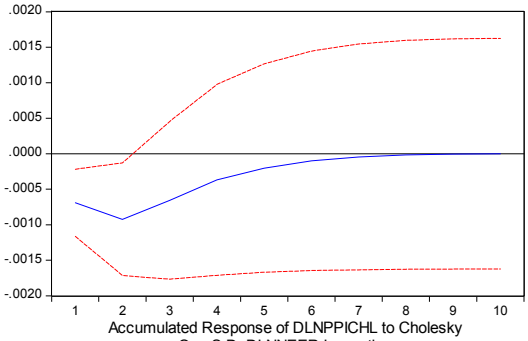
Appendix II. Impulse-Response Functions NEER to CPI and PPI, Pre- and Post-IT (cont'd)

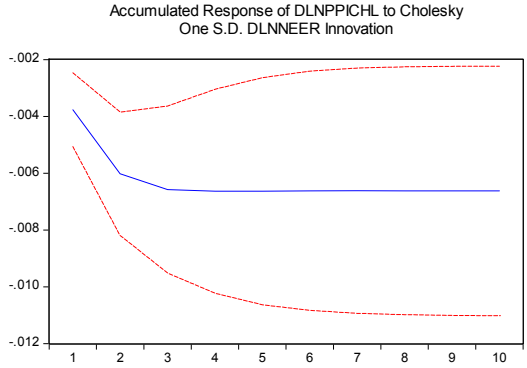
Chile

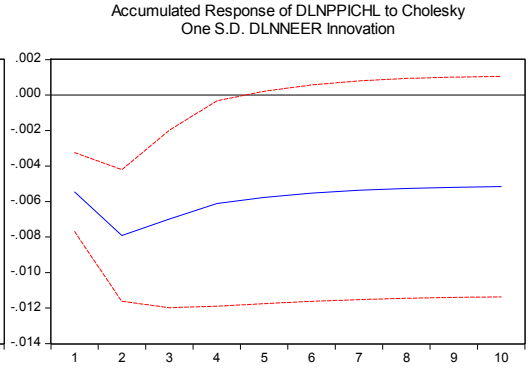
Pre-IT



Post-IT

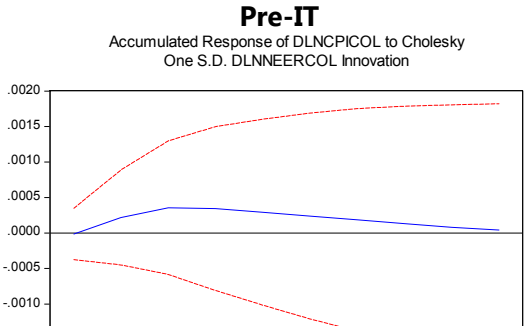




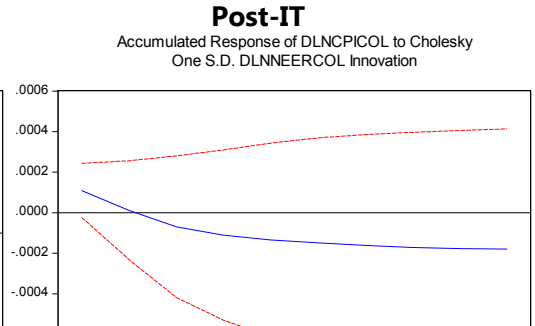


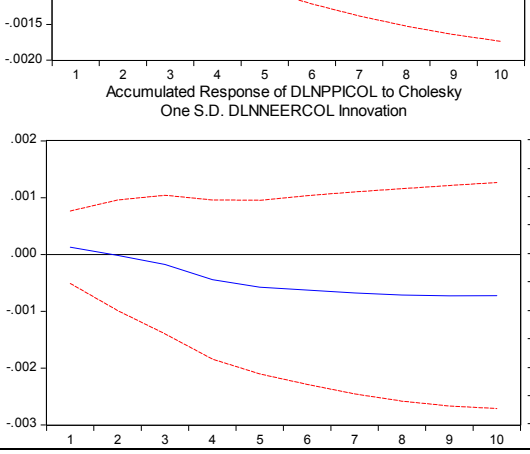
Colombia

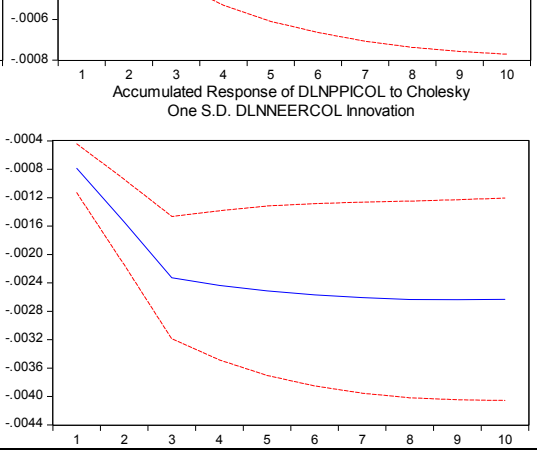
Pre-IT



Post-IT



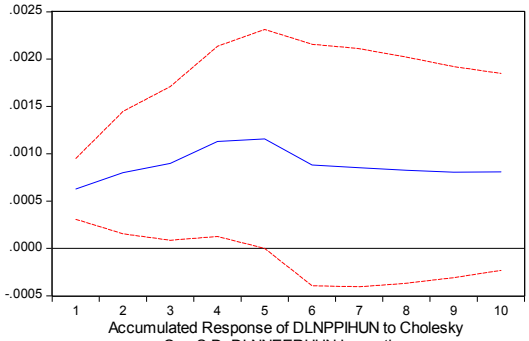




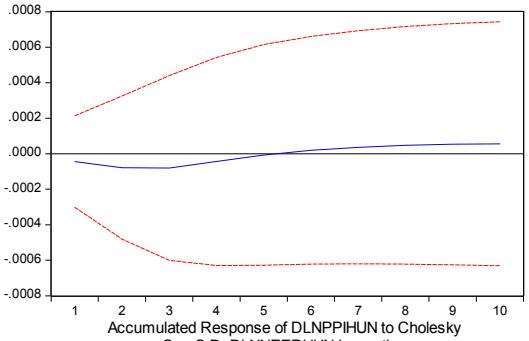
Appendix II. Impulse-Response Functions NEER to CPI and PPI, Pre- and Post-IT (Continued)

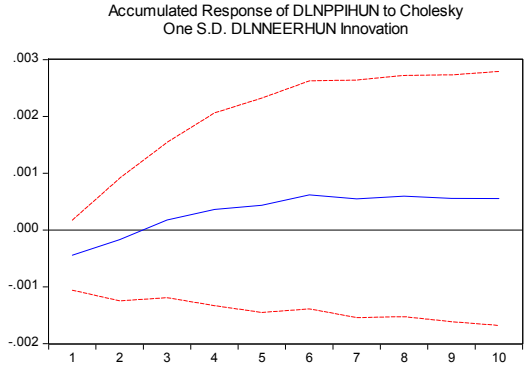
Hungary

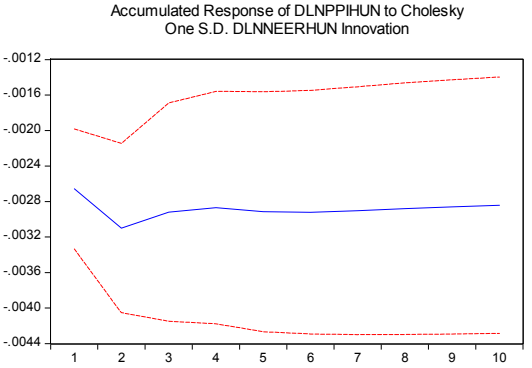
Pre-IT



Post-IT

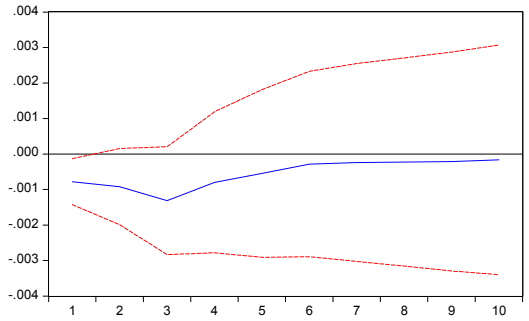




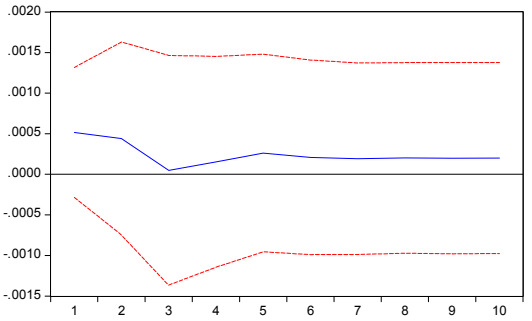


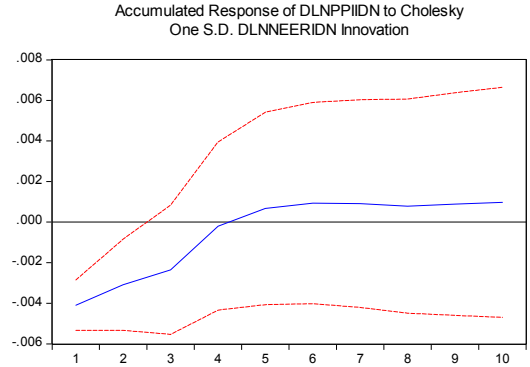
Indonesia

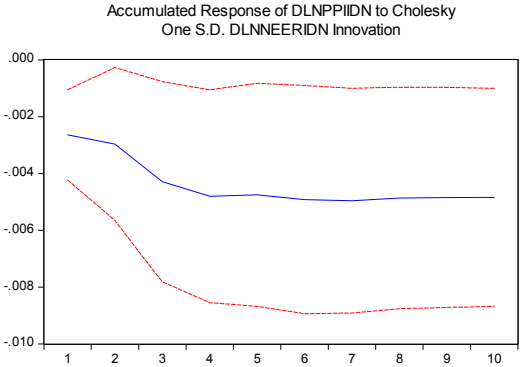
Pre-IT



Post-IT

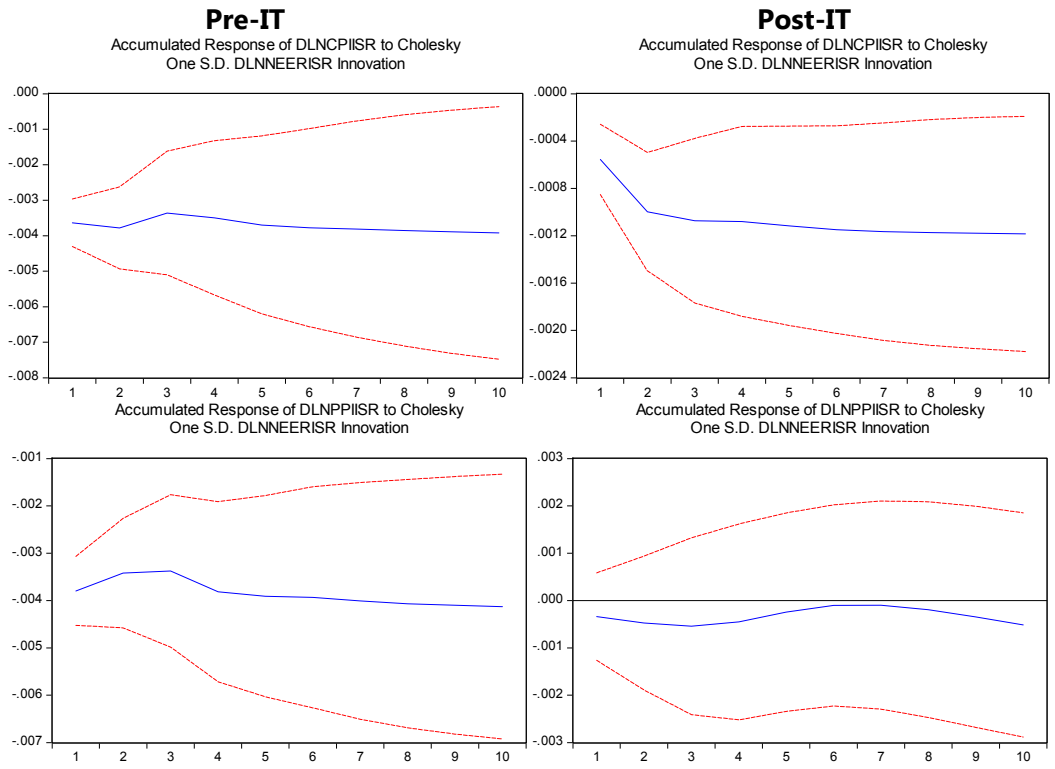




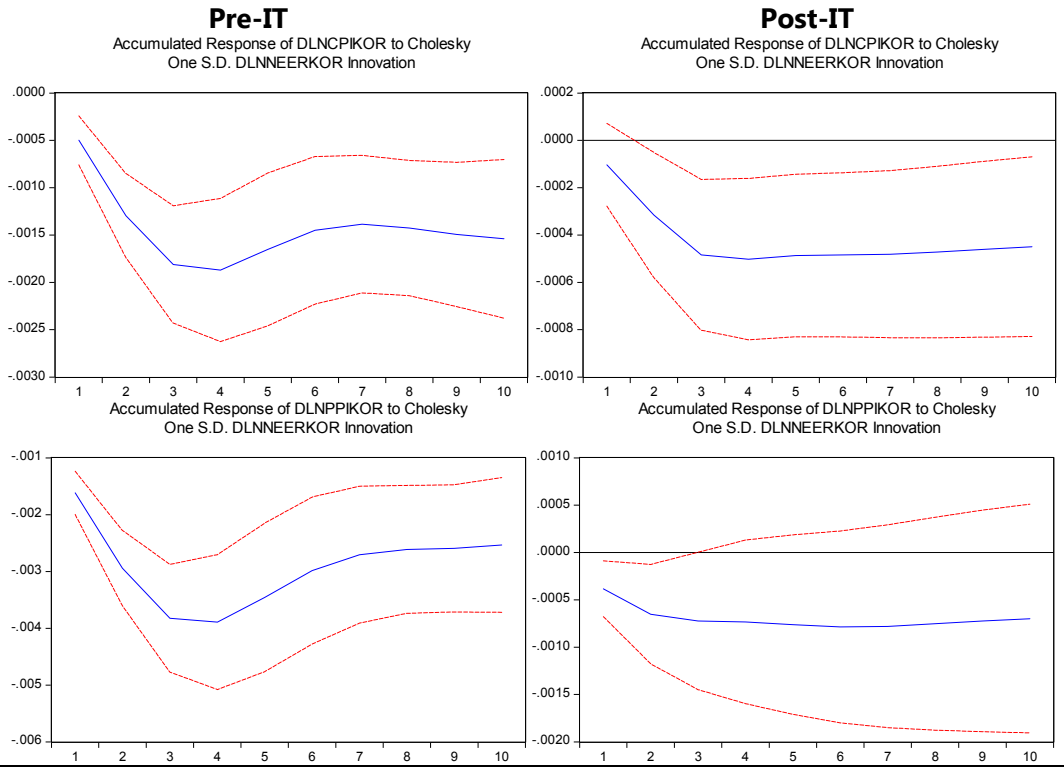


Appendix II. Impulse-Response Functions NEER to CPI and PPI, Pre- and Post-IT (Continued)

Israel



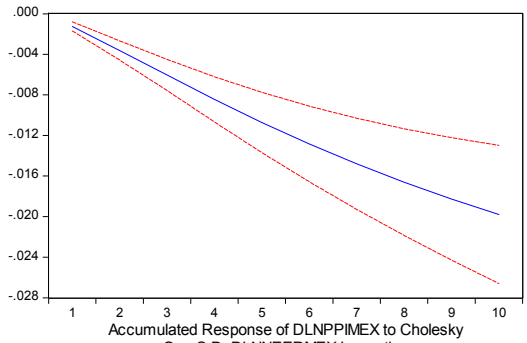
Korea



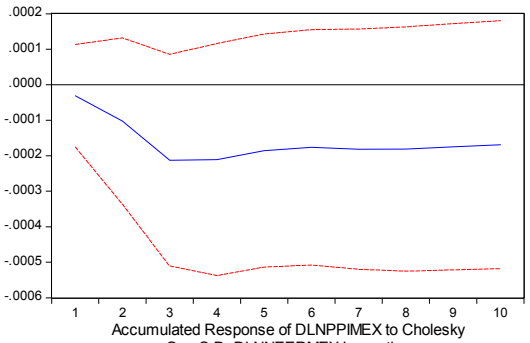
Appendix II. Impulse-Response Functions NEER to CPI and PPI, Pre- and Post-IT (Continued)

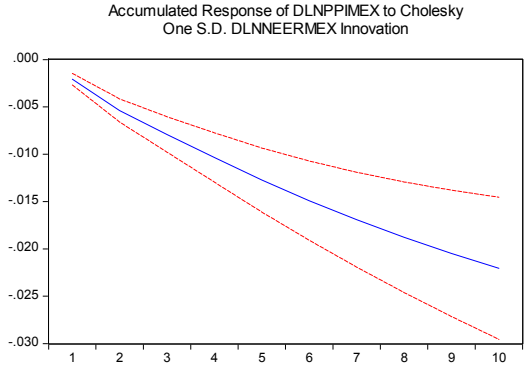
Mexico

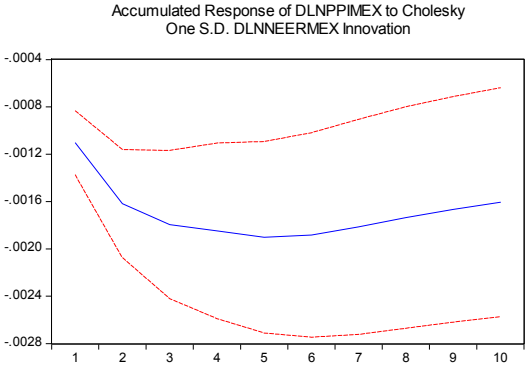
Pre-IT



Post-IT

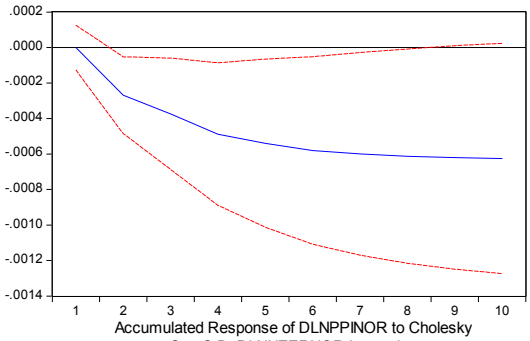




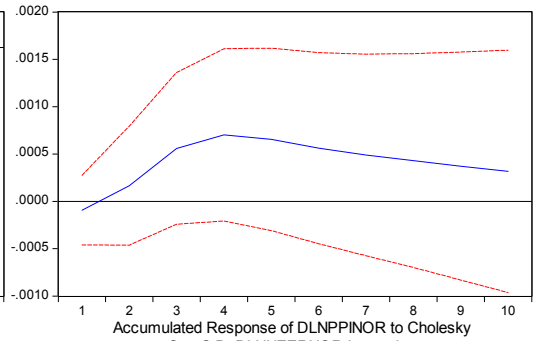


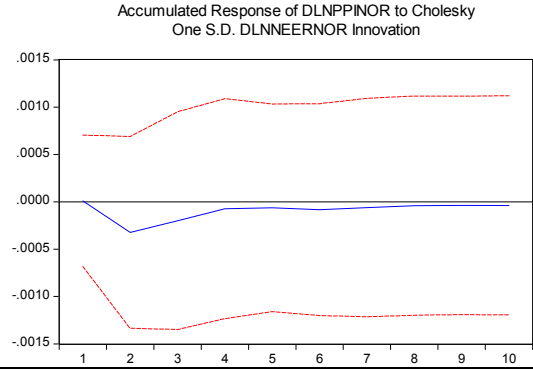
Norway

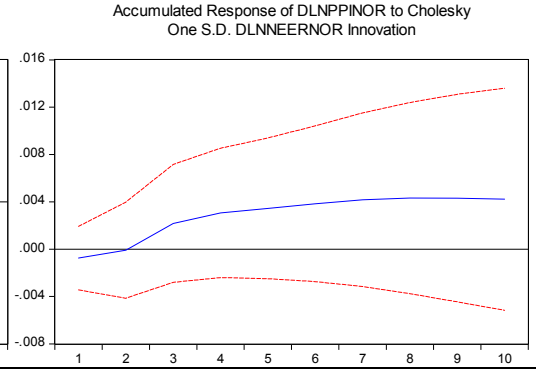
Pre-IT



Post-IT





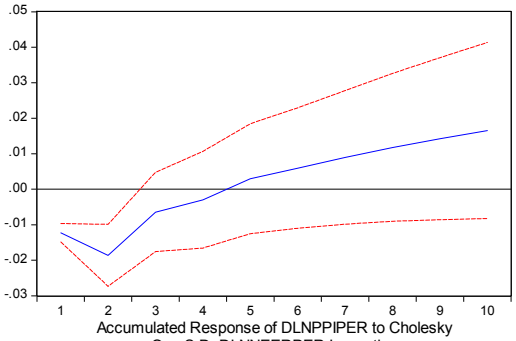


Appendix II. Impulse-Response Functions NEER to CPI and PPI, Pre- and Post-IT (Continued)

