Shock-absorbing properties of the exchange rates in transformation economies: SVAR estimates

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Abstract

Stabilization policies in the wake of the 2008-2009 financial crisis do not provide with clear preferences for a particular exchange rate regime ─ fixed or floating. Considering merits of the flexible exchange rate as a shock absorber, i.e. being useful in absorbing asymmetric real shocks, empirical results on the basis of a structural VAR suggest that it is not the case for all Central and East European (CEE) countries, as more than 80% of variability in the nominal exchange rate over the four quarters horizon is explained by the neutral shocks. Variability in output, on the other hand, is determined mainly by permanent (non-neutral) shocks, as it is extracted from a two-variable SVAR model based on the familiar Blanchard–Quah decomposition. For Ukraine, the share of neutral shocks in the variance decomposition of nominal and real exchange rates does not exceed 75%, which is somewhat lower if compared with the CEE countries, but it is still not enough to signal shock-absorbing properties of the exchange rate flexibility.

Keywords: *exchange rate regime, SVAR, the Blanchard–Quah decomposition, transformation economies*

JEL Classification**:** C30, F31, F41, P30

1. Introduction

Stabilization policies in the wake of the 2008-2009 financial crisis do not provide with clear preferences for a particular exchange rate regime – fixed or floating. Although Poland's experience of sustaining a 'green island' in the midst of worldwide economic turmoil is credited with a free floating exchange rate policy, it is not a sufficient argument in favor of greater exchange rate flexibility. While other largest Central and East European (CEE) countries, as the Czech Republic, Hungary, and Romania, have been practicing variants of a floating exchange rate regime, Slovakia has adopted the euro in 2009 and the Baltic States have been quite successful in macroeconomic adjustment under a fixed exchange rate regime. Among other transformation economies, Russia followed a policy of managed floating, with an increasing aptitude of exchange rate fluctuations. Belarus initially had kept preserved a fixed exchange rate policy, but had to switch to a floating exchange rate regime amidst a harsh currency crisis of 2011. Following a steep exchange rate depreciation of 2008-2009, Ukraine has returned to a policy of *de facto* fixed exchange rate regime, which has been looking quite fragile since the middle of 2013.

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Under high capital mobility, with limited scope for independent interest rate policy, this question largely centers around the costs (or benefits) of giving up the flexible exchange rate as a stabilization tool (i.e., a shock absorber). As mentioned by Stąźka-Gawrysiak (2009), the consensus now is such that the flexible exchange rate can act as a shock-absorbing instrument if its fluctuations are mainly driven by real, especially demand, shocks and as a destabilizing one if they are largely driven by nominal disturbances. Following a pioneering approach by Canzoneri, Valles & Vinals (1996), this paper studies shock-absorbing properties within the simplest two-variable framework, which could be easily extended to the three-variable framework of demand (IS), supply (AS) and nominal (LM) shocks.

Although empirical studies on the exchange rate shock-absorbing properties used to be focused on periods with a floating exchange rate, which is quite natural, taking into account episodes with a fixed exchange rate regime provides with opportunity to compare performance of two regimes across countries. Despite strong theoretical arguments in favour of exchange rate flexibility as a stabilizing tool, evidence is not lacking that flexible exchange rate regimes do a worse job of insulating open economies from external shocks (Aysun 2008). This study is aimed at comparative analysis of exchange rate shocks for 10 transformation economies with different exchange rate regimes within the familiar framework of the Blanchard–Quah decomposition.

The paper proceeds as follows. Section 2 outlines necessary analytical considerations. In Section 3, data and statistical methodology are presented. Estimation results are presented in Section 4. Concluding remarks are made in the final section.

