

Features of exchange rate policy in inflation targeting countries

“Fear of appreciation” vs “fear of floating”

The research of the experience of inflation targeting central banks in developing countries testifies to the significant role of the exchange rate policy. While conducting currency interventions, central banks do not pursue the goal of maintaining a certain level of the exchange rate. This is true for the practice of the Bank of Russia. However, the "fear of appreciation" was inherent in the Bank of Russia only in the pre-crisis period.

Inflation targeting is becoming a very popular monetary policy regime with developing countries. There are thirty -five inflation targeting countries. Among them, there are twenty -five developing countries, but only four of them have free floating exchange rate.

In accordance with the International Monetary Fund (IMF) methodology, a free floating exchange rate policy not only means market methods of exchange rate arrangements with the exchange rate formed by the ratio of supply and demand on the internal currency market, but limits the frequency of monetary authorities' interventions. The IMF classification of exchange rate arrangements is based on only two criteria. The first one is the extent of monetary authorities' participation on internal currency market and the second one is the exchange rate volatility.

An exchange rate can be classified as free floating if intervention occurs only exceptionally and aims to address disorderly market conditions, and if the authorities have provided information or data confirming that intervention has been limited to at most three instances in the previous six months, each lasting no more than three business days. However, these norms are the IMF innovation. Before the global crisis the IMF classification didn't assume any limitation of monetary authorities' interventions. A most flexible exchange rate in that classification was an independently floating exchange rate which was market -determined, with any foreign exchange intervention aimed at moderating the rate of change and preventing undue fluctuations in the exchange rate, rather than at establishing a level for it.

However, apart from the IMF classification there are some other methods of exchange rate classifications proposed by Ghosh A., Gulde A.M., Wolf H., Bubula A. and Ötoker-Robe I., Reinhart C.M. and Rogoff K.S., Shambaugh C. I would like to mention Levi Yeyati E. Sturzenegger F. method, which is based on cluster analysis and takes into account both the volatility of the level and of the monthly dynamics of the exchange rate, as well as changes in international reserves. Levi Yeyati E. Sturzenegger F. method allows us to formulate key features of floating exchange rate, such as high exchange rate velocity with a relatively stable value of international reserves.

Nevertheless, it is the IMF classification that has the greatest practical importance, although it's based on the narrowest list of criteria. The advantages of this classification are the widest scroll of countries and regular updates. These features allow us to use the IMF classification to study exchange rate evolution both in developed and in developing countries.

According to the IMF classification, free floating exchange rate is used only in three developing countries, besides Russia. They are Poland, Chile and Mexico. However, in accordance with their practice, monetary authorities of these countries have the right to intervene in the currency market to increase international reserves and to limit the exchange rate volatility (table 1).

Table 1 – Foreign exchange interventions conducted by monetary authorities in the countries with free floating exchange rate

Exchange rate arrangements	Methods of exchange rate regulation	Time period
The Bank of Mexico		
October 2008 – floating exchange rate	Limitation of exchange rate volatility, five unscheduled foreign exchange auctions , renewed interventions (\$400 mln per day)	October 2008
	Unscheduled auctions, the volume of daily interventions decreased to \$300 mln per day	February/March 2009
	Renewal of foreign exchange auctions by the monetary authority to increase international reserves	February 2010
November 2011 – free floating exchange rate	Foreign exchange auctions stopped, the regulator reserved the right to sell US dollars in the amount of not more than 400 million dollars at a rate of 2% higher than the average for the previous month in case of the national currency depreciation by 2%	November 2011
May 2015	Foreign exchange auctions to sell dollars renewed if the national currency depreciated by more than 1,5% until July 31, 2015 and by 1% until November 2015.	November 2015
The Bank of Chile		
September 1999 – free floating exchange rate	Intervention renewed to increase international reserves	April 2008
	The regulator began to conduct currency swaps when the demand for currency increased	September 2008
	The regulator began to sell currency from Reserve Fund on behalf of the government. The operations were carried out daily at 50 ml \$, then at 40 ml \$.	2009
	Interventions were conducted to increase the international reserve.	2011
The Bank of Poland		
2011 – floating exchange rate	Six interventions were conducted to weaken exchange rate pressure and to support macroeconomic and financial stability	September/November 2011
November 30, 2011 – freely floating exchange rate		

Sources: The Central Bank official site

In the vast majority of inflation targeting developing countries the exchange rate of the national currency is formed in the framework of a floating exchange rate. A floating exchange rate, in accordance with the IMF classification, means that the exchange rate is market -determined, with regular direct or indirect monetary authority interventions, which serve to moderate the rate of change and prevent undue fluctuations in the exchange rate, but any actions targeting a specific level of the exchange rate are incompatible with a floating exchange rate. For example, the Bank of Brazil stopped interventions on both forward and spot markets only in 2013. Since then only REPO auctions in foreign currency have served to regulate supply and demand on the currency market (table 2).