Peru

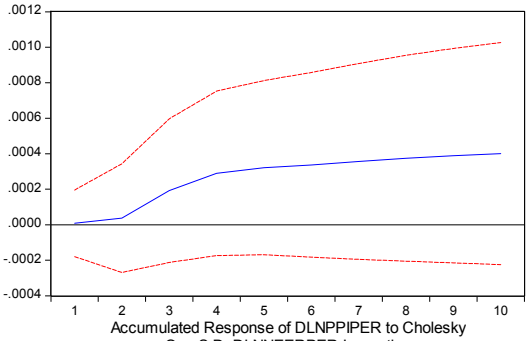
Pre-IT

Accumulated Response of DLNCPIPER to Cholesky
One S.D. DLNNEERPER Innovation

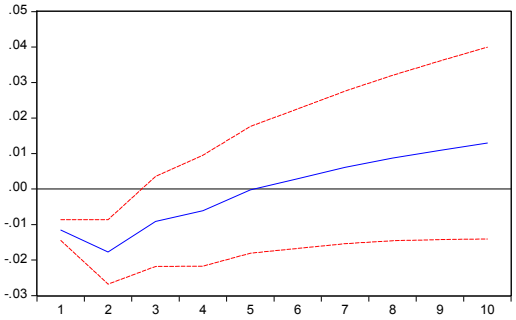


Post-IT

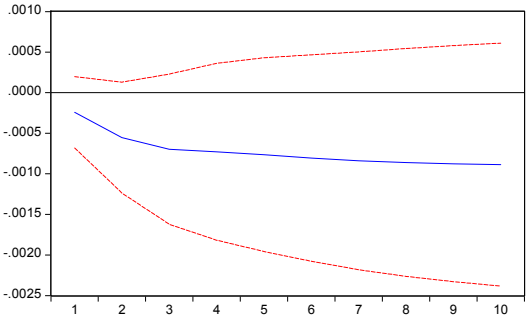
Accumulated Response of DLNCPIPER to Cholesky
One S.D. DLNNEERPER Innovation



Accumulated Response of DLNPPIPER to Cholesky
One S.D. DLNNEERPER Innovation



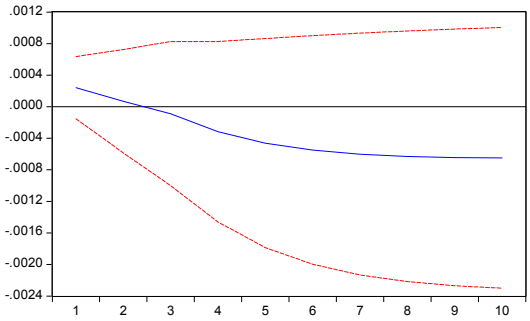
Accumulated Response of DLNPPIPER to Cholesky
One S.D. DLNNEERPER Innovation



Philippines

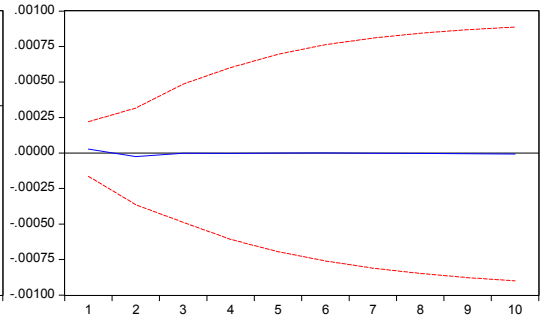
Pre-IT

Accumulated Response of DLNCPIPHL to Cholesky
One S.D. DLNNEERPHL Innovation

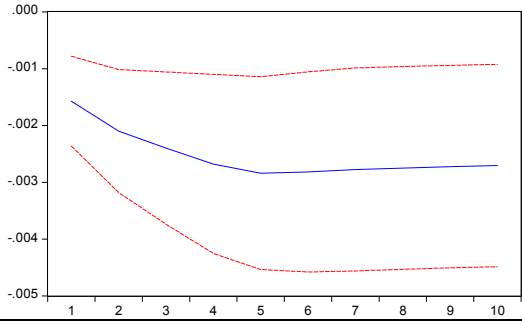


Post-IT

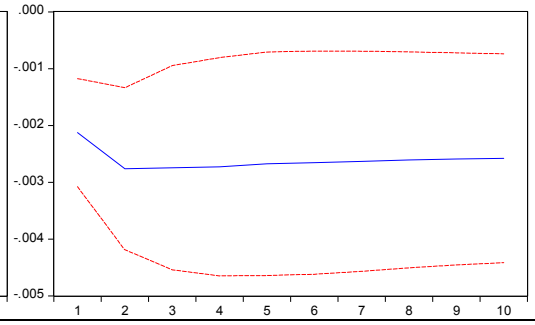
Accumulated Response of DLNCPIPHL to Cholesky
One S.D. DLNNEERPHL Innovation



Accumulated Response of DLNPPIPHL to Cholesky
One S.D. DLNNEERPHL Innovation



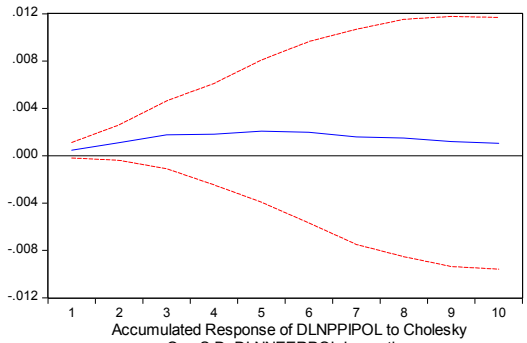
Accumulated Response of DLNPPIPHL to Cholesky
One S.D. DLNNEERPHL Innovation



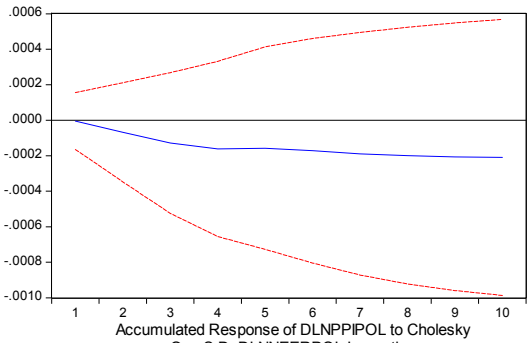
Appendix II. Impulse-Response Functions NEER to CPI and PPI, Pre- and Post-IT (Continued)

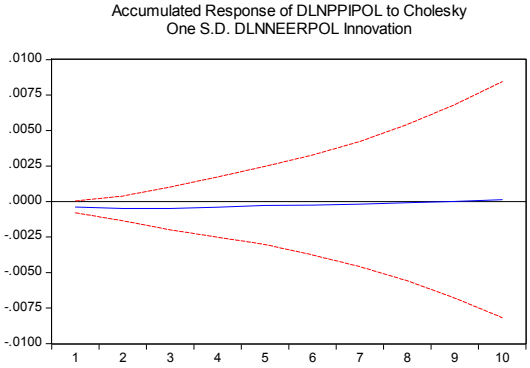
Poland

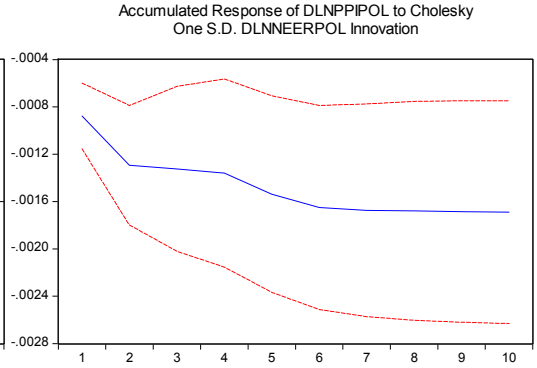
Pre-IT



Post-IT

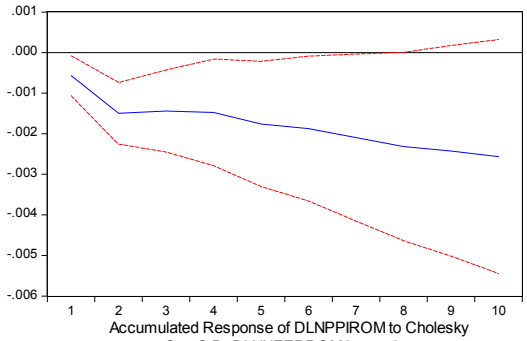




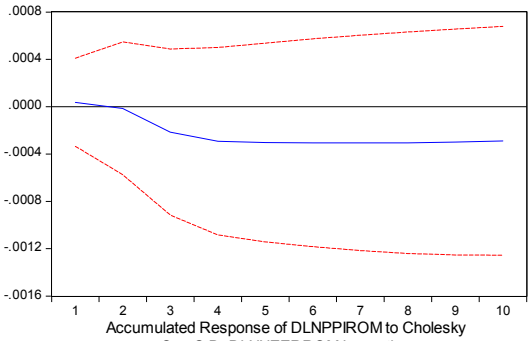


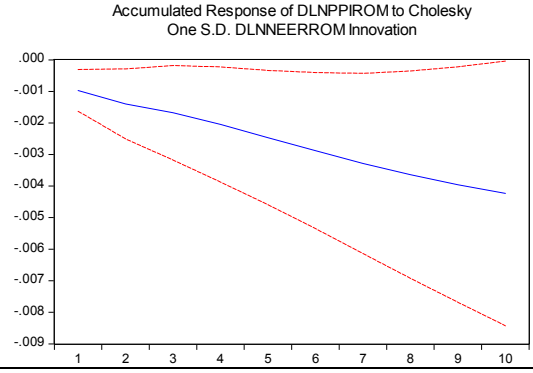
Romania

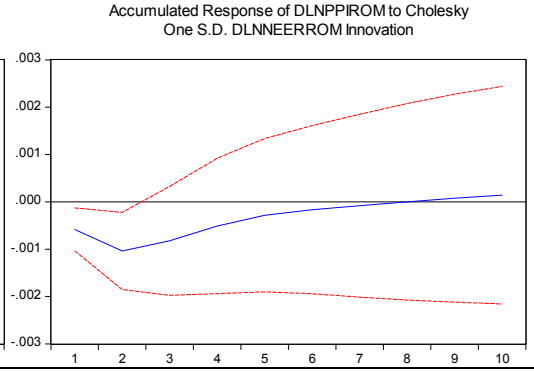
Pre-IT



Post-IT





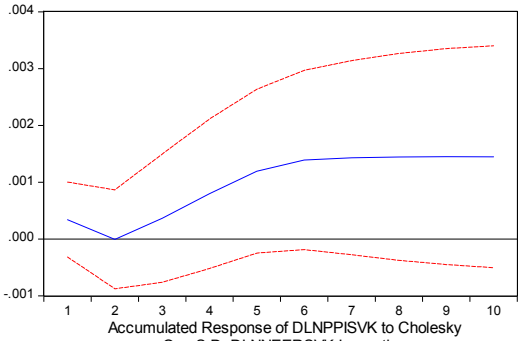


Appendix II. Impulse-Response Functions NEER to CPI and PPI, Pre- and Post-IT (Continued)

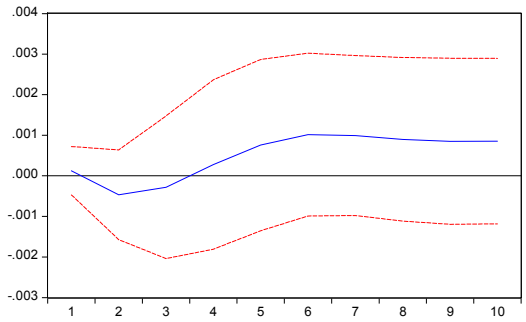
Slovak Republic

Pre-IT

Accumulated Response of DLNCPISVK to Cholesky
One S.D. DLNNEERSVK Innovation

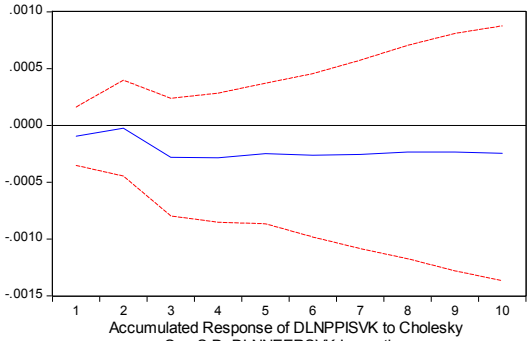


Accumulated Response of DLNPPISVK to Cholesky
One S.D. DLNNEERSVK Innovation

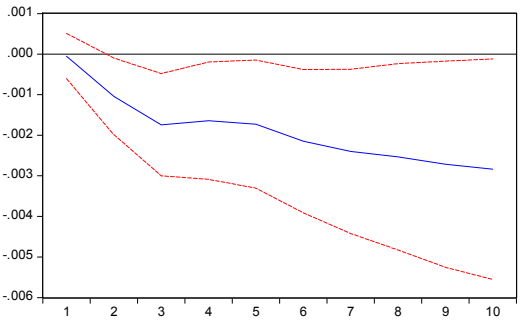


Post-IT

Accumulated Response of DLNCPISVK to Cholesky
One S.D. DLNNEERSVK Innovation



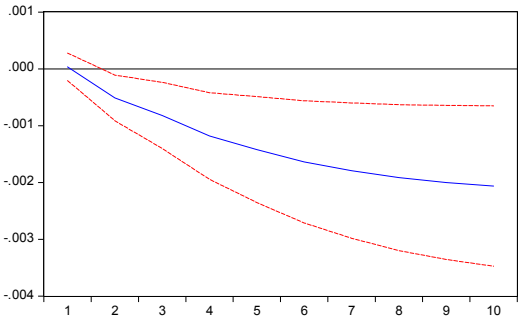
Accumulated Response of DLNPPISVK to Cholesky
One S.D. DLNNEERSVK Innovation



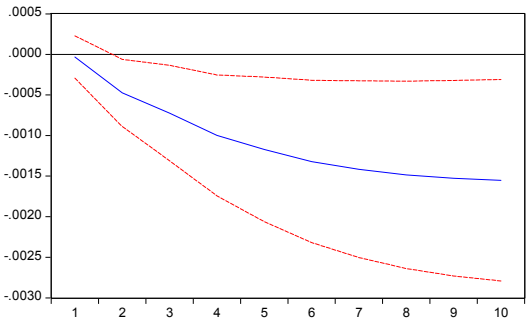
South Africa

Pre-IT

Accumulated Response of DLNCPIZAF to Cholesky
One S.D. DLNNEERZAF Innovation

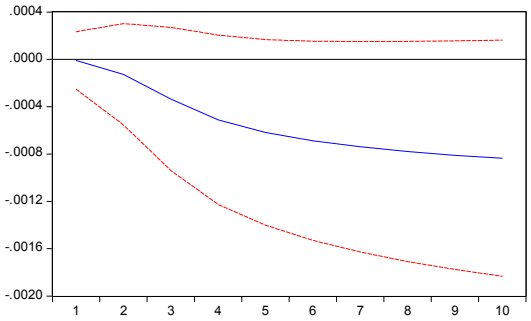


Accumulated Response of DLNPPIZAF to Cholesky
One S.D. DLNNEERZAF Innovation

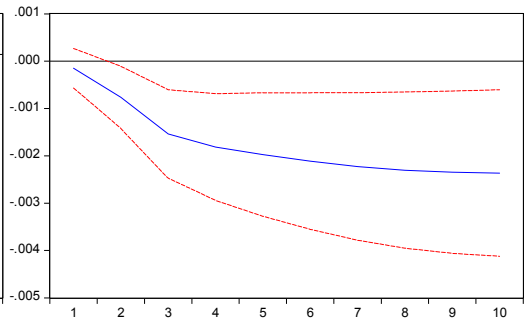


Post-IT

Accumulated Response of DLNCPIZAF to Cholesky
One S.D. DLNNEERZAF Innovation



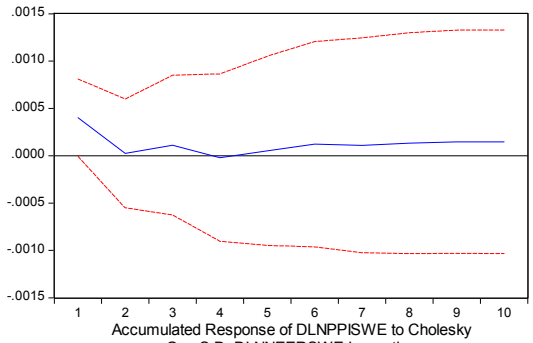
Accumulated Response of DLNPPIZAF to Cholesky
One S.D. DLNNEERZAF Innovation



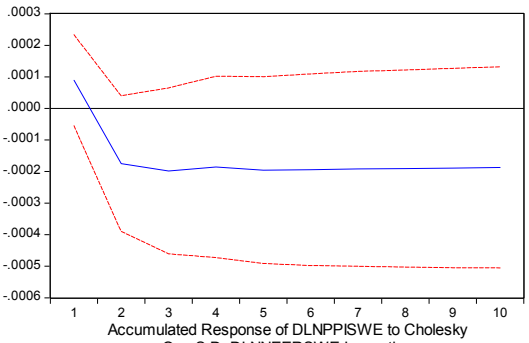
Appendix II. Impulse-Response Functions NEER to CPI and PPI, Pre- and Post-IT (Continued)