2. Analytical framework

Considering shock-absorbing properties of exchange rate flexibility, its main advantage is a potential ability to generate rapid adjustment in international relative prices even when domestic prices adjust slowly (Borghijs & Kuijs, 2005). In the absence of a relative price-driven ‘expenditure-switching’ mechanism, such real shocks as changes in the budget balance, foreign demand or terms-of-trade can cause significant output losses or overheating. However, exchange rate adjustment in response to monetary and financial (or nominal) shocks could be counterproductive, leading to a stronger disequilibrium in the economy. A fixed exchange rate regime looks preferable in the case of nominal shocks, but it is inefficient in neutralization of real shocks. As defined by Canzoneri, Valles & Vinals (1996), shocks are classified as “neutral” if they have no long run effect on relative output, and as “non-neutral” if they do so.

Following Canzoneri, Valles & Vinals (1996), the vector of endogenous variables $\Delta x_t = [\Delta e_t, \Delta y_t]'$ has a structural interpretation:

$$\Delta x_t = C(L)\varepsilon_t, \tag{1}$$

where e_t is the nominal exchange rate, y_t is the output (GDP or industrial production), L is the lag operator and $\varepsilon_t = [\varepsilon_{Nt}, \varepsilon_{Pt}]'$ is a vector of serially uncorrelated structural shocks, with ε_{Nt} and ε_{Pt} being the neutral shock and non-neutral (or permanent) shocks, respectively.

The vector ε_t is to be recovered from an estimate of the moving average representation:

$$\Delta x_t = A(L)u_t, \tag{2}$$

where the polynomial $A(L)$ is the identity matrix and the disturbance vector u_t has an estimated variance-covariance matrix Σ.

Assuming a linear relationship between ε_t and u_t, the long run representation of (1) can be represented as:

$$\begin{bmatrix} \Delta e_t \\ \Delta y_t \end{bmatrix} = \begin{bmatrix} c_{11} & c_{12} \\ 0 & c_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_{Nt} \\ \varepsilon_{Pt} \end{bmatrix}. \tag{3}$$

The long run identifying restriction implies that the neutral shock to exchange rate has no long-run effect on output. On the other hand, permanent (or non-neutral) shocks affect either output or nominal exchange rate. It is common to assume that in a two-variable model neutral shocks include monetary/financial market (LM) shocks, while permanent shocks are identified as supply shocks (Borghijs and Kuijs, 2004).

Empirical studies are rather inconclusive, as results depend on the exact model specification and data used (Stążka 2006). Presence of the shock-absorbing properties of the floating exchange rate is found for the U.S. (Juvenal 2009), Sweden and Canada, but not in Australia, New Zealand and the U.K. (Alexius and Post, 2008). Borghijs and Kuijs (2004) find that exchange rates in the CEE countries (except Poland) react more to monetary and financial shocks, while being unable to absorb real shocks. Stabilizing properties of Poland’s exchange rate are identified by Stążka (2006). López and Chacón (2006) confirm that exchange rate could be a stabilizing tool in Poland and the Czech Republic, although it is not the case in Hungary. Earlier Dibooglu and Kutan (2001) obtained that nominal shocks determine a sizable proportion of real exchange rate (RER) variability in Poland (up to 63% on impact), but not in Hungary. Erjavec et al. (2012) argue that the exchange rate in Croatia seems to be a shock absorber, as volatility of RER is mainly influenced by demand shocks, with the impact of supply shocks being insignificant. Kontolemis and Ross (2005) find that the impact of real shocks upon the RER varies across CEE countries. Ahmed, Gust, Kamin & Huntley (2002) suggest that exchange rate movements may be more destabilizing in developing countries than in industrial countries, regardless of the exchange rate regime chosen.

3. Data and statistical methodology

For empirical study, quarterly time series data for 10 CEE countries and four former Soviet Union (FSU) countries for the period 1999-2013 are used, as provided by the online IMF *International Financial Statistics*. Both nominal and real effective exchange rates, $NEER_t$ and $REER_t$ respectively, are used as the measure of exchange rate. Output is proxied with the gross domestic product and industrial production, Y_t and IND_t respectively[2].