Table 2 – Structure of the Bank of Brazil interventions

	2000	2002	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
International Reserves, end of period, bln \$	33	38	86	180	194	239	289	352	373	359	364	356	365	381
netto currency operations	2,3	-9	34	79	-5	37	42	50	13	-12	7	-2	5,1	7,2
Forward market	0	0	0	0	0	0	0	2	7	0	0	0	0	0
Spot market	2	-6	34	79	8	24	41	48	11	0	0	0	0	0
REPO auctions	0	0	0	0	-8	8	0	0	-6	-12	7	-2	5,1	7,2

Source: The Bank of Brazil official site

The results of the research of inflation targeting central banks practical experience show their participation in exchange rate formation process. Distinctive features of their intervention policy are the absence of the goal to establish or maintain a certain exchange rate level. It is confirmed by insignificance of monetary authority operations that do not influence the fundamental features of exchange rate trajectory. Besides, monetary authorities announce their plans to intervene in advance.

Summing up the practical experience of the inflation targeting central banks we can conclude that their operations on the currency market are de-facto carried out in strict compliance with the announced rules. The central banks use two types of such rules: qualitative and quantitative rules. The differences are related to the goals and tasks of central banks interventions. The qualitative rules suggest quality parameters of increasing international reserves by purchasing foreign currency on internal forward and/or spot markets or by conducting put-options, giving the right to the agent to sell foreign currency to the central bank when the agreed conditions are met. In this case the central bank conducts currency operations on a more liquid spot market. Such operations, for example, were conducted by the Central bank of Chile in April 2008 and January 2011. The regulator bought US dollars on the spot market in the agreed volume.

In February 2010 the Bank of Mexico auctioned the rights to sell US dollars to the central bank (put options) among credit institutions. These rights could be partially or completely exercised in the month following the respective auction. Less often inflation targeting central banks conduct interventions on the forward market. Such operations were conducted by the Bank of Thailand in 1997 (Neerly , May/June 2001), the Bank of India (Tripathy, 2013), the Bank of Indonesia (Ho, et al., September 30, 2015).

The quantitative rules are used by the central banks to intervene if their goal is to weaken exchange rate volatility. The quantitative rules suggest currency corridor, within which the central banks don't intervene and they preserve tolerance to exchange rate

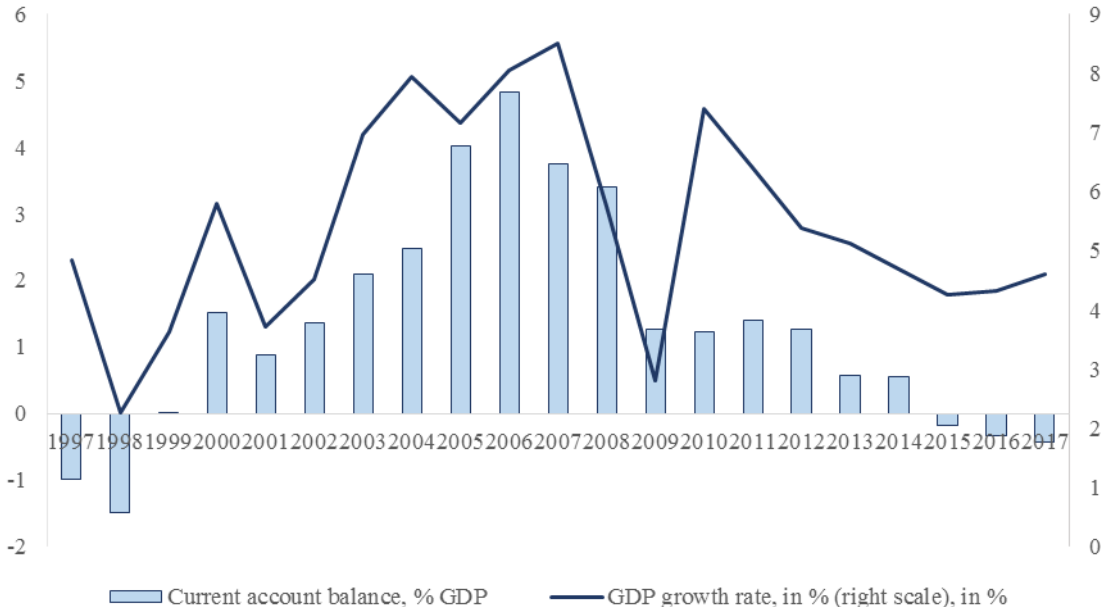
volatility. Such rules were used, for example, by the Bank of Columbia in 1999 and then in October 1999, by the Bank of Mexico in 2015. However, the central banks of Brazil, Peru and Uruguay don't follow any of intervention rules.