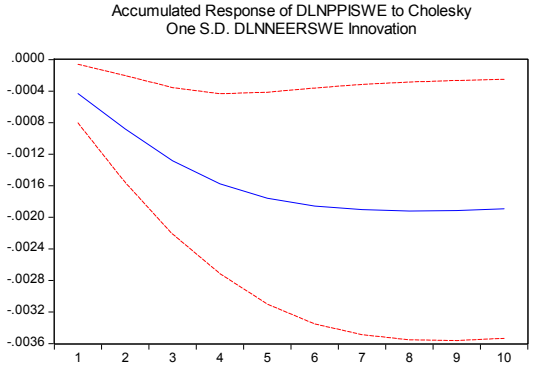
Sweden

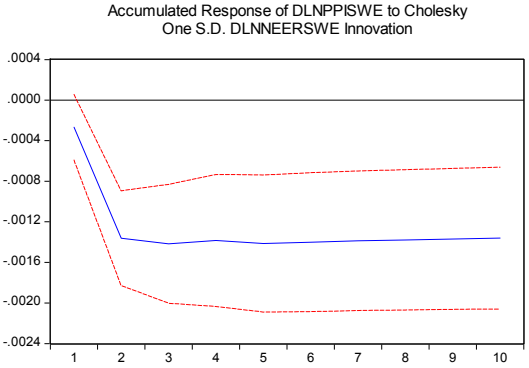
Pre-IT



Post-IT

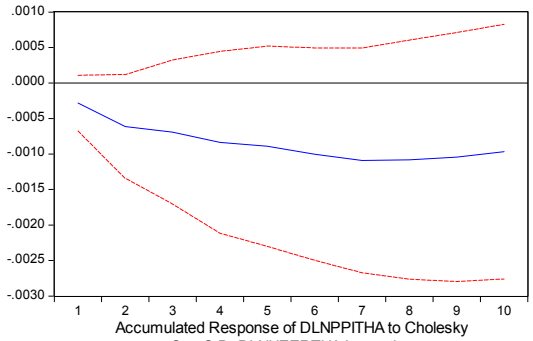




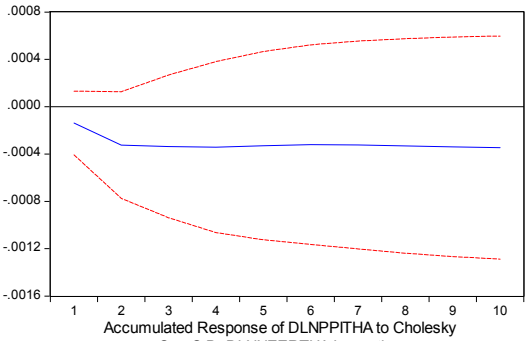


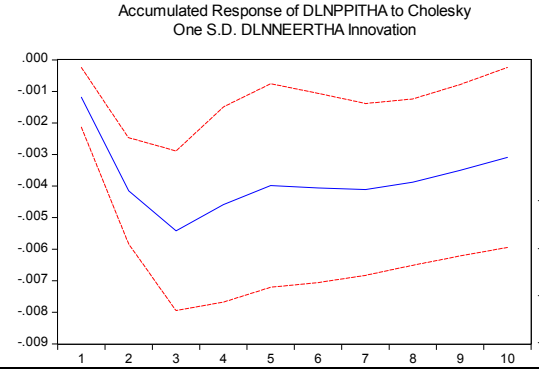
Thailand

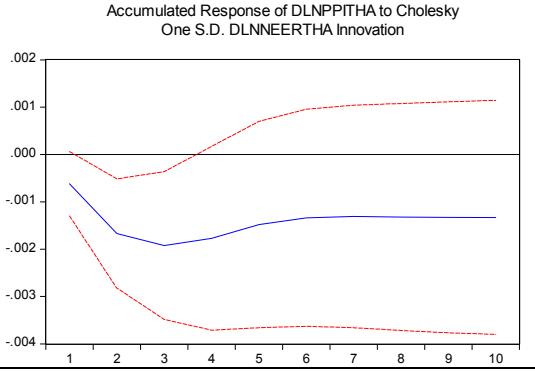
Pre-IT



Post-IT

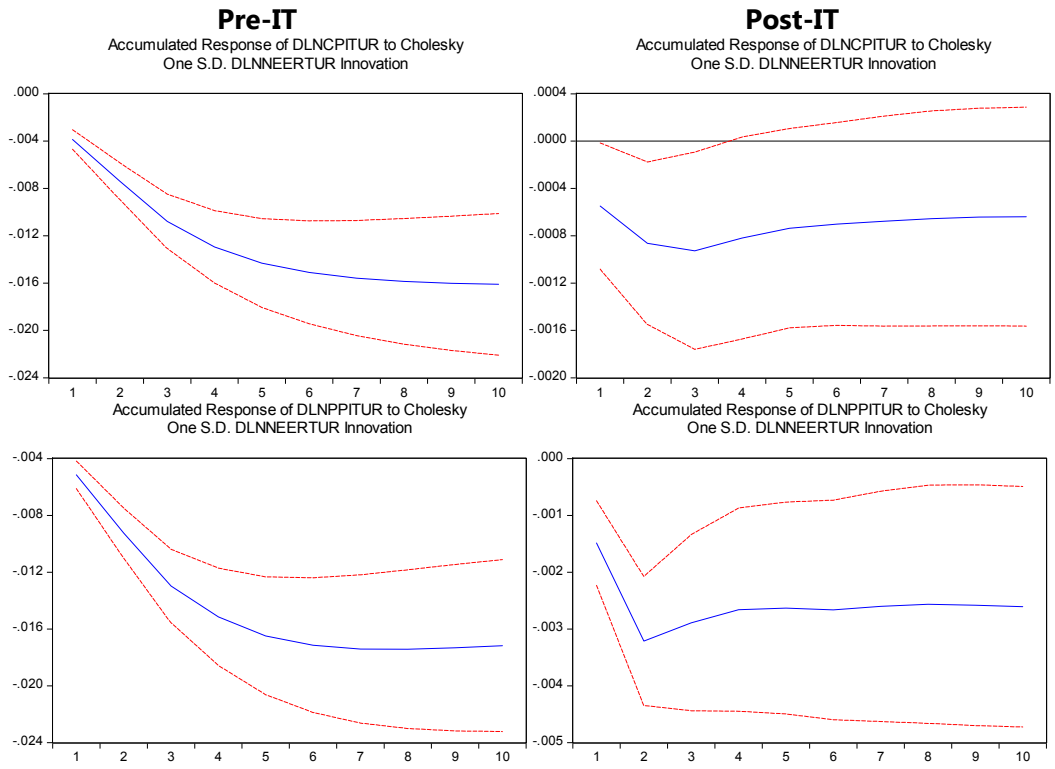




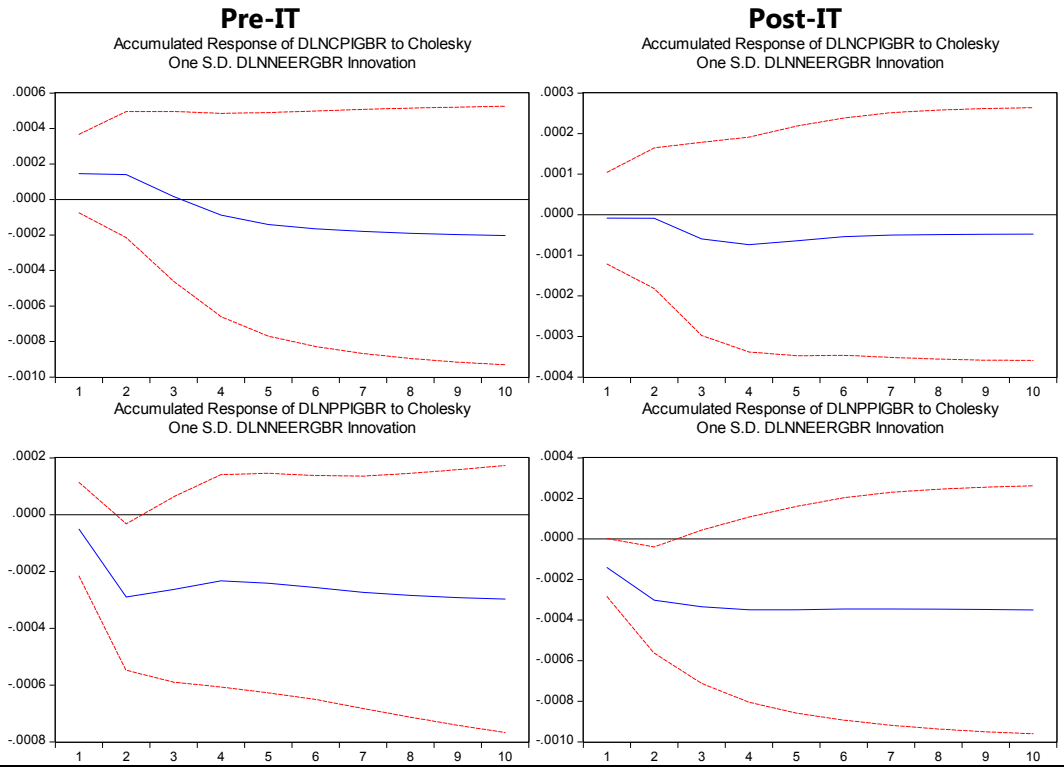


Appendix II. Impulse-Response Functions NEER to CPI and PPI, Pre- and Post-IT (Concluded)

Turkey



United Kingdom



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CREDIT EXPANSION AND THE MACROPRUDENTIAL POLICY FUNCTION IN RUSSIA[1]

Rapid growth in retail lending in Russia raises concerns about financial stability. In particular, the very rapid expansion in uncollateralized retail lending and declining capital and liquidity cushions are matters of concern. This section analyzes the credit expansion and concludes that the risks to financial stability are moderate, but growing. This situation requires improving systemic risk monitoring and the institutional design for macroprudential policy.

1. Russia's brisk credit expansion raises concerns about its financial stability. At 39 percent at end-2012, (y-o-y) growth in retail lending, driven by very rapid growth in unsecured personal loans (60 percent, y-o-y), is particularly high. While to some extent this represents financial deepening, available data and anecdotal evidence suggest that the quality of the uncollateralized retail loan portfolio is deteriorating and the debt burden is heavy and growing for some borrowers. On the other hand, corporate lending has been moderating, but still represents the largest share of credit risk in a challenging economic environment characterized by high GDP volatility and institutional weaknesses.

2. This situation gives rise to two questions: (i) has the recent brisk credit expansion created systemic risks?, and (ii) what can be done to effectively manage the associated risks?[2] This paper attempts to answer these questions using a combination of methodologies. In this context, the paper also discusses how macroprudential policy could supplement the existing microprudential policy framework in Russia. This is done through (i) analyzing the strengths and weaknesses of the existing institutional arrangements for macroprudential policy in a number of countries, with a view to identifying best practices that could be applied in Russia, and (ii) discussing the advantages and disadvantages of different macroprudential policy instruments, based on the experience of other countries, and their potential usefulness in Russia.

3. Available information suggests that the risks to financial stability are moderate but are increasing.[3] This requires improving systemic risk monitoring and the institutional design for macroprudential policy. Key recommendations are (i) the microprudential supervision framework should be strengthened; (ii) the planned "mega-supervisor" needs to be given adequate authority to issue regulations independently and to have the capacity to enforce corrective actions and the

[1] Prepared by Etibar Jafarov (MCM).

[2] Systemic risk is defined here as the risk of disruptions in the provision of key financial services that can have serious consequences for the real economy (IMF, FSB, BIS, 2011).

[3] Extreme tail events such as a collapse of oil prices as well as risks related to fraud and mismanagement are not focus of this note.

resolution of both banks and nonbanks; (iii) the Central Bank of Russia (CBR) should formally have a leading role in conducting macroprudential policy; (iv) the CBR should consider adopting ceilings on the loan-to-value ratio and debt-to-income ratio (including the interest) to prevent risks accumulating in the retail segment.

A. Has Rapid Credit Growth Created Systemic Risks?

A broad spectrum of macroeconomic and financial variables suggests that the current risks to financial stability are moderate, but growing. In particular, rapid growth in uncollateralized retail credit and worsening bank and borrower performance indicators need to be closely monitored.

4. To analyze systemic risks, policymakers need to combine various types of analytical tools and qualitative information, based on market intelligence and a thorough analysis of a country's macroeconomic and financial stability framework. There is no "all-in-one" tool for systemic risk assessment. Instead, different tools need to be used to cover various types of key risks (IMF, 2013). Both low-frequency and high-frequency indicators should be utilized. Generally, slow-moving leading indicators signal that risks are building up in the financial system, while high-frequency indicators are useful in predicting the imminent unwinding of systemic risk.

Total credit growth

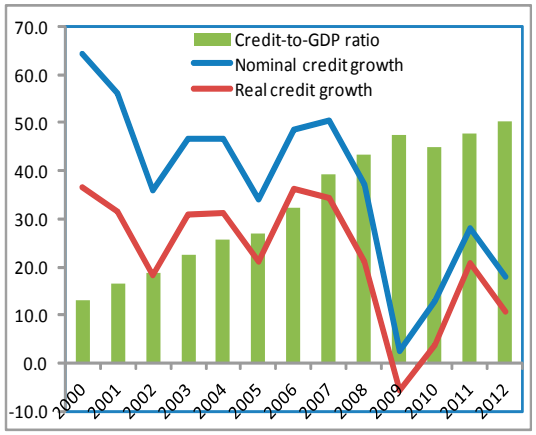
5. Since 2000, Russia's credit growth has been very strong (in real terms, averaging 21 percent per annum). As a result, the credit-to-GDP ratio increased at about 11 percent per annum from 2001 to 2012, which is above the level considered safe in other countries. Credit growth was particularly strong before the 2008–09 banking crisis: between 2001 and 2008, credit grew at 28 percent in real terms, and the credit-to-GDP ratio grew at more than 16 percent (per annum). After decelerating sharply in 2009–10, credit growth has resumed, albeit at a slightly slower pace: in 2011–12, on average, credits grew by 16 percent in real terms; and the credit-to-GDP ratio grew by 6 percent, above the 3 percent threshold level considered as an early warning indicator.[4] It should be noted, however, that Russia's credit-to-GDP ratio is not high compared to that of peer countries, which suggests that it will continue to grow faster than that of other countries for some time.[5]

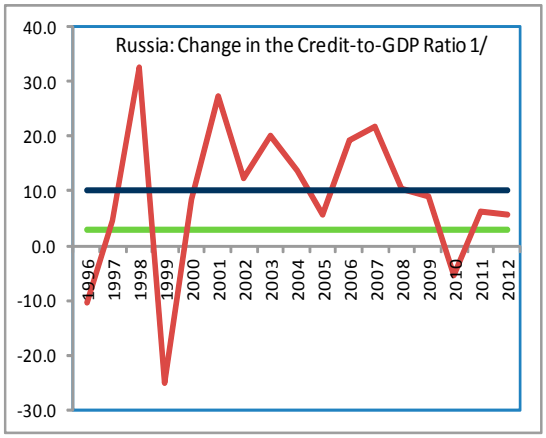
[4] International experience shows that increases in the credit-to-GDP ratio above 3 percentage points, year-on-year, could serve as an early warning signal one to two years before a financial crisis. Cross-country studies show that one in three credit booms end in a banking crisis within three years of its end. See the IMF's Global Financial Stability Report (GFSR), September 2011 and Dell'Ariccia and others, 2012.

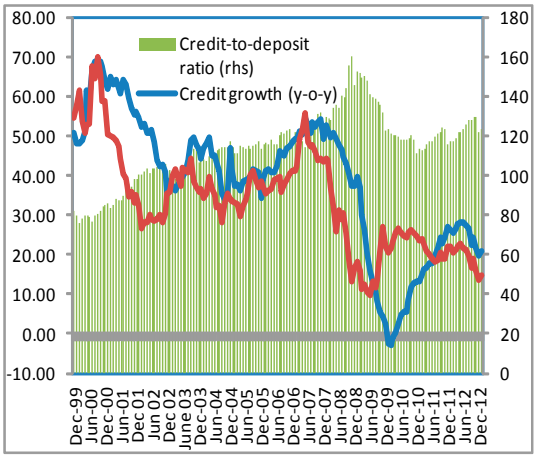
The rapid credit growth in Russia in 2011 triggered an increase in Fitch Ratings' Macro Prudential Index (an indicator of potential stress in the banking system) for Russia from "low" to "moderate."

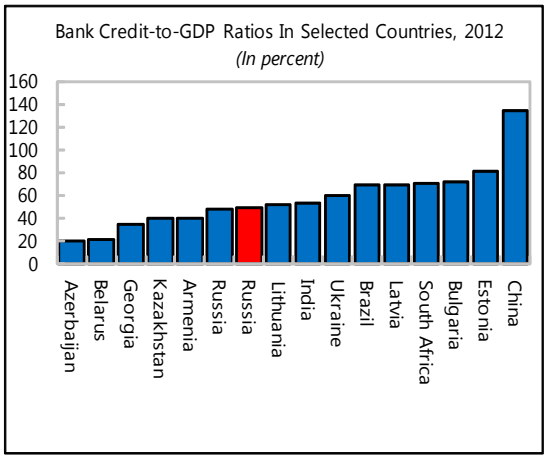
[5] From a more aggregate and forward-looking perspective, rapid credit growth is often central to the buildup of macro-financial risk. High credit growth leads to risks because it may be associated with a decline in underwriting standards and excessive risk taking by both lenders and borrowers. The rapid growth of the loan base may mask an underlying deterioration of loan quality, partly because loans generally take some time to be classified as non-performing. Indeed, international experience shows that credit growth can be a powerful predictor of financial crises.

Figure 1. Credit Growth in Russia and Credit-to-GDP Ratio in Selected Countries







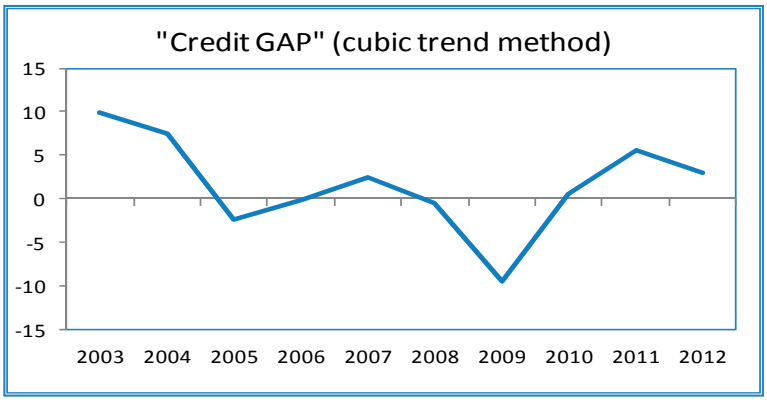


Sources: IMF, International Financial Statistics database, and IMF staff estimates.

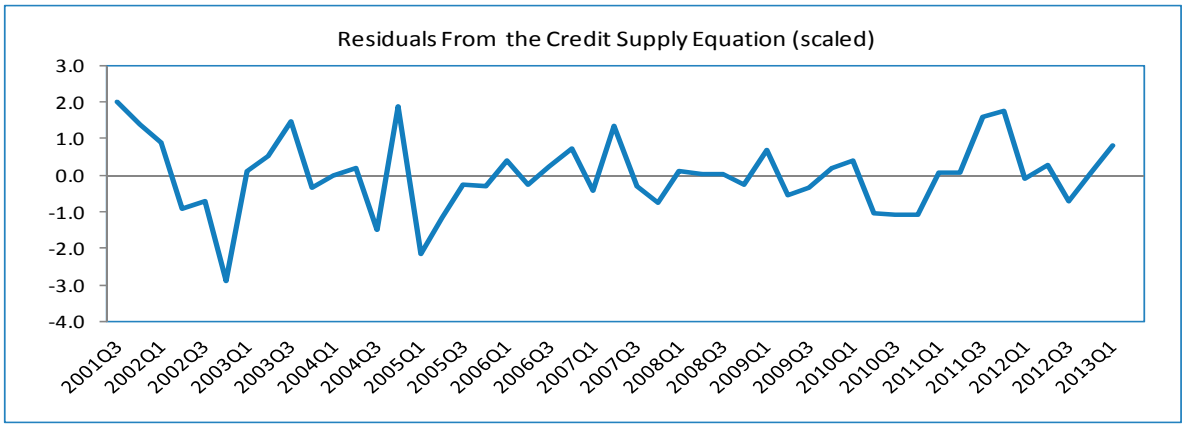
1/ The straight lines represent the 3 percent and 10 percent threshholds as in the IMF's Global Financial Stability Report (GFSR), September 2011 and Dell'Ariccia and others, 2012.

6. A combination of analyses suggests that at the moment the risks are moderate:

- **"Credit gap" analyses using total credit data suggest the absence of acute systemic risks at the moment[6].** The estimate of the credit gap using the so-called cubic trend methodology (Appendix 1) suggests that the current deviation from the trend is not large (text figure)[7]. In addition, strong credit growth in 2011 can to some extent be seen as a recovery from the decline in 2009–10, and appears to be moderating, reflecting the slowdown in the economy.



- **A model equation for the supply of credit (Appendix II) also suggests that Russia's total credit growth was only slightly above the level predicted by the model in Q1 of 2013 (text figure).[8]**



[6] Credit gap analyses assume that large deviations from trend growth will lead to higher probability of a correction ("bust phase"). There are various approaches to estimate trend growth in the ratio (e.g. simple regression, Hodrick-Prescott filter, or cubic trend. Dell'Ariccia and others, 2012 define the credit gap as a percentage deviation of credit-to-GDP from a backward looking, rolling, cubic trend estimated over the period between t-10 and t. They suggest that a credit boom occurs when the deviation from trend is greater than 1.5 times its standard deviation and the annual growth rate of the credit to GDP ratio exceeds 10 percent.

[7] This result should be interpreted with caution since the large shock in 2009-10 increases the standard deviation so that the current boom is within the threshold of one standard-deviation.

[8] The results of credit supply equation should be considered in light of the results from the cubic trend method since, by default, the former would not reveal a "gap" if total credit grew in line with growth in the explanatory variables, even if growth in the explanatory variables was excessive

- **In addition, most banks are profitable,[9] and, using stress tests, the CBR suggests that "the banking sector as a whole is stable" and resilient to a variety of shocks.** Russian banks' average return on assets is one of the highest among emerging market economies. The CBR's stress tests suggest that the banking system's capital adequacy ratio would decline to 11.1 percent in the "pessimistic scenario" and 10.6 percent in the "extreme" scenario (compared to the minimum ratio of 10 percent).[10] However, the same stress tests suggest that 308 banks (34 percent of the banking system assets) would need additional capital under the extreme scenario (236 banks with 26 percent of total assets under the less severe "pessimistic scenario).

- **Furthermore, Russia's flexible exchange rate, the expected adoption of an inflation targeting (IT) framework, a new fiscal rule, and small fiscal deficits reduce the chances of systemic risk.** Russia's large international reserves (more than 14 months of imports at end-2012), BOP surpluses (about 4 percent of GDP in 2012), and Stabilization Fund are cushions that could help mitigate the impact of adverse shocks.

7. On the other hand, the following financial factors suggest that risks to financial stability have been growing:

- **Since the fourth quarter of 2011, the increase in the credit-to-GDP ratio has far exceeded the 3 percentage point safety threshold (see footnote 3).**

- **Credit growth has led to declines in capital and liquidity cushions, which suggest a limited ability to absorb shocks.** Since 2010, credit growth has outpaced deposit growth, with the loan-to-deposit ratio increasing. This has led to reduced liquidity positions, with the reported average capital adequacy ratio declining from 18.1 percent at end-2010 to 13.4 percent in February 2013 (one of the lowest among emerging market economies, Table 1 and Figure 2).

- **HEAT maps suggest that the weakening in banks' capital adequacy positions has been broad based (Figure 3).** Most large private banks' capital adequacy positions are generally lower than the average for the system, while some foreign-owned banks have worse liquidity positions. While it is difficult to compare CAMELS-like indicators[11] across countries, due to potentially significant differences in financial reporting, a general observation in comparing

[9] High profitability of Sberbank is in part related to its monopolistic position, easy access to government and central bank financing, and perceived state (and central bank) guarantees on its liabilities.

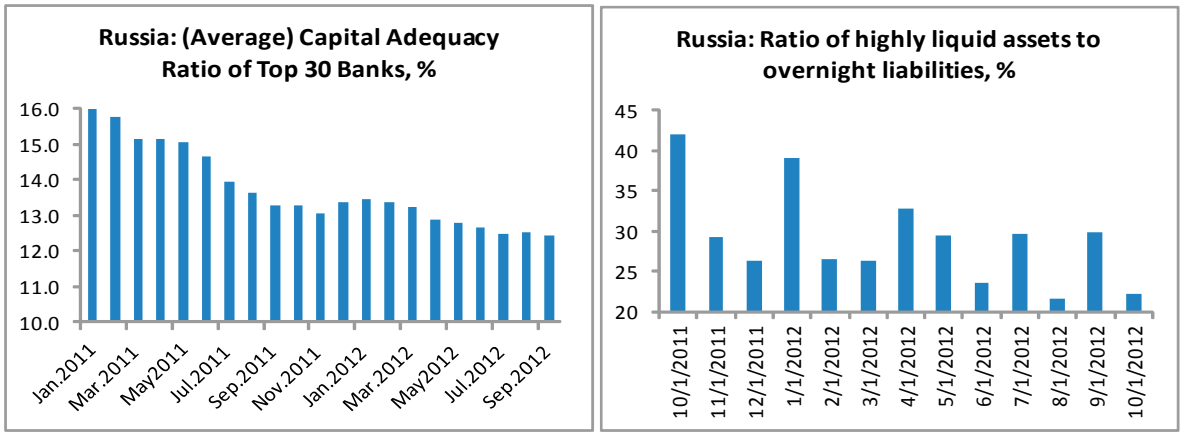
[10] The pessimistic scenario assumes 1.2 percent GDP growth, a 10 percent devaluation of the currency, a 200 percentage point (pp) increase in the risk-free rates, and a 500 pp increase in interest rates on corporate bonds. The extreme scenario assumes a 5 percent decline in GDP, a 20 percent devaluation of the currency, a 350 percentage point (pp) increase in the risk-free rates, and a 1000 pp increase in interest rates on corporate bonds. For comparison, in 2009, GDP declined by 7.8 percent, the ruble depreciated by about 21 percent, and the three-month interbank prime rate increased by more than 400 pp.

[11] CAMELS indicators measure capital adequacy, asset quality, management capability, earnings, liquidity, and sensitivity to market risk.

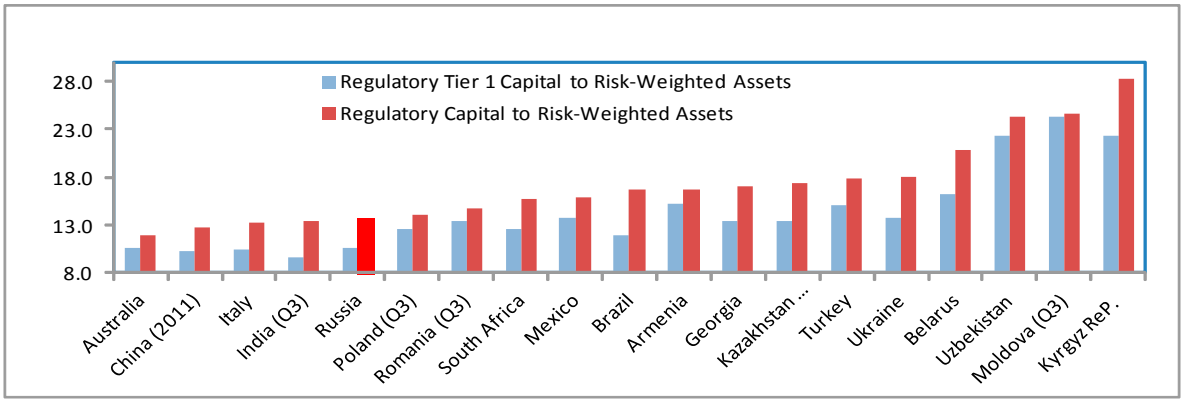
Russian banks' performance indicators with the performance indicators of Global Systemically Important Financial Institutions (Global SIFIs) is that Russian large banks are less leveraged and more profitable than Global SIFIs, but they have somewhat lower capital and liquidity cushions.