With a trend and an intercept included, the results of the Augmented Dickey–Fuller (ADF) test indicate that in almost all cases the (level) data are I(1) and not integrated of a higher order, as the null hypothesis of a unit root in the level of either a nominal effective exchange rate or output cannot be rejected, while it is the opposite for the difference of both time series (Table 1). As possible stationarity of the NEER for Georgia does not set any problems for estimation procedures, a likely non-stationarity of the RER in Estonia is not supported by the alternative tests of Phillips–Perron and KPSS.

The Johansen test suggests that there is no cointegration of $NEER_t$ and Y_t in first differences for all countries, which makes it appropriate to estimate a SVAR model in first differences. Depending on a particular country, SVARs are estimated using two to three lags and a dummy for the 2008-2009 world financial crisis.

4. Estimation results

Figure 1 and 2 present the impulse response functions for the nominal effective exchange rate and output (GDP), respectively. In response to the (positive) neutral shock, the nominal exchange rate uniformly depreciates in all country (Fig. 1a). The strongest response is found for Belarus. Among countries with a more flexible exchange rate regime, temporary increases in output, as it is predicted by the Mundell–Fleming model, are found for Slovakia, Slovenia, and Romania (Fig. 2a). In most of the cases, the initial expansionary effect is followed by a restrictionary correction in two to five quarters. In Bulgaria and the Baltic countries, which all are hard peggers, the neutral shock is mostly restrictionary on impact, then a strong

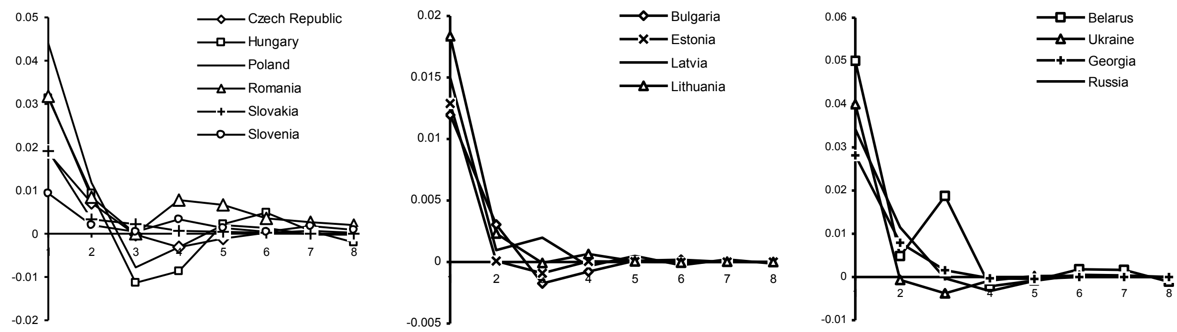
[2] Borgjis & Kuijs (2004) use industrial output expressed relative to the euro area, to capture asymmetric shocks relative to the economic area against which the exchange rate is assessed.

expansionary effect is uniformly observed in a quarter, with another restrictionary correction to follow. For Georgia, Russia and Ukraine, the neutral shock contributes to a decrease in output on impact, but the expansionary effect then follows (with different lags). An opposite sequence of effects is observed for Belarus.