Figure 2. Financial Soundness Indicators in International Comparison

Both capital adequacy and liquidity ratios have declined since 2010.



Russia's CAR is low in international comparison.



Sources: CBR, and IMF Financial Soundness Indicators database.

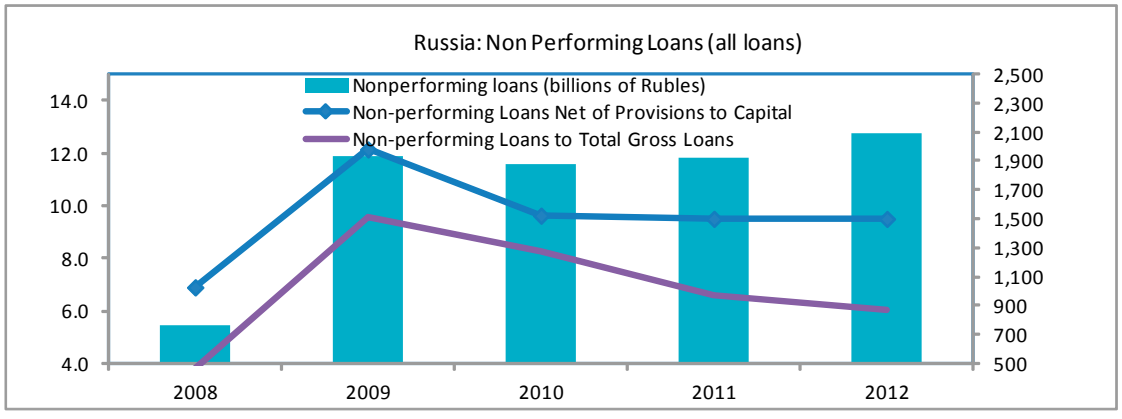
- Moreover, as the 2011 FSAP Update discussed, the reported data probably overstate the capital strength, potentially masking vulnerabilities. In particular, the FSAP pointed to (i) overvaluation of the foreclosed assets on bank balance sheets; (ii) the transfer of assets to affiliated off-balance sheet entities that are not subject to consolidated supervision; and (iii) the doubtful quality of restructured loans, which account for around one-third of all large loans.

Figure 3. Heatmap for Russian Banks

	Capital Adequacy						Asset Quality						Liquidity					
	2007	2008	2009	2010	2011	2012 1/	2007	2008	2009	2010	2011	2012 1/	2007	2008	2009	2010	2011	2012 1/
Bank 1	0.0	-0.1	-0.3	-0.3	-0.4	-0.3	0.0	0.0	-0.3	-0.8	-0.6	-0.5	-1.1	-1.1	-1.2	-1.3	-1.4	-1.1
Bank 2	0.2	-0.3	-0.1	-0.3	-0.4	-0.4	0.1	0.1	0.6	0.1	0.0	..	0.0	0.5	0.1	-0.4	-0.4	-0.2
Bank 3	5.2	-0.1	0.6	0.6	0.3	..	0.4	-0.1	2.4	3.7	2.3	..	1.2	0.0	0.1	0.1	-0.1	0.0
Bank 4	1.5	-0.5	-0.3	-0.3	-0.4	-0.3	-0.2	-0.3	-0.5	-0.5	-0.4	0.2	0.5	0.8	0.1	-0.3	-0.2	-0.4
Bank 5	-0.8	-0.4	-0.1	-0.3	-0.3	..	0.0	-0.1	0.0	0.6	1.3	..	-0.6	0.2	-0.4	-0.7	-0.7	-0.5
Bank 6	0.2	-0.5	-0.1	-0.3	-0.3	..	0.1	0.1	0.2	0.5	0.4	..	-1.2	-0.5	-0.3	0.1	0.1	..
Bank 7	..	..	..	..	..	..	..	..	..	..	..	..	-1.4	-1.1	-1.2	-1.1	-1.1	..
Bank 8	-0.6	-0.4	-0.3	-0.7	0.6	0.6	0.4	0.4	-0.6	-4.6	-2.4	-4.3	-0.8	-0.3	-0.5	-0.4	-0.1	1.5
Bank 9	-0.6	-0.3	-0.1	-0.2	-0.3	-0.3	0.1	0.0	0.3	0.4	0.4	..	-0.8	-0.8	-0.7	-0.5	-0.3	-0.3
Bank 10	..	-0.4	-0.5	0.3	-0.2	..	7.7	..	..	..	..	..	0.2	-0.5	-0.2	-0.5	-1.0	-0.9
Bank 11	-0.4	-0.3	-0.2	-0.4	-0.4	-0.3	-0.1	-0.7	-0.5	-0.3	-0.4	-0.2	-0.2	-0.4	0.4	-0.4	-0.3	-0.6
Bank 12	..	..	0.2	0.1	-0.1	..	0.0	-0.2	-0.2	-0.2	-0.2	0.0	-0.1	-0.4	0.3	-0.1	0.0	0.8
Bank 13	-0.6	-0.4	-0.4	-0.4	-0.5	-0.5	0.0	-0.4	0.1	-0.2	-0.1	0.0	-0.6	-0.4	-0.2	-0.6	-0.6	-0.6
Bank 14	-1.2	-0.6	-0.6	-0.6	-0.5	-0.4	0.0	0.8	-0.7	-0.7	-0.6	..	-0.2	0.0	0.2	0.2	-0.2	-0.7
Bank 15	..	..	..	..	..	..	-0.2	-0.4	-0.5	1.8	1.3	..	1.5	1.9	2.5	0.3	0.4	..
Bank 16	0.7	0.3	0.2	0.1	..	..	-0.2	-0.4	0.6	0.3	..	..	-0.5	-0.8	-0.8	-0.5	..	..
Bank 17	-0.2	-0.1	0.0	-0.1	-0.3	..	0.3	-0.1	0.6	0.5	0.2	..	-0.6	-0.8	-0.9	-0.7	-0.9	..
Bank 18	..	..	..	..	..	..	-0.3	-0.4	-0.5	-0.3	-0.2	..	-0.6	-1.4	-1.2	-1.1	-1.2	..
Bank 19	..	5.0	6.7	5.0	..	..	..	-0.8	0.2	0.8	..	..	..	2.0	4.1	3.4	..	..
Bank 20	0.7	0.8	1.3	0.9	0.1	0.1	0.1	-0.1	0.0	0.1	0.0	-0.2	-0.3	1.7	-0.1	-0.4	-0.9	-1.3
Bank 21	0.2	0.4	0.2	0.1	0.0	0.1	0.2	-0.4	0.4	0.9	-0.5	4.2	0.4	-0.1	-0.3	-0.6	-0.4	-0.6
Bank 22	-0.2	-0.4	-0.4	-0.4	-0.4	-0.4	-0.2	..	-0.4	-1.0	-1.1	..	-0.5	-0.5	-0.6	-0.5	-0.3	-0.3
Bank 23	..	..	..	..	..	..	..	0.1	-0.6	-0.1	0.0	..	-0.1	1.7	1.3	0.6	1.1	..
Bank 24	0.2	..	0.8	0.5	0.2	..	0.2	-0.2	-0.2	0.0	0.0	..	-0.1	0.3	-0.1	0.1	-0.5	..
Bank 25	..	..	..	..	..	..	-0.1	0.0	-0.4	-0.4	-0.3	..	-0.9	-0.8	-0.3	-0.2	0.9	..
Bank 26	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bank 27	-0.4	-0.4	-0.2	-0.3	-0.5	-0.5	-0.2	-0.3	-0.5	-0.5	-0.3	..	0.1	-0.2	0.1	-0.3	-0.5	-0.3
Bank 28	..	..	-0.2	-0.5	..	..	..	1.7	-0.3	-0.1	0.4	..	..	0.3	0.8	0.5	-0.4	..
Bank 29	..	..	..	..	..	..	..	..	..	..	0.6	..	..	..	..	..	-1.0	..
Bank 30	..	-0.3	-0.3	-0.5	-0.3	-0.3	0.3	0.2	0.0	-0.1	-0.1	0.0	-0.7	-1.0	-0.5	-0.2	-0.2	-0.1
Bank 31	..	-0.8	-0.3	-0.2	-0.3	..	..	-0.6	-1.1	-0.6	-1.0	..	0.3	-0.8	-0.7	-0.7	0.1	..
Bank 32	..	..	..	..	..	..	..	..	..	..	..	..	2.6	2.5	2.3	2.2	..	..
Bank 33	-0.7	..	-0.5	-0.2	-0.4	..	0.6	0.7	..	..	0.6	..	0.1	0.0	0.1	0.4	-0.2	..
Bank 34	..	-1.5	0.5	0.0	-0.5	-0.6	..	..	..	0.1	0.0	-0.1	-0.5	-0.5	0.5	-0.6	-1.1	-1.0
Bank 35	..	..	0.9	0.5	-0.2	..	..	0.1	-0.1	-0.1	-0.2	..	..	3.9	-0.2	-0.2	-0.4	..

Sources: BankScope; and IMF staff estimates.
1/ As of June 2012 or latest.

- **Nonperforming assets continue to grow in nominal terms**. While the NPL ratio is declining, this is due to rapid credit growth (text figure).

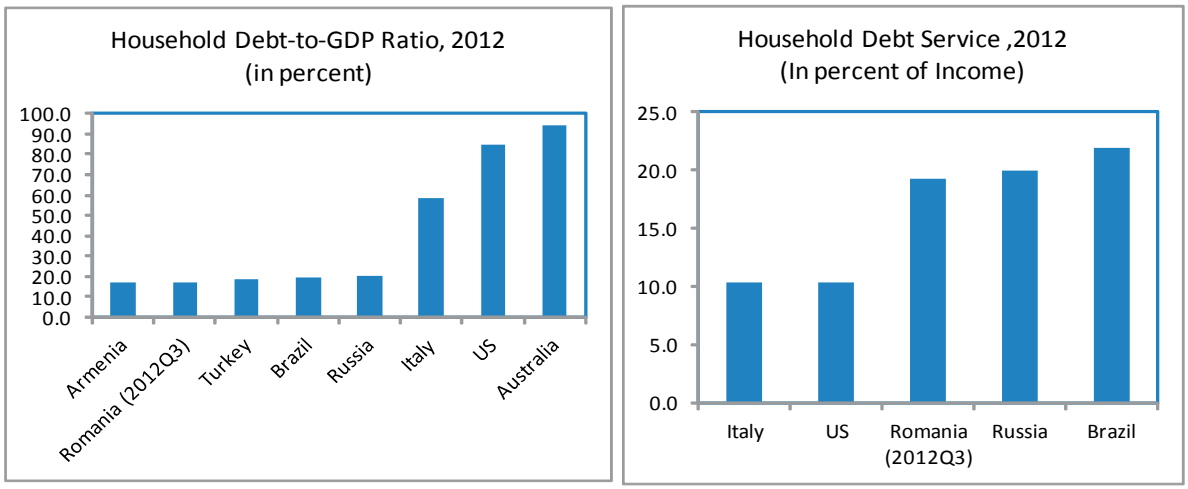


Sources: Russian authorities, and IMF staff estimates.

- **While bank credit is still low in comparison to GDP, the household debt burden is high in international comparison.** The household debt ratio is low, which implies that it will increase over time compared to that of other countries. However, the ratio of household debt-to-income has been increasing rapidly and is high in international comparison. This is due mainly to very high shares of short-term borrowing and high interest rates (Figure 4).

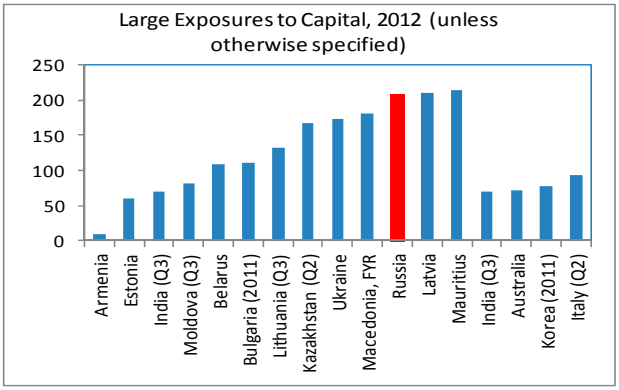
Figure 4. Russia's Household Debt Burden in International Comparison

Russia's household debt service ratio is high.



Sources: CBR, and IMF Financial Soundness Indicators database.

- **Compared to other countries, Russia has a high concentration of banks and debtors.** The five largest banks account for more than half of the banking system assets. Russian banks' large exposures are high in international comparison (text figure).



- **The ongoing economic difficulties in Cyprus and other crisis-affected European countries represent risks.** Spillovers from Cyprus have so far been small, but capital controls in Cyprus could complicate the servicing of loans extended by Russian banks and their subsidiaries. While the subsidiaries of Bank of Cyprus and Cyprus Popular Bank in Russia are likely to be affected, their combined assets are around $3 billion, well below one percent of the Russian banking system's assets.

8. Pockets of vulnerability are emerging. The examination of macro-financial linkages, through which potential risks may be transmitted to the financial and real sectors, points to the possibility of risks accumulating (Figure 5):

- **The retail lending boom is contributing to robust growth in personal consumption.** In particular, the deviation of retail trade from the real disposable income index coincides with the rapid consumer credit expansion, suggesting that the retail credit boom has contributed to robust growth in personal consumption. At the same time, the household savings ratio is at record low levels (CBR, Financial Stability Report, page 29).

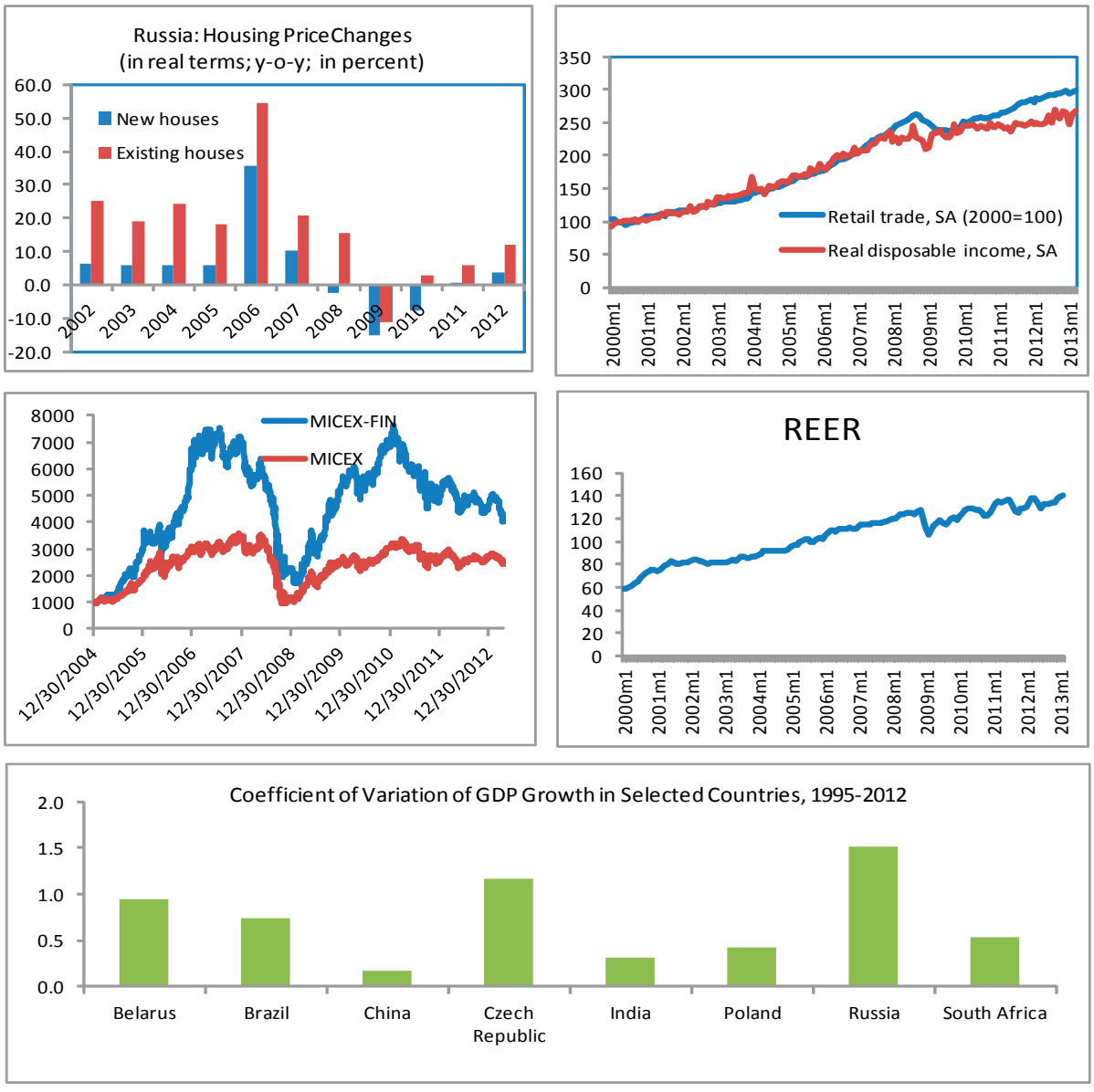
- **Real estate price increases have accelerated again, although the price increases are well below the levels observed before 2009.** Following a large drop in 2009–10, house prices increased by 10–12 percent in 2012, well above the (CPI) inflation rate; no data are available on commercial real estate prices.

- **The real exchange rate has been appreciating, which usually adversely affects the competitiveness of domestic producers.** Cross country studies show that, in emerging economies, the real effective exchange rate (REER) tends to appreciate rapidly in the run-up to a crisis. In Russia, there has been a trend appreciation of the REER since 2000 with increased volatility since mid-2009 (the latter is largely due to a policy shift to a flexible exchange rate). On the other hand, the IMF external balance estimates (EBA) suggest the exchange rate is broadly in line with fundamentals.

- **Financial stock prices started underperforming other stock prices.** The greater declines in financial stock prices compared with other stocks may signal increased risks for banks' performance (compared to the performance of other sectors).

- **In addition, banks' operating environment remains challenging**. In particular, Russia's GDP is more volatile compared to that of peer countries (mainly due to the large share of the commodity sector, which is vulnerable to volatile price changes), and Russia underperforms its peer countries in terms of creditor rights, rule of law, etc.

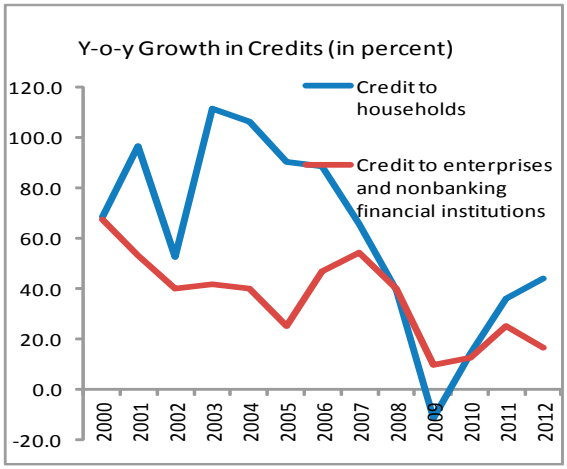
Figure 5. Selected Economic Indicators

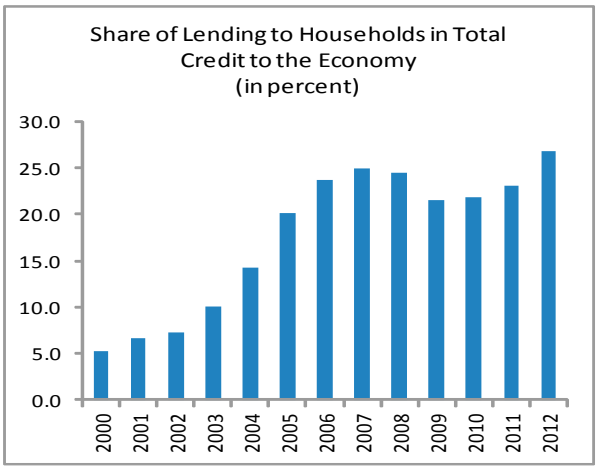


Sources: Country authorities, and IMF staff estimates.

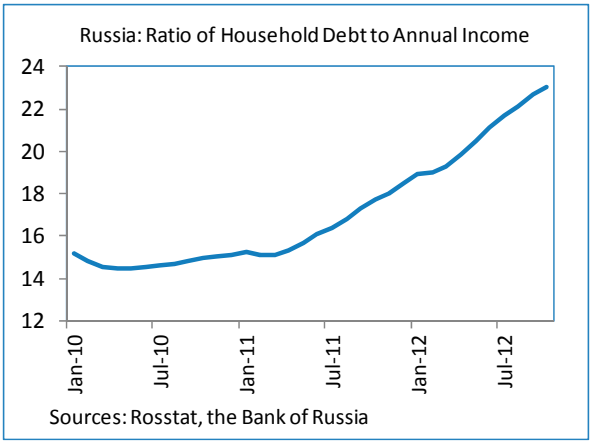
Composition of credit growth and risks

9. The very rapid expansion of unsecured retail credit has become a source of increased risk. Russia's retail lending growth has far exceeded corporate lending growth every year since 2000, with the exception of 2009 (text figure). An important feature of the ongoing boom is that it is driven by very strong growth in unsecured personal loans, which are riskier than other types of loans. In response, the CBR has introduced higher provisioning requirements for uncollateralized retail loans and increased the risk weights for consumer loans.





10. The debt burden is heavy for some categories of borrowers. Russia's household debt-to-GDP ratio is not very high compared to peer countries and is low compared to developed countries, suggesting significant room for growth in the future. The recent retail credit boom has involved a significant increase in the number of borrowers, and thus may have helped improve access to finance. However, the debt burden has recently increased rapidly (text figure) and is high in an international comparison (Figure 4). Anecdotal evidence suggests that some individuals are borrowing to pay off their existing debt.



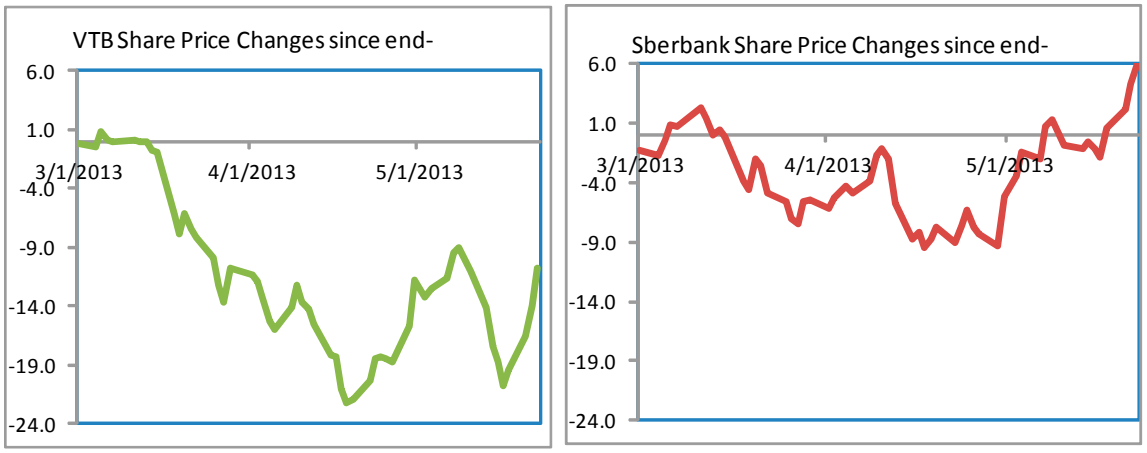
11. Corporate lending has been moderating. Corporate lending was strong in the run-up to the presidential elections in 2012, but has slowed down since then. The fact that corporate lending is moderating while retail lending is booming suggests that the former is caused by a decline in the demand for loans from large corporate; small and medium-size enterprises continue to have difficulties in obtaining loans.

12. Nevertheless, corporate lending still represents a large risk given its size (¾ of banks' loan portfolios) and the high volatility of economic activity in Russia. Russian GDP growth is more volatile than that of peer countries, perhaps due to the important role of oil revenues in the economy. Combined with Russia's underperformance in terms of creditor rights and the business environment, risks related to corporate lending remain an important concern.

Market-based indicators

13. Prices of shares of the banks involved in Cyprus were adversely affected in the aftermath of the Cyprus crisis. The shares of Sberbank, VTB, and other banks with connections to

Cyprus lost about 2-7 percent of their value in the first days of the Cyprus crisis. The price of the shares of VTB, which reportedly has the largest exposure to Cyprus, has been particularly volatile (text figure). The recently announced new share issuance by the bank (for about $3 billion) is expected to improve VTB's financial situation.



Sources: Bloomberg, and IMF staff estiamtes.

14. Market-based indicators suggest that the risk of a major bank's (imminent) failure is small, but the risks have increased since early-2011.[12] Moody's EDF data suggest that, by early 2010, the probability of default for banks had declined from the very high levels seen at end-2008 and early 2009. However, they increased somewhat in H2-2011 and H1-2012 (text figure).

Large exposures by some banks to certain market segments

Some banks are heavily concentrated in few market segments (e.g., credit cards). These so-called "specialized institutions" increased their lending by 50–120 percent in 2012 (y-o-y), mostly in the uncollateralized retail segment. Currently, there are no additional capital requirements for these concentration risks. The share of these banks in the total assets of the banking system is small.

[12] Moody's uses CDS prices to assess the probability that individual financial institutions may undergo distress or fail; it publishes daily information on distance-to-default (DtD) and expected default frequency (EDF). Other indicators frequently used in the literature include (i) Beta index for banks, which measures the correlation between the total returns to the banking sector stock index and the overall stock market index, (ii) the spread between the interbank interest rates or commercial paper and government short-term rate, (iii) "inverted term spread," which is the difference between government short-term rate and government long-term rate; (iv) stock market volatility; (v) sovereign debt spread; (vi) exchange rate volatility; and (vi) corporate debt spread (over government bond yield (see Balakrishnan and others, 2009; Cardarelli and others, 2009. These are good near-term indicators of crisis and spillover risks. The main weakness of this approach is increased risks for errors when markets incorrectly price risks (e.g., in illiquid markets).

B. How can Macroprudential Policies Supplement the Microprudential Policy Framework?

The legislation on consolidated supervision, expected to be adopted shortly, will empower the CBR to supervise complex financial holding companies, and therefore. The planned creation of a mega-supervisor through the merger of the CBR and the Federal Service for Financial Markets may improve the framework for monitoring systemic risks, but the existing weaknesses in the supervisory framework for nonbank financial institutions need to be addressed.

The strengths and weaknesses of existing institutional arrangements for macroprudential policy in other countries

15. The key institutional elements of a macroprudential policy framework include the mandate, powers, instruments, and coordination between microprudential and macroprudential policies. For example, a formal mandate can improve the clarity of decision making and avoid policy paralysis when the views of stakeholders differ. A mandate normally comes with the power to collect information and adopt measures. Establishing accountability in conducting macroprudential policy is important given that there is no easily measurable metric of success (Appendix III).[13]

16. Previous IMF studies identify three broad categories of stylized models of macroprudential policy. The three broad categories are differentiated mainly based on how the objectives and functions of macroprudential, monetary, and microprudential policies are coordinated and how much information is available within the central bank.

- *full integration* means that all financial supervisory and regulatory functions are carried out by the central bank or by its subsidiaries**;**
- *partial integration* means that the securities supervisor or business conduct supervisor are separate entities, while prudential supervision of banks and other financial institutions is conducted by the central bank; and
- *separation* means that essentially all financial regulatory functions (other than payments oversight) are housed outside of the central bank (Nier and others, 2011 and Appendix III).

17. In the models within the full and partial integration categories, the central bank, either alone or together with other agencies, is in charge of macroprudential policy. The central bank becomes the owner of macroprudential policy when it is given the objective to safeguard financial

[13] The "costs" of macroprudential measures in the form of restrictions on certain activities are felt immediately, while the "benefits" of lowering the incidence of financial distress accrue over a long term and are hard to measure.

stability (as in the Czech Republic and Singapore). The partial integration or twin peaks models involve close institutional integration between the functions of the central bank and the prudential supervisor, while the regulation of activities or "conduct" in retail and wholesale financial markets is conducted by another agency (e.g., the set-up in Brazil, the Netherlands, the U.K., and the U.S.). The main advantages of the full or partial integration models relate to better flow of information and improved coordination across objectives and functions within one organization, which can increase the effectiveness of decision making. The main disadvantage relates to the lack of institutional mechanisms to challenge the "house views" formed within one institution.

18. In the models falling under the separation category (models 5–7 in Appendix Table), the central bank is not directly responsible for macroprudential policy. The strengths of such a multi-agency set-up include (i) reduced risk that any one institution will not be challenged in its identification of risks or assessment of the appropriate policy response, and (ii) keeping each agency focused on its main objective, which in itself may contribute to maintaining financial stability. Under this arrangement, policy making benefits from different perspectives on the sources of systemic risk, the potential for regulatory arbitrage, and the appropriateness of measures (which may be housed in different agencies). Canada, Chile, Mexico, Peru, as well as Australia, Hong Kong SAR, and Korea provide examples of such stylized models.

19. However, this set-up faces a number of challenges in ensuring the effectiveness of macroprudential policy. In particular, a collective responsibility for systemic risk mitigation can dilute accountability and incentives and may create a situation where no one institution has all the information needed to analyze all interlinked aspects of systemic risk (e.g. due to barriers to free flow of information, caused by rivalry or legal obstacles). This may increase the chances of risks remaining unaddressed and delays in taking remedial measures.

20. A key mechanism to address some of these weaknesses is the establishment of a coordinating committee. It can facilitate the exchange of information between agencies and foster the engagement of each agency with the shared goal of financial stability. Formal arrangements, which are more visible to the public, can enhance these benefits. Specifically, more formal arrangements may allow the committee to issue public warnings and recommendations to constituent agencies (as in Mexico). This can foster the effective use of macroprudential policy instruments even where such recommendations are not binding on the agency. However, a committee may not be able to fully address deep-rooted accountability and incentive problems, and this remains a concern for the effectiveness of this group of models.

21. Another important risk is that decisions may be subject to delay. This risk is greater where the committee's membership is large or where the treasury occupies a strong role. Careful design of voting arrangements can reduce the risk that no action is taken as a result of persistent disagreement between constituent agencies or political economy pressures. Such voting should be subject to a simple majority or a qualified majority rule rather than requiring unanimity among all constituent agencies (Nier and others, 2011).

The macroprudential policy framework in Russia

22. In Russia, the CBR is responsible for financial stability, but there is no formal mandate for macroprudential policy. It collaborates closely with the government, and disagreements are resolved through consensus. The CBR does not have power to initiate legislation; it forwards its proposals to the MoF. In December 2010, an Inter-Agency working under the Presidential Council (Working Group to Monitor Financial Market Conditions) was created. In March 2011, the CBR established a Financial Stability Directorate to carry out systemic risk monitoring; the CBR produces Financial Stability Reports. The authorities are planning to establish a Financial Stability Council.

23. The absence of a macroprudential policy mandate has so far not prevented the CBR from taking measures of a macroprudential nature. In particular, the CBR (i) used differentiated reserve requirements to reduce capital inflows before the 2008–09 crisis;
ii) reduced provisioning standards during the crisis to stimulate lending in the downturn (that "saved" some 220 billion rubles for banks); (iii) introduced limits on net open FX positions to prevent capital outflows during the crisis; and (iv) even proposed legislation outside its mandate (with a view to promoting financial stability) such as the Tax Code to make foreign currency denominated borrowings less attractive.[14]

24. More recently, the CBR has introduced the following measures aimed at maintaining the stability of the financial system.

- An increase in risk weights for noncore assets and foreign-currency retail loans to 150 percent from 100 percent (from July 2012);
- An increase in risk weights to 50 percent from 20 percent for placements in unrated banks in countries considered low risk by the OECD (from January 2013);
- An increase to 10–75 percent in impairment reserves on project-finance loans with grace periods for interest payments (from July 2013);
- An increase in risk weights on newly issued high-margin loans to up to 200 percent (from July 2013). The impact of this measure is reduced by the fact that not all loan-related charges are captured in the "effective rate" calculations.
- Assignment of permanent bank supervisors to the largest banks, to be located on the banks' premises.

[14] Furthermore, during the crisis, the CBR reduced "haircuts"/margins on collateral for borrowing from the CBR and lent to banks without collateral; and used the refinancing rate to affect capital flows (increased them in November–December 2008 to contain capital outflows and reduced them in 2009-10 to contain inflows).

25. However, the banking prudential supervisory framework suffers from several weaknesses with implications for systemic risk monitoring and prevention. In particular, the CBR lacks the authority to (i) supervise bank holding companies and broadly defined related parties; (ii) impose restrictions on transactions between affiliates; (iii) use professional judgment in applying laws and regulations to individual banks; (iv) sanction individual directors and key managers; (v) raise capital requirements on individual institutions; and (vi) share without restrictions information with other supervisors. Most of these shortcomings would be addressed by pending legislation to be adopted soon.

26. The planned merger of the CBR and Federal Service for Financial Markets (FSFM) may enhance the capacity to monitor systemic risks, but the current weaknesses of the supervisory framework for nonbank financial institutions need to be resolved. In particular, currently the FSFM does not have adequate power to require insurers to have in place internal controls and a risk management system commensurate with the complexity of their business; apply fit and proper requirements to directors and key management of insurers; and take preventive and corrective actions to address weak securities firms. Also, the FSFM can issue regulations only after consultation with the MoF, but this issues is expected to be resolved when the mega-regulator is established.

Advantages and disadvantages of different macroprudential policy instruments

This section describes briefly the most frequently used macroprudential measures and discusses their relevance for Russia. The measures considered here include the loan-to-value ratio (LTV), debt (service)-to-income ratio (DTI), and dynamic provisioning (DP). The advantages and disadvantages of other measures are described in Appendix IV.[15] These are for illustration purposes only; the actual assignment and specification of instruments has to take into account local considerations, such as legal constraints, the effectiveness of the instruments to meet the objectives, and the level of development, structure, and complexity of the financial system.[16]

[15] Most macroprudential measures can be (and are) applied also for microprudential purposes. Both policies exist to correct market failures and externalities related to them. Generally, microprudential policy looks at individual institutions, and macroprudential at a financial system as a whole. In practice, overlaps are possible in the areas of perimeter, toolkit, and its transmission mechanism. Osiński and others, 2012 offer several approaches to deal with the problem of borderlines and potential tensions and conflicts.

[16] These instruments are used to address the time dimension of systemic risks. See Appendix III for instruments that are used for addressing the cross-sectional dimension of systemic risks.

LTV

27. LTV limits enhance banks' resilience to credit risks by increasing the collateral backing of loans and thus restricting losses in the event of default. Generally, the ratio is set based on the historical volatility of the collateral value. It directly limits risky lending, slowing down the supply of credit to specific sectors (e.g., real estate, car lending, etc).[17]

28. Limits on LTV ratios have been increasingly applied to reduce systemic risk arising from boom-bust episodes, notably in real estate markets. By limiting the loan amount to well below the current value of the property, LTV limits can help rein in house price increases by putting the brakes on household leverage, reducing the financial accelerator effect. For example, Wong and others (2011) find that, for a given fall in prices, the incidence of mortgage default and bank losses are higher for countries without an LTV measure. This measure is less prone to

29. The ratio can be (and often is) applied countercyclically. Tightening the ratio during a boom restricts the accumulation of risks, thereby moderating the credit cycle and house price increases. Some countries have kept LTV rates constant to provide a minimum buffer against an unsustainable increase in house prices (Colombia, Lebanon, Malaysia, and Sweden). In other countries, LTV limits are adjusted in line with the cyclical position, with a tightening occurring during housing booms and a relaxation during downturns (China, Hong Kong SAR, and Korea). In some cases, the adjustments are made in a reactive, and not necessarily countercyclical, manner (Lim and others, 2011).

30. Like other measures, LTV limits have also a number of disadvantages. First, implementing this measure has costs associated with potential credit rationing. For example, new entrants to the housing and real estate market could be rationed out. In some countries (e.g. Hong Kong SAR), this problem is addressed with insurance programs for first-time home buyers. Accordingly, it is difficult to calibrate the trade-off between financial stability benefits, economic activity, and societal preferences for home ownership. Second, the measure is susceptible to circumvention and could encourage obtaining second mortgages on the same property or unsecured loans such as credit card borrowing. Importantly, it has less impact on the leverage of bor rowers and banks.

31. Globally, this is the most frequently used tool. According to the 2010 IMF survey, 34 out of the 52 responding countries had this measure in place.[18] LTV limits are particularly popular in Asian countries experiencing real estate booms.

[17] Crowe and others (2011) find that tighter LTVs lead to lower house price increases, at least in the short run. Igan and Kang (2011) find similar results.

[18] In addition, several countries such as Australia, Canada, Korea, Latvia, Thailand, and United Kingdom had granular capital requirements based on LTVs.

32. Russia, there are no formal LTV requirements. Individual banks apply LTV ratios for their creditworthiness assessments. However, the increased competition may force banks to apply less stringent requirements. The authorities could usefully consider formal requirements, including lower ratios in zones where housing prices increase much faster than the national average. To be able to apply such a differentiated ratio, the authorities would need to collect and analyze information on housing prices as well as (actual) LTVs applied by banks.

DTI

33. When used alone, limits on DTI aim at safeguarding banks' asset quality. They limit risky lending and reduce the probability of default. When used in conjunction with the LTV, the DTI can help further dampen the cyclicality of collateralized lending by adding another constraint on households' capacity to borrow. Like in the case of LTV limits, adjustments in the DTI ceilings can be made in a counter-cyclical manner to address the time dimension of systemic risk (Lim and others, 2011).

34. Like the LTV, the DTI may involve costs associated with potential credit rationing. Moreover, data requirements can be challenging, calibration is difficult, and it is susceptible to circumvention.

35. In Russia, there are no formal DTI requirements. Although this is less of a problem in a growing economy, the situation may change in downswings with higher unemployment rates.

DP

36. DP is designed to distribute loan losses evenly over the credit cycle. It is based on the notion that provisions should account for expected loss over the long term (cycle) rather than incurred loss. Generally, the level of provisioning in a dynamic provisioning approach would be less subject to sharp swings stemming from the strength (or weakness) of economic activity because of the primacy of expected, rather than actual, losses. By requiring banks to build reserve buffers during an upswing, DP counterbalances the tendency of specific loan reserves to be low when credit quality is high. As a result, the marginal cost of loan-loss provisioning is smoothed significantly over the credit cycle. DP is more effective when applied to narrowly-defined categories at the beginning of the credit cycle. In the same way, DP would be less effective if a bank incurred large losses in an upswing, reducing the available cushion in the form of accumulated reserves.

37. While DP has a number of beneficial properties, there are also limitations to what it can achieve. For example, it can help absorb reasonably large shocks to loan quality, reducing a bank's probability of default, but it is not designed to cover large unexpected loan losses (for which there is bank capital) or tail risks. For example, in Spain, the buffer of dynamic provisions was large enough to offset about half of the loan losses that occurred during 2008–09 but not all delinquencies, since eventual loan losses exceeded expected losses. By contrast, the reserves coverage in Uruguay ballooned as the expected loan delinquencies on which the model was calibrated did not materialize (Lim and others, 2011). While DP contributes to smoothening the

credit cycle, it is not designed to rein in rapid credit growth. Its overall impact on credit growth is muted, as lending can be shifted to foreign (parent) banks and less-regulated intermediaries.

38. Data requirements and calibration can become challenges. Some calibration does not take into account the credit risk profile of banks. Those involving probability of default estimations require granular data, which are missing in many countries. Moreover, data should cover a full credit cycle; data covering only the boom period would lead to underestimation of risks. There are strong overlaps with countercyclical capital buffers and variable risk weight tools.

39. Arguably, Russia's softening of the provisioning standards during the 2008–09 crisis is similar to DP. However, DP implies building capital during the "boom phase," which then can be released in a slowdown. In that sense, the easing of provisioning standards in Russia was more of forbearance rather than DP.

Implications and conclusions

40. Available information suggests that risks to Russia's financial stability are moderate, but growing. In particular, the very rapid expansion in uncollateralized retail lending and declining capital and liquidity cushions are matters of concern. These need to be closely monitored.

41. The CBR should build on its progress in monitoring systemic risks. The CBR's Financial Stability Report's focus could be extended to cover real estate prices (both housing and commercial real estate), financing conditions in the corporate sector, and risks to financial institutions at the conglomerate level. In addition, the authorities should consider utilizing market based indicators (e.g. bank stock prices; Beta index for banks; CDS; CDS-based probabilities of default for banks; the difference between interbank rates and the yield on Treasury bills; corporate bond spreads; see footnote 12) to analyze immediate risks to financial stability.

42. The macroprudential policy function can complement sound prudential supervision and macroeconomic policies (which are the starting points in preventing the accumulation of risks).

- **The mega-supervisor should be given adequate authority to conduct stringent (micro)prudential supervision.** Implementing the recommendations of the 2011 FSAP should be the priority. In addition, it is very important to maintain and enhance the independence of the CBR in the merger of the two supervisory agencies.

- **The authorities should stand firm against calls for loose macroeconomic policies and build up the credibility of the existing policy frameworks**. Prudent macroeconomic policies reduce risks to financial stability. Russia's welcome flexibility in the exchange rate, the IT-like monetary policy framework (and expected move to an IT regime), and the new fiscal rule reduce risks to the economy and financial system and should be maintained and enhanced.

43. It is essential to maintain and strengthen the independence of the central bank in the process of merging the two supervisory agencies. In particular, it is important for the new mega-supervisor to be able to issue relevant regulations independently and have adequate capacity to enforce corrective actions and the resolution of both banks and nonbanks.

44. CBR's leading role in macroprudential supervision should be formally established. In Russia, the CBR has already shown itself as an institution capable of conducting macroprudential policy. If established (as originally envisaged), a Financial Stability Council (FSC) would provide a good platform to bring all relevant stakeholders together to maximize the benefits of macroprudential policy, but it will be important to secure the leading role of the CBR in the work of the council. Furthermore, the agency in charge of macroprudential policy (either the FSC with the CBR playing a leading role or the CBR itself) would be more effective if (i) it is given a formal mandate, which would strengthen accountability and incentives to act, and reduce (potential) risks of delayed action due to political pressures or lobbying in the presence of multiple agencies; and (ii) the roles of the involved agencies are clearly defined.

45. Any specific macroprudential measures that the authorities might adopt would depend on the type and expected impact of the systemic risks that need to be addressed. While banks apply (self-imposed) LTV and DTI ratios, increased competition may force them to loosen lending standards. Thus, the authorities could consider adopting formal LTV and DTI requirements or at least recommend a range, taking into account the leverage of the household sector. In adopting any measures, the authorities should weigh the benefits of the measures against their costs.

46. Regarding high concentration risks (very large exposures to certain market segments) at the "specialized" institutions, the authorities should consider either (i) requiring additional capital under the Pillar II capital requirement for concentration risks or (ii) introducing a higher Pillar I minimum capital requirement for "simpler financial institutions."