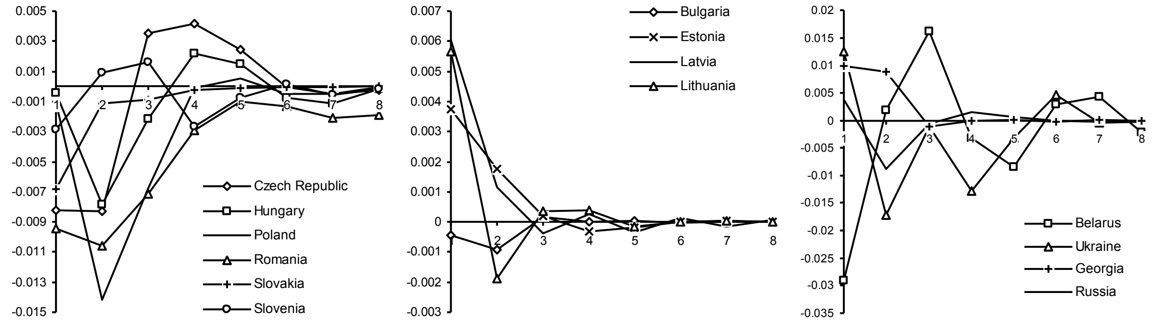
Country	BG 2000Q1: 2013Q2	CZ 2000Q1: 2013Q3	HU 2000Q1: 2013Q3	PO 2000Q1: 2013Q3	RO 2000Q1: 2013Q3	SK 2000Q1: 2013Q3	SI 2000Q1: 2013Q3
NEER	–2.42	–2.28	–2.57	–2.46	–2.68	–1.56	0.57
	–5.24*	–5.93*	–2.79***	–3.89**	–5.23*	–6.21*	–2.68*
REER	–1.44	–2.15	–0.97	–3.06	–1.29	–0.89	–0.75
	–6.80*	–5.10*	–3.83**	–3.94**	–5.71*	–5.29*	–11.81*
Y	–0.03	–0.34	–0.81	–1.88	–1.23	–0.71	–1.27
	–6.79*	–5.34*	–3.14***	–6.93*	–3.45***	–7.96*	–3.22***
IND	–1.31	–2.18	–2.03	–2.23	–2.99	–0.41	–
	–5.45*	–5.27*	–4.09**	–3.87**	–5.52*	–5.12*	–
Country	**EE 1999Q1: 2012Q3**	**LV 1999Q1: 2012Q3**	**LT 2000Q1: 2013Q3**	**BY 2000Q1: 2012Q3**	**GE 2000Q1: 2013Q3**	**RU 1999Q1: 2013Q3**	**UA 1999Q1: 2013Q3**
NEER	–1.39	–3.02	–3.12	–0.41	–3.38***	–2.86	–1.82
	–7.36*	–6.21*	–6.93*	–4.97*	–4.53*	–7.12*	–7.76*
RER	–2.28	–2.57	–1.92	–2.33	–3.03	–2.19	–2.97
	–2.81	–3.83*	–2.87*	–5.99*	–5.55*	–7.38*	–4.28*
Y	–1.58	–2.05	–1.78	–2.35	–1.28	–1.30	–0.92
	–4.25*	–3.17***	–5.70*	–5.32*	–10.90*	–5.88*	–6.10*
IND	–1.58	–2.28	–	–	–	–2.28	–1.61
	–5.04*	–6.63*	–	–	–	–4.84*	–5.71*

Notes: * null hypothesis can be rejected at the 1% level (**, *** at the 5% and 10% level, respectively). Lags are based on the automatic criteria selection by the Schwartz criterion. BG stands for Bulgaria, CZ for the Czech Republic, HU for Hungary, PO for Poland, RO for Romania, SK for the Slovak Republic, SI for Slovenia, EE for Estonia, LV for Latvia, LT for Lithuania, BY for Belarus, GE for Georgia, RU for Russia, and UA for Ukraine.

Table 1 ADF test statistics for transformation economies.



a) neutral;