Table 1. Financial Soundness Indicators, 2007–May 2013

(Percent)

	2007	2008	2009	2010	2011	2012	2013 May
Financial Soundness Indicators							
Capital adequacy							
Capital to risk-weighted assets	15.5	16.8	20.9	18.1	14.7	13.7	13.4
Core capital to risk-weighted assets	11.6	10.6	13.2	11.4	9.3	8.5	9.3
Capital to total assets	13.3	13.6	15.7	14.0	12.6	12.3	...
Risk-weighted assets to total assets	85.6	81.0	75.2	77.4	85.9	87.7	...
Credit risk							
NPLs to total loans	2.5	3.8	9.6	8.2	6.6	6.0	6.3
Loan loss provisions to total loans	3.6	4.5	9.1	8.5	6.9	6.1	6.2
Large credit risks to capital	211.9	191.7	147.1	184.6	228.4	209	204.9
Distribution of loans provided by credit institutions							
Agriculture, hunting and forestry	3.8	4.2	4.9	5.1	4.8	4.6	4.6
Mining	3.1	3.3	3.9	3.6	2.9	3.2	3.1
Manufacturing	13.5	14.4	15.7	16.0	15.2	14	13.7
Production and distribution of energy, gas and wat	1.7	1.9	2.4	2.6	2.9	2.7	2.5
Construction	6.0	6.1	6.2	5.9	5.6	5.5	5.7
Wholesale and retail trade	18.0	17.4	18.4	17.1	15.6	14.9	14.6
Transport and communication	3.7	4.3	3.4	3.8	5.4	5.4	4.7
Other economic activities	23.3	23.3	21.9	22.2	22.3	20.5	21.0
Individuals	24.8	25.1	23.0	23.7	25.3	29.2	30.1
Of which: mortgage loans	5.1	6.6	6.5	6.6	6.7	7.5	7.8
Geographical distribution of interbank loans and deposits							
Russian Federation	40.0	27.1	29.5	41.1	41.6	47.1	35.0
United Kingdom	23.3	29.1	21.7	21.4	20.2	17.5	24.0
USA	4.1	7.1	4.1	2.5	3.0	3.6	5.3
Germany	6.8	7.5	4.7	6.0	4.2	1.6	2.4
Austria	6.1	5.7	8.2	3.7	6.6	5.9	6.6
France	3.5	4.0	5.7	4.0	2.7	1.6	3.7
Italy	1.7	1.5	1.8	0.1	2.7	2.7	0.7
Cyprus 1/	0.8	0.4	6.2	5.0	6.6	8.7	8.4
Netherlands	2.6	4.6	4.6	2.6	3.2	1.5	2.0
Other	11.0	13.1	13.4	13.6	9.0	9.8	12
Liquidity							
Highly liquid assets to total assets	...	28.0	26.8	13.5	11.8	11.1	10.7
Liquid assets to total assets	24.8	25.9	28.0	26.8	23.9	23.2	21.8
Liquid assets to short-term liabilities	72.9	92.1	102.4	94.3	81.6	82.9	86.9
Ratio of client's funds to total loans	94.8	84.6	99.9	109.5	105.3	101.2	101.7
Return on assets	3.0	1.8	0.7	1.9	2.4	2.3	2.1
Return on equity	22.7	13.3	4.9	12.5	17.6	18.2	17.0
Balance Sheet Structure, in percent of assets							
Total asset growth rate	44.1	39.2	5.0	14.9	23.1	18.9	...
Total customer loans growth rate	53.0	34.5	-2.5	12.6	28.2	...	...
Asset side							
Total customer loans	61.1	59.0	54.8	53.7	55.9	56.0	...
Accounts with CBR and other central banks	6.4	7.4	6.0	5.4	4.2	4.4	3.0
Interbank lending	7.0	8.9	9.3	8.6	9.5	8.5	9.5
Securities holdings	11.2	8.4	14.6	17.2	14.9	14.2	14.4
Liability side							
Funds from CBR	0.2	12.0	4.8	1.0	2.9	5.4	4.4
Interbank liabilities	13.9	13.0	10.6	11.1	11.0	9.6	9.0
Fund raised from organizations	35.0	31.3	32.5	32.9	33.6	31.6	...
Individual deposits	25.6	21.1	25.4	29.0	28.5	28.8	30.0
Bonds, PN and bank acceptance	5.5	4.0	3.9	4.0	3.7	4.4	...

Sources: Central Bank of Russia; and IMF staff calculations.

1/ Exposure to Cyprus mostly reflects a state-owned bank's exposure to its subsidiary in the country.

Appendix I. The Cubic Trend Methodology

(as in Dell'Ariccia and others, 2011)

Define the credit to GDP ratio as $cr_t = \frac{CR_t}{\sqrt{GDP_t\, GDP_{t-1}}}$

For each t, consider the time window from period $t-10$ to period $t-1$:

$\{cr_{t-10}, cr_{t-9}, \ldots cr_{t-1}\}$ and regress those observations on a cubic trend.

Use the estimated coefficients to predict $\widehat{cr_t} = \hat{\beta}_0 + \hat{\beta}_1 t + \hat{\beta}_2 t^2 + \hat{\beta}_3 t^3$

Define the credit gap measure as $cg_t = cr_t - \widehat{cr_t}$.

For each t, consider the time window from period $t-10$ to period t: $\{cg_{t-10}, cg_{t-9}, \ldots cg_t\}$

and compute the standard deviation $sdcg_t$.

A boom is identified when the deviation from trend (credit gap) is greater than 1.5 times its standard deviation ($cg_t > 1.5 sdcg_t$) and the annual growth rate of the credit to GDP ratio exceeds 10 percent ($\frac{cr_t - cr_{t-1}}{cr_{t-1}} > 0.1$), or the annual growth rate of credit to GDP ratio exceeds 20 percent ($\frac{cr_t - cr_{t-1}}{cr_{t-1}} < 0.2$). Booms created by a drop in GDP are ignored.

The start of the boom is the earliest year in which either (i) the credit to GDP ratio exceeds its trend by more than three-fourths of its standard deviation ($cg_t > 0.75 sdcg_t$) while its annual growth rate exceeds fiver percent ($\frac{cr_t - cr_{t-1}}{cr_{t-1}} > 0.05$); or (ii) its annual growth rate exceeds 10 percent ($\frac{cr_t - cr_{t-1}}{cr_{t-1}} > 0.1$).

A boom ends as soon as either (i) the growth rate of the credit to GDP ratio turns negative ($\frac{cr_t - cr_{t-1}}{cr_{t-1}} < 0$); or (ii) the credit to GDP ratio falls from trend within three-fourths of its standard deviation ($cg_t < 0.75 sdcg_t$) and its annual growth rate is lower than 20 percent ($\frac{cr_t - cr_{t-1}}{cr_{t-1}} < 0.2$).

Appendix II. Credit Supply Equation

Here, in two steps, an equation for the supply of credits is estimated to identify the factors of total credit growth and excessive supply of credits.

- Since some variables appear to have unit roots, first, a cointegration analysis is carried out, using three lags. The results suggest a cointegrating relationship (vec) between loan supply in real etrms (L), total deposits in real terms (D), stock prices (SP), volatility of bank stock prices (VBS), and lending rate in real terms (I). The vector can be written in the following form:

$$l = 0.98d + 0.25sp - 0.09vbs + 0.1i \qquad (1)$$

- Then, this co integrating relationship is used to estimate an error-correction model. A general-to-specific approach yields the following equation.

$$\Delta l_t = 0.02 + 0.27\Delta l_{t-2} + 0.50\Delta d_t + 0.04\Delta sp_t + 0.49\Delta y_t + 0.75\Delta y_{t-3} - 0.01\Delta vbs_t + 0.07\Delta i_t - 0.25\Delta vec_t - 0.02\Delta ins_t + u_{1t} \qquad (2),$$

where, y stands for real GDP, ins for the banking sector share price volatility relative to the total market bolatility; and u_t for shocks.

Appendix III. Some Relevant Elements of the Institutional Design of Macroprudential Policy[1]

Information and resources. To gauge the accumulation of systemic risks, it is essential that policy makers have access to information and data on the components of the financial system, including data on individual financial institutions, their exposures to other institutions, and developments in payments and settlement systems. When several bodies are involved, the arrangements for sharing information become complex, as some information is confidential and market sensitive. It is also important that adequate resources are available to process received information and develop measures or provide recommendations.

Mandate and powers. The advantages of developing a formal macroprudential mandate include establishing clear objectives, responsibilities, and powers for the agency (agencies) involved in macroprudential policy. The 2010 IMF macroprudential survey found that less than half of the respondents had a formal macroprudential mandate in place, beyond financial stability. A larger proportion of emerging market economies (50 percent) than advanced economies (35 percent) has such a mandate, which may be related to the fact that emerging markets have had more frequent financial crises in the past than advanced economies. Of those without a formal mandate, about half either have plans to adopt such a mandate or are contemplating doing so.

Powers to communicate risk warnings and to recommend regulatory instruments and actions are essential parts of policy making. Examples include the ability to issue non-binding recommendations to other authorities. The recommendations are often subject to a "comply or explain" mechanism (e.g., in the EU, U.K. and U.S.), sometimes strengthened by an ability to publish recommendations.

Accountability. An institutional design challenge is to establish accountability when the "costs" of macroprudential measures in the form restrictions on certain activities are felt immediately while the "benefits" of a lower incidence of financial distress accrue over a long term and are hard to measure. This challenge is often compounded by the presence of multiple agencies in macroprudential policymaking that may differ in their primary objectives. This challenge highlights the importance of insulating the authorities in charge of macroprudential policy from pressures linked to the political cycle.

Transparency and clear communication of policy decisions to the public are central elements of accountability. This can include ex ante statements of strategy, publication of records of meetings, Financial Stability Reports, and annual performance statements with an ex post assessment of policy effectiveness.

[1] Based on FSB, IMF, BIS (2011).

Appendix IV. Some Key Distinguishing Dimensions of Real Life Macroprudential Policy Models
(based on Nier and others, 2011)

- Degree of institutional integration of central bank and financial regulatory functions. Institutional integration affects coordination across the objectives and functions of macroprudential, monetary, and microprudential policies and how much information is available within the central bank. The degree of integration can be full, partial, or separation.

- Ownership of macroprudential policy. Ownership of the macroprudential mandate can rest with the central bank or a committee related to the central bank or an independent committee or be shared by multiple agencies. If the mandate is given to multiple agencies, each agency is expected to take responsibility for the mitigation of systemic risk arising in its domain.

- Role of the treasury. The formal role of the treasury can be (i) active, if it plays a leading role in policymaking or coordinating committees; (ii) passive, if the treasury participates in such committees, but has no special role; or (iii) simply nonexistent.

- Existence of a separate body coordinating across policies to address systemic risk. A separate coordinating committee is a common feature when the policy mandate is shared by multiple agencies.

Appendix Table. Stylized Models for Macroprudential Policy [1/]

Features of the model/Model	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
1. Degree of institutional integration of central bank and supervisory agencies	Full (at a central bank)	Partial	Partial	Partial	No	No (Partial*)	No
2. Ownership of macroprudential policy mandate	Central bank	Committee "related" to central bank	Independent committee	Central bank	Multiple agencies	Multiple agencies	Multiple agencies
3. Role of MOF/ treasury/government	No (Active*)	Passive	Active	No	Passive	Active	No (Active*)
4. Separation of policy decisions and control over instruments	No	In some areas	Yes	In some areas	No	No	No
5. Existence of separate body coordinating across policies	No	No	No (Yes*)	No	Yes	Yes (de facto**)	No
Examples of specific model countries/ regions	Czech Republic Ireland (new) Singapore*	Malaysia Romania Thailand United Kingdom (new)	Brazil* France (new) United States (new)	Belgium (new) The Netherlands Serbia	Australia	Canada Chile Hong Kong SAR* Korea** Lebanon Mexico	Iceland Peru Switzerland

Source: Nier and others, 2011.

1/Stars are explained in the table.

Appendix V. Selected Systemic Risk Manifestations and MaPP Tools in Other Countries

(Based on a review of the literature)

MaPP tools	Country of use	Pros	Cons
Leverage ratio	Canada, USA	Guards against underestimation of asset risk. Less susceptible to arbitrage and mis-measuring.	A blunt instrument that can constrain economic activity. No penalty for risk may create perverse incentives to "risk-up."
Time varying counter-cyclical capital surcharges		Increases costs of borrowing while building loss-absorbing capacity to cope with the eventual bust. May help moderate credit cycles. Under Basel III, the "leakage problem" is mitigated by introducing mutual recognition of national countercyclical buffers. In particular, it is envisaged that the national buffer measure will apply to the local exposure of foreign banks. This reciprocity is mandatory only for buffers of up to 2.5 percent. The leakage problem could be more significant in small countries with large and open financial systems.	Limited success in curtailing the incidence and duration of credit booms. It is a crude tool if exuberance is localized in particular sectors, and may even encourage "risking up." May divert attention from the liabilities side of banks' balance sheets and is subject to "international leakage." The effectiveness of this measure is very sensitive to appropriate risk weighting of assets.
Ceiling on general credit or credit growth.	Bulgaria, China, Colombia, Croatia, Greece, Nigeria, Portugal, Serbia, Slovakia, Romania	Direct impact on credit. Limits rapid expansion and leverage. Have had some success in slowing down the pace of bank credit.	Susceptible to circumvention. Can be offset by increases in credit from nonbanks, leading to build-up of systemic risk in often less-regulated intermediaries, and foreign borrowing by some borrowers.
Risk weights/ Sector-dependent risk weights	Austria, Argentina, Brazil, Bulgaria, Croatia, Czech republic, Estonia, France, India, Lebanon, Malaysia, Mongolia, New Zealand, Norway, Poland, Spain, Turkey	Targeted approach. May provide sharper incentives than countercyclical capital buffers. Adjusting risk weights on the flow of lending relative to its stock could restrain lending in booms or encourage lending in downturns.	May displace risk to other parts of the system — a "water bed" effect. Implementation challenges to ensure consistent application across the balance sheet. Data needs greater than with aggregate tools.
Sectoral credit growth or level limits	China, Colombia, Malaysia, Philippines, Portugal, Singapore	Targets specific sectors, with limited impact on other sectors.	Muted impact on overall lending growth.
Time-varying liquidity buffers	Argentina, China, Croatia, India, Indonesia, Lebanon, Nigeria, Norway, Portugal, Serbia, South Africa, Switzerland,	Direct effect on banks' liquid asset holdings and maturity mismatch, increasing resilience. Harder to arbitrage than capital-based measures. May also help to moderate the credit cycle (Croatia)	Limited international experience with liquidity requirements. Microprudential standards still under development.
Core funding ratios	Belgium, Greece, India, Indonesia, Switzerland, Italy, Lebanon, Mongolia, Netherlands, Poland, Portugal, Spain, Sweden, Uruguay	Affect the quality and amount of liabilities. Limit the ability of financial institutions to rely on risky sources to fund growth in upswings and thus minimize the impact of liquidity crises in bust periods.	

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USES AND RISKS WITH FX LIQUIDITY ASSISTANCE IN SYSTEMIC CRISIS—IS IT A GOOD IDEA FOR RUSSIA?[1]

Should the Central Bank of Russia (CBR) set up policy framework to ease foreign exchange (FX) conditions when it faces systemic FX liquidity shortage? The global financial crisis caused systemic FX liquidity shortages around the world, and central banks took various measures to ease FX liquidity shortages. What is the need for introducing such facilities when the CBR already has committed domestic liquidity support and ample FX was supplied in spot FX market under exchange rate peg framework? Direct lending in FX may be more effective to ease FX liquidity shortage while avoiding a balance of payment crisis. The CBR's large scale FX intervention and ample domestic liquidity support seem to have distorted the arbitrage conditions in FX markets during the 2008 crisis, leading to additional capital outflows and nearly resulting in a balance of payment crisis. Direct lending in FX at market cost for those who prudently manages FX liquidity risks but turned into shortages due to systemic nature of the crisis, could help achieving the right balance.

A. Introduction

1. Maintaining the stability of FX funding is one of the key elements ensuring the financial stability of the system. For globally active banks with multinational operations, FX funding is an integral part of their overseas operations. In emerging market economies (EM), FX funding often reflects capital inflows (into banks, nonfinancial corporations, and sovereign), a reversal of which is a major source of systemic risk not only to the financial sector, but also to the whole economy. Moreover, risks to FX funding in EM are often associated with broader shocks to the balance of payment (BOP), including large exchange rate depreciation and declines in key commodity export prices. The global financial crisis demonstrated that shocks to FX funding give distinctive challenges to banks, different from domestic liquidity problems.

2. In response to systemic FX liquidity shortage during the global financial crisis, many central banks and governments provided FX liquidity. In advanced economies (AE), central banks introduced temporary FX emergency liquidity facilities for banks. The supply of dollar was often backed up by time-bound swap arrangement with the U.S. Federal Reserve Board (FRB). In EM, a wider range of measures were taken, including those very similar to FX market intervention, changes with capital account restrictions, and targeted support for non-financial corporates. Many countries drew down their international reserves, while some established bilateral swap arrangements with central banks issuing hard currencies and/or sought IMF programs.

3. What are the benefit and costs of introducing FX liquidity facility? There are questions about the need for introducing such facility when the CBR already has committed domestic liquidity

[1] Prepared by Hiroko Oura (MCM).

support and ample FX was supplied in spot FX market under exchange rate peg framework. In the 2008 crisis, banks and corporates managed to obtain FX by first securing domestic liquidity and then converting them to FX in spot market.

4. This chapter explores the rationale for introducing such FX facility. For one, the CBR is moving to inflation targeting framework from exchange rate peg. This will limit the scope of large scale FX intervention in the future. Moreover, the policy mix have, in effect, provided dollar funding at negative rate, making it profitable to borrow in Ruble, convert them into dollar with forward cover and then invest in dollar assets. During the global financial crisis, this appears to have worsened already high balance of payment outflow pressures, risking a BOP/currency crisis. In the end, the CBR devalued the Ruble and tightened monetary policy to avoid a full-blown crisis and regain confidence. On the contrary, directly lending in FX would give the CBR more flexibility to set the adequate levels of dollar interest rate, limiting potential misuse. Providing FX liquidity out of international reserve is also consistent with the need for tightening domestic monetary conditions, which often becomes relevant for EM under BOP crisis pressures.

5. If the CBR introduces FX liquidity facility, care should be taken to establish a framework that can minimize misuse. Proper risk management and monitoring should be in place to prevent excess buildup of FX liquidity risks to begin with. Additional reporting might become necessary to identify institutions that are truly in need of liquidity assistance. It should be emphasized that it is an exceptional measure to counteract against a systemic stress and not a facility to be used for regular operations, let alone expansions.

B. Primer: FX Funding Instruments

6. Banks can rely on a number of FX funding options.

- *Local funding abroad:* If a bank has branches and subsidiaries abroad, they may tap into retail deposits in the host countries. Wholesale funding in the host country is another option, including issuing commercial paper, CDs, long-term bonds (purchased by local mutual funds and other institutional investors). If the bank has qualified assets to be pledged as collateral (such as local government bond and other securities), they could use repurchase agreement (repos) or other secured funding options, which are relatively more stable and cheap compared to unsecured funding, especially during stress time. Some banks may have status as a counterpart of local central bank's monetary operations, which allows them to tap local liquidity facilities.

- *Cross-border and cross-currency funding:* A bank can issue international bonds in foreign currency. If a bank has foreign parent, the parent bank might send FX liquidity to the subsidiary/branch. Another avenue is cross-currency funding where banks first obtain domestic currency funding and then convert them into foreign currency by exchanging them in spot FX

market while hedging currency risk with FX forward (shorter-term) or currency basis swap (longer-term).[2] Cross-currency funding allows banks to access FX funding even when they do not have access to direct FX funding instruments or their interest rates are too expensive.

- *FX funding in domestic market:* In some dollarized economies in particular, banks may collect FX deposits in their home country.

C. FX Liquidity Shortage and Support since the Global Financial Crisis

7. The global financial crisis caused systemic FX liquidity shortages in funding and FX markets around the world.

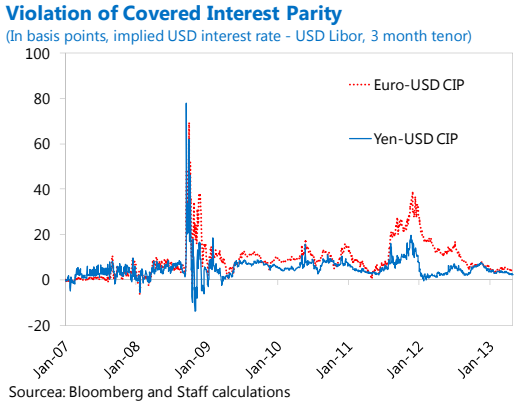
- In advanced economies (AE), the distress in money markets destabilized wholesale bank funding (in both domestic and foreign currencies), which had been extensively used to expand banks' investment in securities and derivatives (Adrian and Shin, 2010, and IMF's Global Financial Stability Report, 2010). Banks often relied on local wholesale funding, as they lacked deposit base in FX. Notably, some European banks built up large exposures to U.S. mortgage securities, financed with wholesale funding from U.S. money market mutual funds (Baba, McCauley, and Ramswamy, 2009). They came under serious liquidity distress when the money market mutual funds cut down financing due in part to their own withdrawal pressures and to increased counterparty risk[3] with European banks.

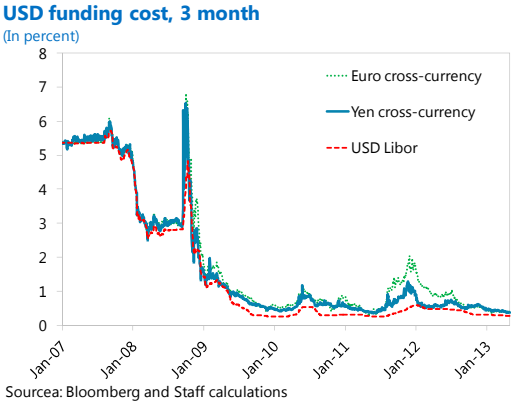
- The systemic liquidity shortages disturbed normal functioning of FX swap and cross-currency basis swap markets, making cross-currency funding extremely expensive or weakening its availability (see Box 1 for details). The market liquidity dry up limited arbitrage trading in FX derivatives markets, violating covered interest parity condition for a prolonged period since the crisis even for euro, yen and dollar (Figure 1). This gap raised the cost of cross-currency dollar funding using euro and yen above dollar Libor rate.

[2] FX swaps are usually short-term (3–6 months) and consist of two transactions, the exchanges of principals at spot rate in the beginning of the contract and the exchange at maturity at forward rate. Currency basis swaps are usually longer-term (1–5 years) and consist of three types of transactions: the exchanges of principals at the spot rate when starting the contract, the exchanges of interest rate payments during the contract period, and the exchanges of principals at maturity using the same spot rate as the start of the contract.
See http://www.bis.org/publ/qtrpdf/r_qt0803z.htm for details.

[3] It is the risk of losing money when one's counterparty (usually financial institutions) defaults on interbank deposit and loans, CDs, commercial papers, derivatives, etc.

Figure 1: Global Turbulences in FX Forward Markets and Cross Currency Dollar Funding Cost





- In emerging market economies (EM), FX liquidity shortage was closely related to BOP flow reversals, and therefore, its impact was felt by the broad segments of the economy beyond the financial sector. Capital flows to EM swing substantially when global investors' risk aversion changes. Fluctuation in commodity prices can affect both current and capital account flows for a commodity producer such as Russia. All of these lead to drastic surge in exchange rate volatility. Governments may carry high levels of foreign currency debt. Banks may be exposed to FX and FX liquidity risks[4], including though lending to unhedged borrowers. Non-financial corporations and household may also have large FX mismatches between their assets and liabilities (e.g., dollarized economies). These economy-wide vulnerability to FX and FX liquidity shocks can result in solvency problems (for sovereigns, banks, and corporate) and require macro-policy adjustments, in addition to financial sector policies.

[4] FX risk reflects exchange rate fluctuation and reflects FX asset and liability mismatch. FX liquidity risk is caused by maturity mismatch between FX assets and liabilities.

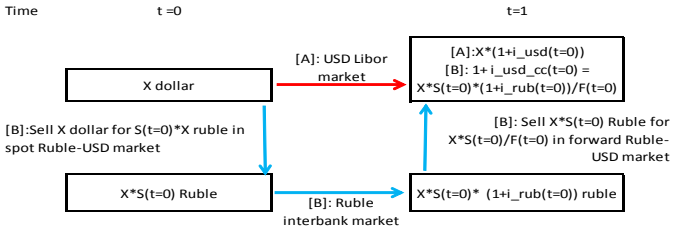
Box 1. Mechanics of Basic Cross-Currency Funding Using FX Forward and Currency Basis Swaps, and their Behavior during a Systemic Crisis

For banks that need FX (dollar) funding, there are two basic options: [A] direct funding in dollar interbank market (such as Libor) and [B] cross-currency funding using FX forward or currency basis swaps (Figure 1.1). Dollar interest rate with option [A] is i_usd, which is set at the time of contract (t=0). Dollar interest rate with option [B] is i_usd_cc, which is determined by spot Ruble-dollar rate, forward Ruble-dollar rate with one month tenor, and interest rate in Ruble interbank loan market. All of these three inputs are known at the time of contract (t=0), therefore i_usd_cc is set with certainty at t=0.

During normal time, healthy arbitrage transactions should bring the difference between the two interest rates close to zero (net of transaction costs) especially for well-developed and liquid FX markets for advanced economies—this is the nature of covered interest parity (CIP). When direct dollar interest rate is higher than cross-currency dollar rate, an arbitrager can make money (with certainty) by borrowing in Ruble, convert it in spot market into dollar, and then cover its future dollar value by selling dollar in forward market and then invest in dollar Libor market.

Figure 1.1: Mechanics of Cross-currency Funding

[A]: Direct dollar funding interest rate: i_usd



[B]: Cross-currency dollar interest rate: i_usd_cc = S(t=0)*(1+i_rub)/F(t=0)-1

Notes: S(t=0) is Ruble-USD exchange rate (1 dollar for S Ruble) as of t=0; F(t=0) is Ruble-dollar forward exchange rate with 1 month tenor; i_usd(t=0) is interest rate in dollar Libor market as of t=0; i_rub(t=0) is interest rate in Ruble interbank market as of t=0; and i_usd_cc(t=0) is cross-currency dollar interest rate using transactions [B], using Ruble-dollar spot and forward markets and Ruble interbank market.

At the time of systemic crisis, however, the increased recognition of counterparty risk often obstruct these arbitrage transactions, violating CIP (Figure 1). Banks become increasingly wary about their counterparty becoming distressed in the future (i.e., credit risks of the countrerpary), refraining from being engaged in arbitrage transactions despite of (FX risk free) profit-taking opportunities. Some may lose access to some or all of the four key markets required to take the arbitrage positions or face much more expensive price than what the reported price indicate. These are the transaction-level mechanics leading to market liquidity "dry up" in the FX forward and currency basis swaps markets. Such violation of CIP was widely observed for a large number of currency markets (Baba and Packer, 2009a). Indeed, the violation of CIP (and some other arbitrage-free conditions) can be used as an indicator of systemic liquidity shortage (IMF, Global Financial Stability Report, 2011a).

For euro and yen, the CIP has continued to be violated since the Lehman crisis well into 2013 (Figure 1). The acute systemic liquidity shortage that followed the Lehman collapse resulted in the large jumps of both dollar Libor rate, euro-dollar and yen-dollar cross currency rates, and their differences. The rates have come down rapidly, as major central banks expanded liquidity support in domestic currency and, in some cases, in dollar (IMF, 2010). However, possibly due to the sustained concerns over counterparty risks, the CIP hasn't been fully recovered for several years, widening more when global markets experienced renewed pressures (e.g., end 2011 when the concerns over European debt crisis deepened).

8. There are central banks that have FX liquidity facilities, some on temporary basis in response to the crisis. The IMF surveyed central banks about their monetary policy instruments in 2008 and 2010 (Gray and Jadrijevic, 2010).[5] As of 2010, 67 (32) percent of central banks conduct spot FX (FX swaps) transactions as part of open market operations. Central banks in Middle East were the most involved in spot FX transactions (85 percent). Some central banks—Bahrain, the Czech Republic, and the European Central Bank (ECB)—explicitly reported that they used FX swaps only on a temporary basis.

9. In AE, central banks introduced temporary FX liquidity facilities to banks, often using similar framework to domestic liquidity facilities and backed up by swap agreement with the FRB. Key features of these facilities are follows.

- *Temporary*: In key AE[6], FX facilities were introduced at end 2007, most of which expired in February 2010. The ECB, United Kingdom, Switzerland, Canada, and Japan reinstituted the facilities in May 2010 when market pressures reemerged, but these are expected to expire in 2014.[7]

- *Emergency*: The facilities were offered against systemic crises and not standing facilities that bank can count on normal times.[8]

- *Counterparty*: The facilities were offered to financial institutions that satisfy similar eligibility criteria to domestic liquidity support.

- *Operations*: Some offered (reverse) repo (including the Bank of England, the ECB, and the Swiss National Bank), and the others offered FX swaps (the Bank of Japan, BOJ). Some central banks offered limited quantity based on competitive auctions, while some offered the facility without quantitative ceiling, using fixed rate, noncompetitive auction where all bids would be filled (full allotment, Table 1).

- *Collateral*: The facilities were collateralized, using similar eligible collaterals to domestic liquidity facilities in case of repo (with haircuts) or using domestic currency cash as collateral in case of FX swaps.

[5] The 2011 sample contains 121 respondents (including 3 monetary unions), representing 151 countries. 22, 60, 18 percent of responses are from high, middle, and low income countries respectively.

[6] Including euro area, Switzerland, United Kingdom, Australia, New Zealand, Japan, Canada, Denmark, Sweden, Norway, South Korea, and Singapore.

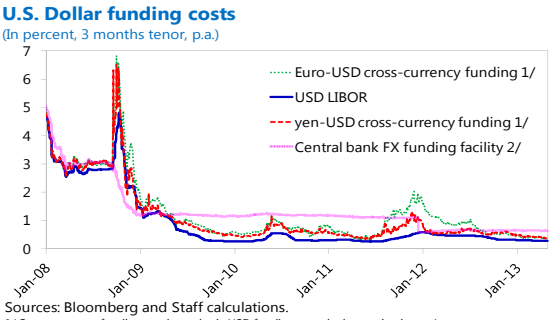
[7] However, central banks may agree to extend the program if they consider it necessary, as they have done in the past five years.

[8] FX liquidity stress test for Japan FSAP (IMF, 2012) excluded access to BOJ's FX facility from FX liquidity buffer based on the understanding that the facility should not be counted on regular basis.

- *Backup*: Most AE central banks that offered FX facilities established dollar swap arrangement with the FRB.

- *Pricing*: The costs of these funding were set at levels that are expensive during calmer times but competitive during stress periods (Figure 2).The rate (OIS+100 bps initially and the +50 bps since end 2011) has been above dollar Libor and cross-currency dollar rate most of the time, but the rise in market rate, especially cross-currency dollar rate at end 2011 made central bank funding more attractive.

Figure 2. Cost of AE Central Bank Dollar Facility



Sources: Bloomberg and Staff calculations.
1/ Cross-currency funding rate is synthetic USD funding costs by borrowing in yen/euro at ye Libor/euribor rate and converting into U.S. dollar in spot market with FX forward cover.
2/ USD lending facility by BoJ and ECB charged OIS+ 100 bps up to mid December 2011 and then cut to + 50 bps.

10. EM, on the other hand, used a wider range of tools to ease dollar funding conditions. As summarized in Table 2, the measures included those very similar to spot FX market intervention[9]; changes with capital account restrictions; changes in FX reserve requirements; open market operations including FX swaps and other types of lending in FX to banks; regulatory forbearance and amendment; and targeted support for non-financial corporates[10]. Many countries drew down their international reserves; some established bilateral swap arrangements with the FRB or other central banks; and some asked for IMF-supported programs. Some of these measures were directly or indirectly meant to provide FX liquidity for corporates in addition to banks, as FX and FX liquidity risks were often widespread among non-financial corporations reflecting the openness of the economy.

11. As in AE, EM central banks also offered domestic monetary easing and liquidity support, although they were initiated at a later stage in the global financial crisis. The global financial crisis started in AE, and many EM faced the downturn only in late 2008. In earlier part of the year, EM economic growth was generally strong with persistent inflationary pressures, which warranted tight monetary policy stance. They turned to monetary accommodation only when the global financial stress intensified upon the Lehman's failure. As capital flow reversed and economic outlook deteriorated, central banks took measures to mitigate the broad liquidity shortage and balance sheet effects.

[9] Some countries attempted to set the operational framework by adopting rule-based auctions to distribute FX (Moreno, 2010) so that such measures are not interpreted as a policy defending a certain level of exchange rate. For example, Colombia offered market participants the option to buy FX from the central bank when exchange rate volatility jumped beyond a certain threshold. Mexico adopted a rule to set the daily amount to be auctioned with a minimum price floor.

[10] See Druck, Hofman, and Lu (2013) and Stone, Walker and Yasui (2009) for pros and cons with each tool.

12. However, not every EM could aggressively ease domestic liquidity conditions. For those with their own vulnerability, the external shock evolved into a full-blown BOP crisis, and they needed to raise domestic policy rate in order to regain confidence and limit capital outflows. In general, EM could face more serious trade-offs between giving support for balance sheet misalignment of the private sector and maintaining the overall confidence in the economy. Unlike AE which issue international reserve currencies, monetary loosening and unconventional monetary policy in EM at the time of financial distress could fuel capital outflows and sales pressures on their currency, increasing the chances of currency crisis (Jacome, Sedik, and Townsend, 2011). However, even in such cases, a central bank might still be able to offer limited FX facilities, to the extent its international reserves allow, as they are consistent with monetary tightening (i.e., the reduction of net foreign assets and reserve money). Indeed, Hungary offered FX swaps to mitigate FX liquidity needs (Table 2, and IMF, 2009).

D. Russia's "FX Liquidity Support" during the Crisis: Benefits and Consequences

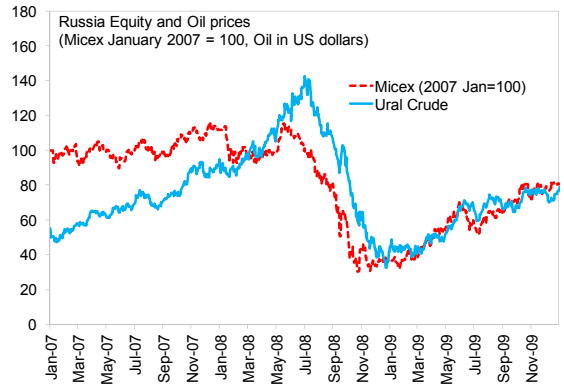
13. Turning to Russia, the CBR provided FX liquidity in spot market through 2008-09, but this was within its exchange rate peg framework rather than directly providing FX loans (Figure 3).[11] Russian financial system experienced serious generalized liquidity shortage, as oil prices declined and external borrowing by banks and corporates reversed. The CBR provided ample domestic liquidity to banks and corporates (channeled through banks) including with uncollateralized lending to banks.[12] The CBR did not offer FX loans per se. However, it supplied substantial FX out of international reserves in spot exchange rate market in order to maintain Ruble at its target range.[13] Banks and corporates obtained FX by first securing domestic liquidity and then convert them to FX in spot market.

[11] Nonetheless, the government separately provided $50 billion (10 percent of the reserve at that time) to support banks and eventually corporates. The funds were placed with VEB and could be lent to banks and corporate to repay liabilities to foreigners (contracted before announcement date) at terms that reflect market conditions (Ishi, Stone, Yehoue, 2009, Table 2).

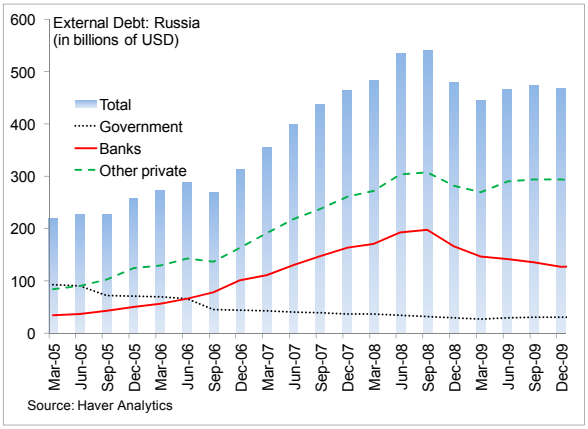
[12] A wide range of measures were adopted including temporary lowering required liquidity reserve ratios, widening access to the CBR's refinancing facilities (including extending eligible collateral to accept corporate bonds), auctioning government deposits, extending unsecured loans from the CBR to banks with a minimum credit rating, and guarantees by the CBR of interbank loans. See IMF (2011) for details.

[13] Druck, Hofman, and Lu (2013) count this as a form of FX liquidity support, while Ishi, Stone, and Yehoue (2009) exclude it from their FX liquidity provision database.

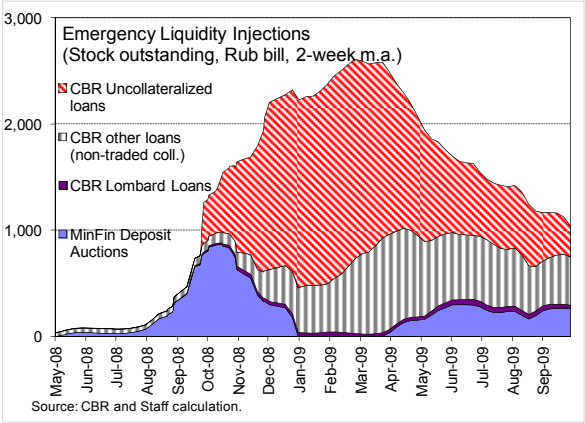
Figure 3. External and Monetary Conditions in Russia during the 2008–09 Crisis



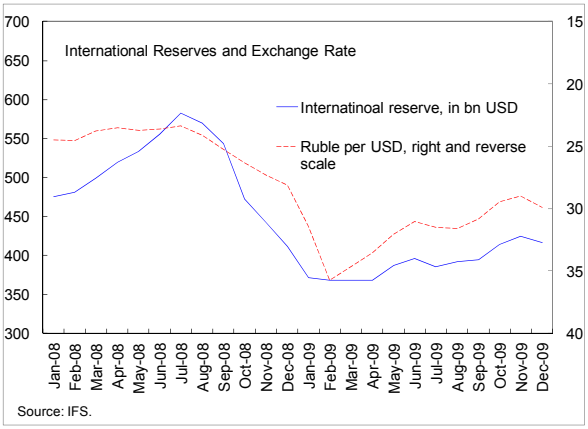
Sources: Bloomberg, L.P.



Source: Haver Analytics



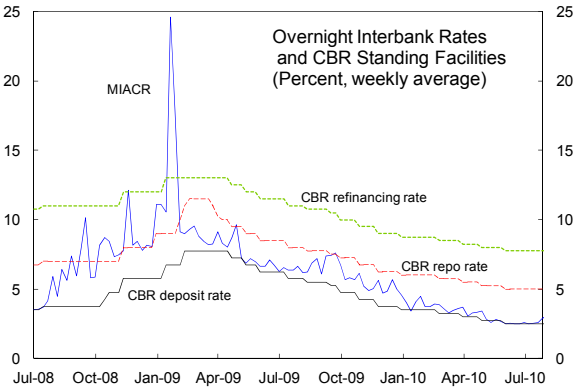
Source: CBR and Staff calculation.



Source: IFS.

14. However, Russia risked a BOP/currency crisis.[14] The accommodative monetary policy providing large domestic liquidity at low interest rate immediately after the Lehman shock fueled further capital outflows. At macroeconomic levels, the sudden change in exchange rate expectations trigged by the collapse in oil prices led banks and corporates to seek to hedge their foreign currency exposures, exacerbating pressure on the Ruble. The CBR's FX intervention reduced international reserves from a peak of $598 billion in August 2008 to a trough of $375 billion in March 2009 (Figure 3). Confronted with surging reserve losses, the Ruble was devalued sharply, and monetary policy tightened with higher interest rate and withdrawal of domestic liquidity support to banks (Figure 4).

Figure 4. Russia's Interest Rate Policy: 2008–10



Sources: CBR

15. Pricing appears to have been a key problem with the policy mix in 2008–09. The best practices for liquidity support during a systemic crisis (Box 2) suggest that it is critical to provide liquidity at rates that do not give substantial arbitrage profits to banks. The pricing problem with the CBR framework comes out clearly when the costs are compared with those for AE facilities.

- *In advanced economies:* The charges on the FX facilities provided by key AE central banks were broadly consistent with market conditions: the dollar interest rates charged by the ECB and BOJ (OIS +100 bps initially and then +50 bps since end 2011) were more expensive than dollar Libor and cross-currency funding rate most of the time but were less expensive during stress period (e.g., end 2011, Figure 2, Box 1).

- *Arbitrage opportunity in Russia*: In contrast, interest rate structures for Russian banks in late 2008 were such that banks could earn substantial risk-free arbitrage gains by borrowing in Ruble and investing in dollar. The implied dollar funding rate using dollar-Ruble forward fell to negative upon the Lehman event (Figure 5)[15]. Banks who maintained access to these rates[16] could earn FX risk-free profit by borrowing in Ruble (at interbank MosPrime or CBR repo rates) and lending in dollar (Libor or other) markets. The interest earning from dollar was near zero after the FRB cut its policy rate, and MosPrime (1 month), by comparison, was high at over 20 percent levels.

[14] See IMF (Russia country report) for details discussing BOP conditions and monetary and exchange rate policy in Russia during the crisis time.

[15] The figure is calculated using mid-prices for simplicity. Cross-currency dollar interest rate remains negative when incorporating bid-ask spreads explicitly as well (see Bloomber's FXFA function for instance).

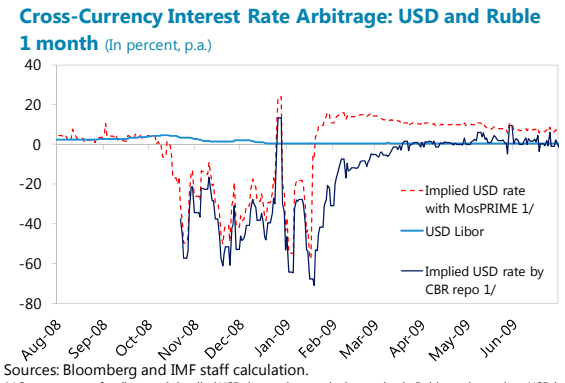
[16] It is possible that not all banks had access to these markets at the quoted rates.

Nonetheless, the main source of profit was the Ruble depreciation implied in dollar-Ruble forward market, amounting to annualized 30-50 percent in late 2008.

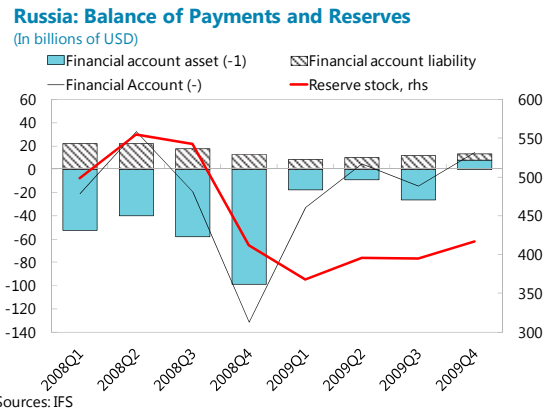
16. The pricing problem appears to have further fueled already severe capital outflow pressures. The capital flows turned to large net outflows in 2008Q4. Especially, the acquisition of foreign assets—consistent with the arbitrage trading—contributed to this turnaround more than the reduction in liabilities (Figure 5). Indeed, Ishi, Stone, and Yehoue (2009) reference news reports discussing that some Russian banks used the cheap Ruble liquidity to invest in abroad and profit from depreciation.

17. Directly providing FX loans/swaps instead can, in principle, mitigate some of the above issues. A central bank can set the right FX borrowing costs that do not create arbitrage opportunities, instead of indirectly relying on (out-of-parity) market FX forward rates. If fixed amount of FX is auctioned off at competitive prices, it would help delivering the scarce FX liquidity to those who need them the most. If FX loan is provided out of international reserves (instead of providing domestic currency liquidity and then ask banks to convert them into FX), net foreign assets decline and domestic monetary conditions are tightened. But such tightening might be desirable when the central bank needs to raise domestic interest rate in order to regain confidence and limit the possibility of a currency crisis.

Figure 5. Cross-Currency Arbitrage Opportunities in Russia and Capital Flows: 2008–09



Sources: Bloomberg and IMF staff calculation.
1/ Cross-currency funding rate is implied USD borrowing rate by borrowing in Ruble, exchange it to USD in spot market and change them back to Ruble with FX forward.



Sources: IFS

18. Lastly, having the capacity to provide FX liquidity can become more important when Russia fully moves to inflation targeting framework. The CBR is aiming at moving to inflation-target framework in 2014, under which intervention in FX market becomes harder to justify. Using auction and intervening based on rules could give different wrap from FX intervention to maintain exchange rate, in reality. However, it is hard to draw a clear line between FX provision and intervention in reality as seen in the case of Mexico. Furthermore, Ishi, Stone and Yehoue (2009) showed that countries with inflation targeting framework were more likely to introduce FX liquidity facilities during the last crisis.