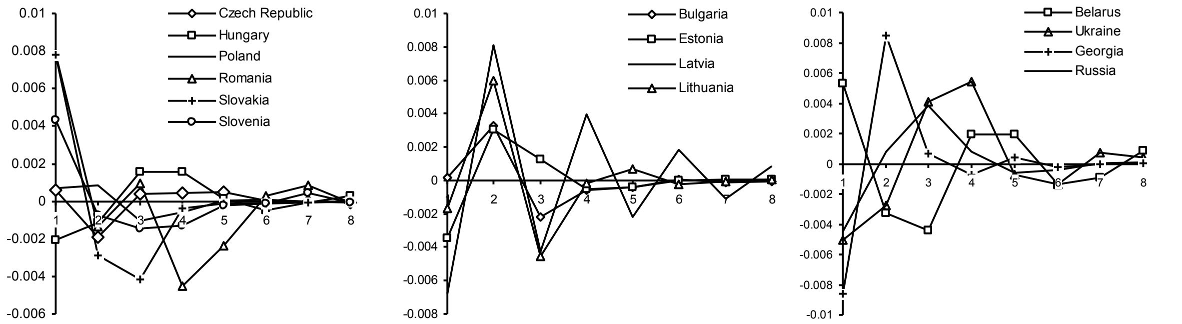


b) non-neutral;

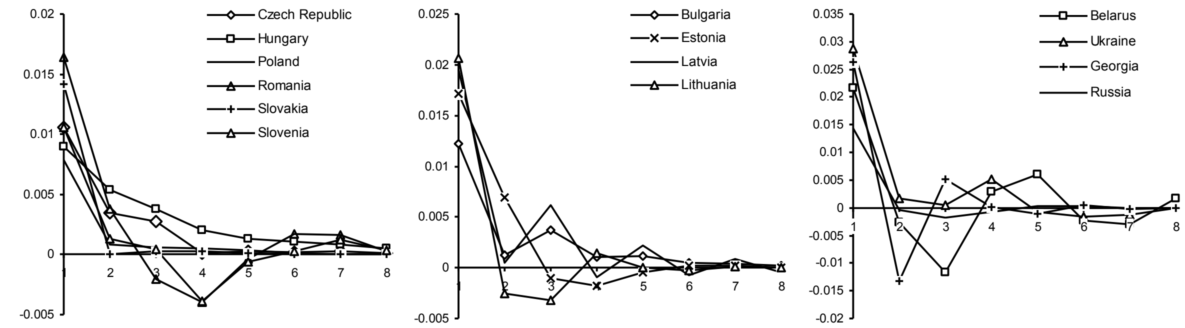
Fig. 1. Effects of VAR shocks on the nominal effective exchange rate.

The (positive) permanent shock leads to a temporary appreciation of the NEER in almost all countries practicing a flexible exchange rate (except Slovenia), with an opposite correction above the equilibrium level in the Czech Republic and Hungary. For the Baltic countries, the permanent shock results in depreciation on the NEER (no impact is found for Bulgaria). As for Belarus, a NEER appreciation on impact is followed by the depreciation with a two quarter lag, while no significant effects are observed for other FSU countries. Permanent shock brings about an increase in output across all countries, though with a slight restrictionary adjustment in Slovenia, Romania, Lithuania, Belarus, and Georgia (Fig. 2b).

Table 2 reports the variance decompositions for the estimated model at a horizon of 4 quarters, which is the horizon over which monetary policy and exchange rate flexibility are presumed to be most potent. Similar to other studies (Borgjis & Kuijs 2004), at least three quarters of variability in the NEER is explained by the neutral shock, except somewhat lower share for the Czech Republic at 71%, which is not surprising as this country has been practicing the floating exchange rate regime since 1997. At the same time, the neutral shock is responsible for 90% of the variance decomposition of Poland's nominal exchange rate, another well-known floater among the CEE countries. On the other hand, the second lowest share of neutral shock in variability of the NEER at 74% is found for Ukraine, which has followed the policy of *de facto* fixed exchange rate, although a *de jure* floating exchange rate regime had been declared in March 2000.



a) neutral;



b) permanent;

Fig. 2. Effects of VAR shocks on the output.

Variability in the output is mostly determined by permanent shocks. Their contribution ranges from 70% in the Slovak Republic and 75% in Latvia to over 90% in majority of countries (Bulgaria, the Czech Republic, Hungary, Poland, Estonia, Belarus, and Ukraine). As empirical results suggest that the nominal exchange rate does not respond to the shocks that seem to cause the bulk of fluctuations in output, it is possible to conclude that the exchange rate does not serve as an absorber.

Using industrial production as a proxy for output, there is no significant change in the variance decomposition for Hungary, the Slovak Republic, and Ukraine. But the share of permanent shock in the decomposition of NEER increases substantially for Russia (from 7% to 43%), Estonia (from 15% to 35%), Poland (from 10% to 28%), and Bulgaria (from 6% to 22%), while being on a decrease for the Czech Republic (from 29% to 7%) and Romania (from 19% to 4%). However, an increase in the contribution of the nominal shock to the changes in industrial production is observed only for Russia (from 15% to 22%).

Country	**Bulgaria**		**Czech Rep.**		**Hungary**		**Poland**		**Romania**	
	N	**P**	**N**	**P**	**N**	**P**	**N**	**P**	**N**	**P**
NEER	94	6	71	29	95	5	90	10	81	19
Output	6	94	3	97	8	92	4	96	22	78
RER	91	9	92	8	90	10	71	29	82	18
Output	4	96	10	90	2	98	4	96	11	89

Country	**Slovakia**		**Slovenia**		**Estonia**		**Latvia**		**Lithuania**	
	N	**P**	**N**	**P**	**N**	**P**	**N**	**P**	**N**	**P**
NEER	89	11	85	15	85	15	85	14	91	9
Output	30	70	15	85	8	92	25	75	12	88
RER	95	5	90	10	48	52	71	21	93	7
Output	16	84	1	99	40	60	9	91	7	93

Country	**Belarus**		**Georgia**		**Russia**		**Ukraine**	
	N	**P**	**N**	**P**	**N**	**P**	**N**	**P**
NEER	84	16	78	22	93	7	74	26
Output	9	91	16	84	15	85	8	92
RER	90	10	94	6	89	11	76	24
Output	5	95	6	94	16	84	13	87

Note: N is for neutral shock and P is for permanent shock.

Source: the author's calculations.

Table 2 Variance decomposition for the exchange rate and GDP (%).

Regarding the relationship between industrial production and the RER, there is no much difference if compared with the results for a joint estimation of GDP and RER shocks for Bulgaria, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic, and Ukraine. There is a decrease in importance of the permanent shock in changes in the RER for Estonia (from 52% to 37%) and Latvia (from 21% to 9%), but the opposite outcome is obtained for Russia, with an increase in the share of permanent shock in the RER from 11% to 31%. The neutral shock loses its importance in determining the variance decomposition of output for Estonia and Latvia, but in Russia it determines up to 30% of the variance decomposition of industrial production.

Conclusions

One of the most persistent arguments in favour of a flexible exchange rate regime is its hypothetical ability to absorb asymmetric real shocks. Based on quarterly data for the 1999-2013 period, it is found that it is not the case for all CEE countries, as more than 80% of variability in the nominal exchange rate over the four quarters horizon is explained by the neutral shock (except the Czech Republic with its share at 71%), while variability in GDP is determined to the same extent by the permanent shock, as it is extracted from a two-variable SVAR model based on the familiar Blanchard–Quah decomposition. Using industrial production as a proxy for output improves shock-absorbing properties of the nominal exchange rate, especially for Poland and Estonia, which are practicing floating and pegged exchange rate regimes, respectively. Regardless of the output indicator – GDP or industrial production, the share of neutral shocks in the variance decomposition of nominal and real exchange rates is somewhat lower for Ukraine, but it is still not enough to signal shock-absorbing properties of the exchange rate flexibility. Using industrial output instead of GDP brings about a much lower share of neutral shock in the exchange rate variability of about 60%, with output being affected by this kind of shock up to 30%.

Acknowledgements

This paper is part of the research project F-4/DS/143/12, and the financial support provided by the Cracow Technical University is gratefully acknowledged.

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