Box 2. Best Practice for Liquidity Support by Central Banks in a Systemic Crisis 1/

This box lists some of the key issues in designing and assessing FX liquidity provision framework upon systemic financial crisis. Most items also apply to domestic currency liquidity provision framework.

- *Proper liquidity risk management by banks*: Crisis management tools should be accompanied by solid crisis prevention/monitoring framework. Banks should have sound liquidity risk management framework, and supervisors need to monitor risks posed by banks, and when relevant, the corporate sector. FX liquidity stress test could be a useful tool. FX risks are usually well monitored and regulated in EM using open FX positions. However, it is not sufficient to monitor FX liquidity risk because it does not capture maturity mismatch in FX assets and liabilities. IMF survey on stress testing (Schumacher and Oura, 2012 and Oura, 2012) points out a half of the country authorities in the sample conduct FX liquidity tests.
- Establish (cross/within) organizational coordination: On the national level, Memoranda of Understanding (MoU) are needed among the central bank, the ministry of finance, the supervisor(s), and the deposit insurance institution to establish the principles for assigning the responsibility to approve liquidity provisions, sharing information, dividing other responsibilities, and securing government guarantees for support resources. MoU between home-host supervisors/central banks are desired to cover cross-border issues. In particular, preparing for obtaining liquidity back-up from other central banks or from private sources is an important set-up for FX liquidity support.
- Instrument choice: Three basic instruments are typically used: (i) repo against a list of eligible securities; (ii) collateralized lending against a list of eligible assets (including non-security assets that cannot be used for repos) or FX swaps; and (iii) lending against whatever collateral the bank has. It is also important that banks have ample flexibility to use their reserves at the central bank and liquid assets for short-term liquidity management. The central bank should consider relaxing reserve requirements and liquid asset requirements, if they exist.
- Terms and quantity: Reserve (or other FX resource) adequacy should guide the term and quantity. Large and longer term FX lending operations are risky to undertake with relatively low levels of reserves. In such a case, short-term tenors (overnight to one-week) and limited amounts are appropriate. Spot intervention permanently reduces international reserves, while repos and FX swaps reduce the usable portion of reserves until they mature. When a central bank is rolling-over very short-term FX loans repeatedly, it is critical to signal that these measures are discretionary and emergency, and borrower should not develop false sense of security.
- Collateral: For both domestic and FX liquidity facilities, securing collaterals is essential for mitigating risks to central bank balance sheet. With FX swaps, the collateral is simply domestic cash. For repos and collateralized lending, it is critical to maintain solid collateral eligibility criteria. Many AE central banks use the same eligibility criteria as domestic open market operations (OMO), possibly with additional haircut on local currency assets to reflect FX risk (e.g., ECB puts additional 15 percent haircut).

Box 2. Best Practice for Liquidity Support by Central Banks in a Systemic Crisis (Concluded)

- Pricing: Pricing should be consistent with market conditions for off-shore FX funding costs and should not result in subsidizing banks. This is critical for preventing banks with easy access to the FX funding market from arbitraging against central bank facilities. FX funding costs calculated from FX forward and domestic interest rate (i.e., synthetic FX funding rate with domestic currency funding and FX forward (or swaps) where synthetic FX rate = domestic interest rate – domestic currency depreciation implied by spot and forward rate) should guide adequate charges. A discriminative or "market-related" pricing would also prevent misuse of this facility and an unnecessary drawdown of FX reserves.
- Counterparties: Expand the pool of counterparties in a crisis if necessary beyond standard OMO counterparties. In large market, in particular, central banks do not deal directly with all commercial banks (and other systemically important financial firms). When distress limits the distribution function of the interbank market, the central bank may need to use different operational instruments and allowing a wider group of financial institutions to have direct access to the central banks' OMO. Affiliates of foreign-owned banks are generally expected to be treated the same way as domestic banks. But there have been examples where the central bank referred foreign-owned banks to their headquarters for (FX) liquidity support in order to ration FX reserves.
- Transparency: Central banks should publish about their international reserves positions, including repos, swaps, and other operations that affect usable amount of the reserves. During the Asian crisis, the lack of transparency (intervening using swaps and forwards without properly reflecting these position to international reserves data) ultimately led to trigger a loss of confidence that resulted in currency crisis.

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1/ Based on the IMF note "Emergency Liquidity Support by Central Banks in Systemic Crisis" by Zsofia Arvai, Luis Jacome, and Alexandre Chailloux and "Central Bank FX Reverse Transactions" by Alexandre Chailloux, Simon Gray, and Mark Stone. All notes are available on IMF Fundwide Collaboration Workspace for Crisis Group http://www-intranet.imf.org/fundwide/collaboration/CG/default.aspx.

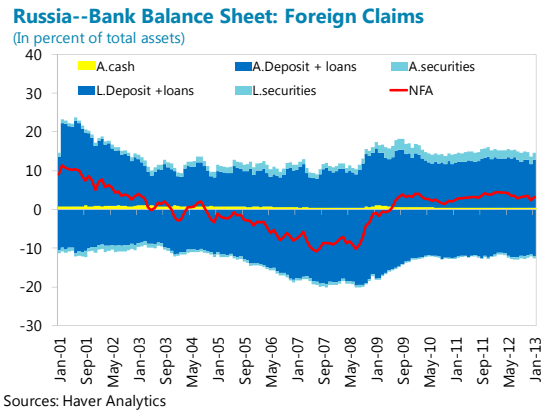
E. Key Considerations for Establishing Effective FX Liquidity Safeguard in Russia

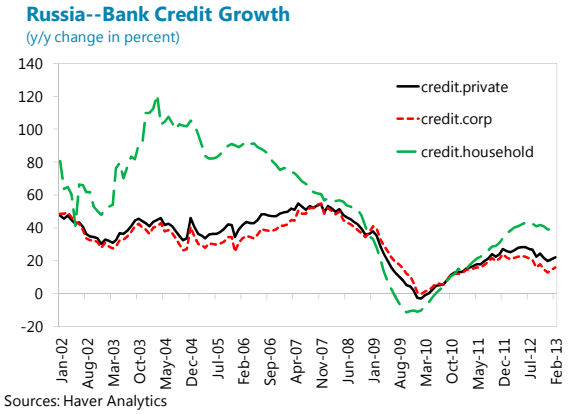
19. An effective FX facility should follow principles similar to liquidity support in general (Box 2). Without adequate safeguards, central bank facilities could cause moral hazard and eventually cost losses to the central bank. Moreover, the adequacy and effectiveness of liquidity provision framework needs to be judged in the context of overall crisis prevention and management framework, which includes framework for supervisory early intervention of problem banks (crisis prevention), micro- and macro-prudential supervision and tools, and crisis management tools (official liquidity and capital support, orderly and effective resolution, and deposit guarantee schemes). Recommendations in 2011 FSAP should guide the issues for further improvement in this

broad area.[17] Nonetheless, there are a few specific areas that should be strengthened when considering FX liquidity facilities in Russia.

20. First and foremost, it is important to monitor and limit the buildup of vulnerability. The financial crisis in Russia in 2008-09 was partly triggered by global development but its root causes were domestic. Domestic bank credit to the corporate and household sectors rose at an unsustainable level of approximately 400 percent over the four years prior to the crisis. Fueled by rising property and commodity prices and the authorities' earlier focus on exchange-rate stability, Russian bank lending was increasingly financed by external borrowing (Figure 3, 6). Thus, banks and corporates were in vulnerable to sudden changes in exchange rate expectations.

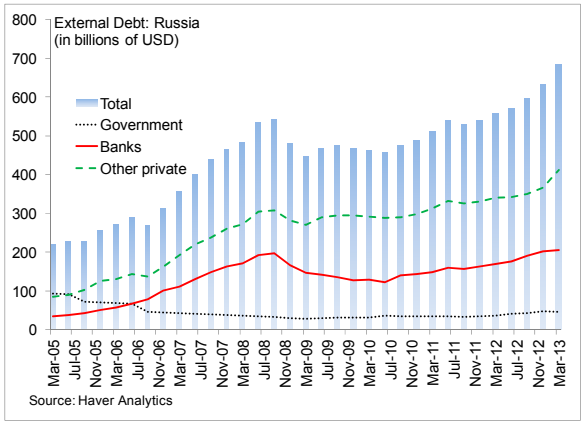
Figure 6. Russia Banks, Foreign Financing and Credit Growth





21. In particular, terms and uses of external debt for both banks and corporates need to be monitored carefully. Non-bank private corporations rely more on external debt than banks, and borrowing has been picking up strongly once again recently (Figure 7). Bank external debt is rising again as well, but their net foreign assets have turned to positive since 2009, which is a distinctive improvement compared to the time just before the global financial crisis. When assessing FX maturity mismatch/liquidity risks, it is necessary to look beyond contractual maturity. External borrowings often include covenants that give creditors options to request repayment before

Figure 7. Russia's External Debt: 2005–13



[17] See Russian Federation: Technical Note on Crisis Management and Crisis Preparedness Framework (IMF Country Report No.11/335).

maturity when certain market conditions are met.[18] Many of the external borrowing by Russia contracted before the global financial crisis indeed had such covenants, which suddenly shortened residual maturity and increased liquidity need exactly when the market conditions deteriorated.

22. For fuller assessment of cross-border risks that often contribute to FX liquidity risks, home host collaboration, and regular data collection are particularly relevant.

- As pointed out by 2011 FSAP, the CBR monitors a rather limited set of banks' cross-border activities. Cross-border exposure data by country are limited to inter-bank claims. While balance of payment data provide some information about cross-border financial flows for banks, they do not cover funding and investment activities of Russian banks that do not cross the Russian border.[19] If, for example, Russian banks build similar positions to European banks' exposures in the United States (obtain funding from money market funds in the United States to purchase U.S. securities in U.S. markets), it will be hard to gauge the exact extent of such exposures with existing data.

- More broadly, reporting and monitoring of cross-border exposures, liquidity, and FX liquidity is weak in most countries, including AE, even though data on overall liquidity are being enhanced, as countries prepare for introducing Basel III liquidity regulations.[20] Still, the regulatory requirements to cover FX liquidity risks are scant. When needed, some national supervisors require systemically important institutions to report additional details in line with the risks and vulnerability the financial systems face.

23. Stress test, especially bottom-up stress tests could be effectively used to monitor FX and FX liquidity risks even when there is limited regulatory reporting. Bottom-up stress tests are organized by supervisor and implemented by banks. The supervisor usually sets up specific common scenarios and shock assumptions to be applied to all the participating banks, and banks calculate the impact using their own internal data. Due to limited liquidity data, many supervisors rely more on banks' data and methodology for liquidity stress tests than solvency tests (Schumacher and Oura, 2012). The IMF survey on stress testing by supervisors/central banks (Oura, 2012) indicates that about a half of the regulators conducts separate FX liquidity stress tests. For the Japan 2012 FSAP[21], the IMF and the BOJ focused on U.S. dollar liquidity risks in their liquidity stress test, including the

[18] For instance, some covenants are linked to global interest rates (e.g., U.S. dollar Libor) and trigger early repayment when the rates jump beyond a certain threshold.

[19] For instance, when Russian banks' affiliates in Cyprus take deposit in the country and lend to local entities or to any entity from countries other than Russia, these activities will not be captured by BoP.

[20] Quantitative Impact Study (QIS) organized by Basel Committee on Banking Supervision (BCBS) to prepare for Basel III regulations ensures banks and national regulators are setting up adequate reporting and monitoring framework for introducing the regulations. One Russian bank participated in the most recent exercise released in March 2013 (http://www.bis.org/publ/bcbs243.htm)

[21] http://www.imf.org/external/pubs/cat/longres.aspx?sk=26137.0 More recently, the BoJ follows up with similar exercises in their Financial Systems Report http://www.boj.or.jp/en/research/brp/fsr/fsr130417.htm/

roll-over risks with FX swaps (one of the key dollar funding tools for Japanese banks), which materialized after the Lehman failure.

24. It will be extremely important to make it clear that a possible FX facility is an exceptional measure against a systemic crisis and not standing facility. Such exceptional liquidity facilities (both in domestic or foreign currencies) should not be misused to finance banks' regular operation or let alone credit expansion. Setting expiration date explicitly and charge costs in line with market conditions are essential for avoiding moral hazard and misuse, which can not only cause some direct loss to the central bank but also risk large capital outflows and currency crisis.

25. Any liquidity facility should be consistent with broad policy packages for regaining confidence. For EM, unconventional monetary policy and other financial sector support upon crisis, can do more harm than good when a country has its own domestic vulnerability. The central bank and government might need to make difficult choices under substantial uncertainty. At the height of a crisis, one needs to focus on measures that can help regaining confidence. For instance, Stone, Walker and Yasui (2009) discussed various FX liquidity support taken by Brazil in 2008–09, and point out that the announcement of the swap arrangement with the U.S. FRB contributed the most among other FX support measures (including spot and futures market intervention, FX swaps auctions, dollar lending to exporters and corporations with external debt) in stabilizing the FX markets.

Table 1. Details of Dollar Swap Arrangement with FRB and Corresponding Domestic Dollar Provision Modality, by Central Banks, October 2008 through 2010

Country	Lot size (USD billion)	As of date	Range of tenors offered since inception	Minimum bid rate	Notes	Auction format in each jurisdiction 1/
ECB	Full allotment	10/13/08	overnight, 1W, 1M, 3M	USD OIS+ 100 bps	Expired in Feb. 2010, re-established in May 2010, extended to Feb. 2014. Bid reduced to USD OIS+ 50 bps in Nov. 2011.	Non-competitive, fixed rate, full allotment
Switzerland	Full allotment	10/13/08	overnight, 1W, 1M, 3M	USD OIS+ 100 bps	Expired in Feb. 2010, re-established in May 2010, extended to Feb. 2014. Bid reduced to USD OIS+ 50 bps in Nov. 2011.	Non-competitive, fixed rate, full allotment
England	Full allotment	10/13/08	overnight, 1W, 1M, 3M	USD OIS+ 100 bps	Expired in Feb. 2010, re-established in May 2010, extended to Feb. 2014. Bid reduced to USD OIS+ 50 bps in Nov. 2011.	Non-competitive, fixed rate, full allotment
Australia	30	9/29/08	1M, 3M	USD Libor	Expired in February 2010.	Competitive, multi-price auction
New Zealand	15	10/28/08	Not drawn	…	Expired in February 2010.	…
Japan	Full allotment	9/29/08	1M, 3M	USD OIS+ 100 bps	Expired in Feb. 2010, re-established in May 2010, extended to Feb. 2014. Bid reduced to USD OIS+ 50 bps in Nov. 2011.	Non-competitive, fixed rate, full allotment
Canada	30	9/29/08	Not drawn	…	Expired in Feb. 2010, re-established in May 2010, extended to Feb. 2014. Bid reduced to USD OIS+ 50 bps in Nov. 2011.	…
Denmark	15	9/29/08	1M, 3M	Libor + 50 bps	Expired in February 2010.	Competitive, single price auction
Sweden	30	9/29/08	3M	USD OIS+ 50 bps	Expired in February 2010.	Competitive, single price auction
Norway	15	9/29/08	1M, 3M		Expired in February 2010.	Competitive, multi-price auction
Korea	30	10/29/08	3M	USD OIS+ 50 bps	Expired in February 2010.	Competitive, multi-price auction
Brazil	30	10/29/08	Not drawn	…	Expired in February 2010.	…
Mexico	30	10/29/08	3M	USD OIS+ 50 bps	Expired in February 2010.	Competitive, multi-price auction
Singapore	30	10/29/08	Not drawn	…	Expired in February 2010.	…

Sources: Goldberg, Kennedy, and Miu (2010) and FRB (2013)

1/ Collateral eligibility follows those for domestic open market operations.

Table 2. Emergency FX Liquidity Support by Types of Instruments in Emerging Markets—September 2008–June 2009

Trading FX in the spot market (excluding peg countries)

- Turkey, CB starts intermediating interbank FX operations. (2008)
- Turkey, CB halts its daily purchase of dollars and shifts to daily dollar sales. (2008)
- Chile, CB suspends reserve accumulation program. (2008)
- Chile, CB initiates daily FX sale auction program. (2009)
- Columbia, CB provides FX based on a rule (giving market participants the option to buy FX from CB when the volatility goes above a threshold). (2008)
    - Mexico, CB offers rule-based daily FX auction with a minimum price floor. (2009)

Changes in reserve requirement

- Indonesia, CB reduces FX reserve requirement. (2008)
- Romania, CB reduces FX reserve requirement. (2009)
- Serbia, CB reduces FX reserve requirement and further changes currency structure of required reserves. (2008)
- Turkey, CB reduces FX reserve requirement. (2008)
- Ukraine, CB relaxes FX reserve requirement. (2009)
- Argentina, CB relaxes FX reserve requirement. (2008)
- Chile, CB relaxes FX reserve requirement to be met in any FX not just USD. (2008)
- Mexico, CB begins to pay monthly interest on dollar bank deposits. (2008)
- Peru, CB eliminates reserve requirements on long-term international bank loans. (2008)
- Peru, CB reduces marginal reserve requirement on FX deposits. (2008)

Lending using FX swaps

- Hong Kong SAR, CB offers FX swaps to banks. (2008)
- India, CB offers temporary FX swaps to overseas branches of Indian banks (2008)
- India, CB offers temporary FX swaps to Indian banks with overseas offices. Allow banks to get domestic liquidity from the central bank to be used for swaps. (2008)
- Indonesia, CB extends FX swap tenors. (2008)
- Korea, government provides liquidity in FX swaps market. (2008)
- Korea, CB introduces competitive auction FX swap facility. (2008)
- Hungary, CB offers FX swaps daily. (2008)
- Hungary, CB offers fixed price euro/Swiss franc swap. (2008)
- Hungary, CB offers 6-month euro/froint swaps 3-month floating-price euro/froint swaps (2009)
- Poland, CB introduces FX swaps. (2008

Table 2. Emergency FX Liquidity Support by Types of Instruments in Emerging Markets—September 2008–June 2009 (Continued)

- Serbia, CB offers local currency liquidity and FX swaps for foreign banks' subsidiaries committed to maintain their exposures to the country.
- Chile, CB offers FX swap program, and extends its maturity later. (2008)

Lending in FX to banks

- Korea, government grants temporary 3-year guarantee on banks' FX borrowings. (2008)
- Philippines, CB starts to offer USD repo. (2008)
- Vietnam, CB expands eligible collaterals for its FX lending operations to include recently issued USD sovereign debt of the country. (2009)
- Russia, government provides its FX reserve to state-owned development bank (VEB) to on-lend banks and corporate (2008).
- Turkey, CB increases the limit on its GX lending window and cuts the rates. (2008)
- Turkey, CB extends the maturity for FX repo between banks and vis-à-vis CB. (2009)
- Argentina, CB offers to auction options for banks to borrow dollars to help trade finance. (2009)
- Brazil, CB sells 1-month dollar liquidity lines. (2008)
- Brazil, government allows Brazilian banks to borrow reserves (collateralized) for on-lending to exporters. (2008)
- Brazil, CB auctions FX loans taking Brazilian sovereign global bonds as collateral. (2008) The eligible collaterals are expanded later. (2009)
- Brazil, CB offers dollar repo targeted at exporters. (2008)

Support for non-banks

- India, CB offers collateralized FX lending to oil refinery companies. (2009)
- Indonesia, government creates a new export financing agency to provide FX liquidity via guarantees, insurance, or lending.
- Korea, government and CB provide funding to exporters. (2008).
- Korea, CB expands collateral for FX loans given to banks, including export bills from all enterprises to facilitate export financing from banks. (2008)
- Hungary, government provides FX to state-owned development bank to boost lending to companies. (2009)
- Russia, government provides its FX reserve to state-owned development bank (VEB) to on-lend banks and corporate (2008).
- Brazil, CB offers 1-year dollar loans to companies. (2008)

Table 2. Emergency FX Liquidity Support by Types of Instruments in Emerging Markets—September 2008–June 2009 (Concluded)

Changes in capital account restrictions

- India, CB allows banks to borrow FX from overseas branches. (2008)
- India, CB raises refinancing limit on bank export credit. (2008)
- India, CB raises interest rate ceilings on FX export credit. (2009)
- Indonesia, state-owned firms are required to repatriate export proceeds. (2008)
- Korea, CB eliminates limits on bank purchases of USD in offshore non-deliverable forward markets. (2008)
- Philippines, CB relaxes some FX documentation rules to allow easier access to dollars. (2009)
- Ukraine, CB relaxes limits on foreign borrowings by banks. (2008)
- Argentina, impose 3-day waiting period for investors buying local securities for sale abroad for dollars. (2008)

Regulatory forbearance/amendment

- Nigeria, CB lowers limits on net open FX position. (2008, 09, 10)
- Philippines, CB lowers limit on FX liquidity holdings in excess of FX liability. (2008)
- Philippines, CB relaxes marked-to-market requirement for foreign currency deposit units to reduce their dollar demands. (2008)

Swap/lending arrangement with other central banks

- China, with Japan and Korea. (2008)
- Hong Kong SAR with Netherland. (2009)
- Estonia with Sweden. (2009)
- Hungary with ECB. (2008)
- Iceland with Denmark, Norway, Sweden and Finland. (2008)
- Latvia with Sweden and Denmark. (2008)
- Poland with Switzerland and ECB. (2008)
- Brazil, Korea, Mexico with the U.S. (2008–Feb. 2010) Among AEs, Australia, Canada, ECB, Japan, Singapore, Norway, New Zealand, Denmark, Sweden, Switzerland and the U.K. also had swap arrangement with the U.S. Most of these expired in February 2010, except for Canada, Japan, ECB, Switzerland and the U.K. where the arrangement has been extended to 2014.

Other

- Brazil, the government eliminates certain tax on FX transactions. (2008)
- Chile, government shifts FX deposit from foreign banks to domestic banks and coordinates with CB in auctioning USD CDs to local banks. (2008)

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Sources: Author's extract from background database for Ishi, Stone, and Yehoue (2009), based on central bank websites, Factiva and IMF country reports; Moreno (2010); and Druck, Hofman and Lu (2013).

Note: CB stands for central bank.

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