Repo operations in foreign currency were conducted by the central banks of Argentina, Brazil and Philippine to cover the increased demand of economic agents for foreign currency. But also it's necessary to mention that different methods of capital control were introduced to limit currency pressure. Such methods were involved in Brazil, Peru, and Columbia.

“Fear of appreciation” is the goal of the central bank’s intervention

Since the late 1990s inflation targeting central banks have been taking an active part in exchange rate regulation. However in the late 1990s it was caused by the “fear of floating” due to increased currency risks in developing countries with huge currency debt and a high degree of transfer of the exchange rate to prices of goods. Although there is still a risk of extremely high currency volatility and financial instability, the debt problems and effects of exchange rate transfer to prices of goods are not so painful. The degree of dollarization of developing economies has decreased. Therefore, at present, when developing countries have accumulated an essential volume of currency reserves, including those in US dollars, the goal of central banks’ interventions is limitation of currency appreciation. This phenomenon is known in the economic literature as the “fear of appreciation”.

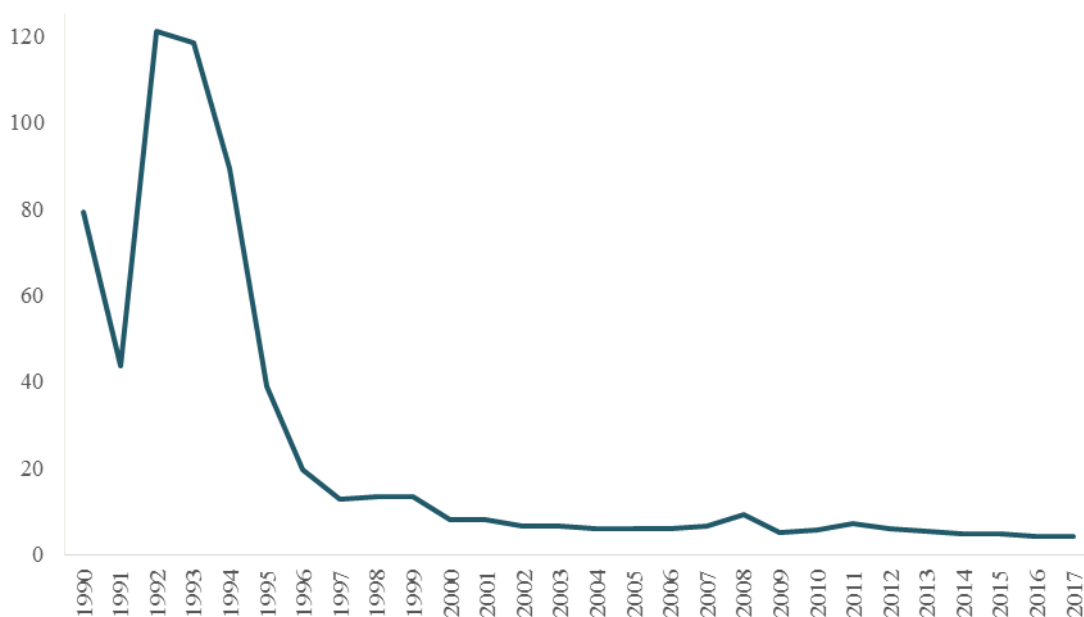
Change of goals pursued by targeting inflation central banks is caused by several factors. Before the global crisis high and increasing world oil prices caused huge inflow of export revenue and external borrowing. The current account balance of developing countries reached its maximum at 4.8% GDP in 2006 compared to the average of 1.8% GDP in 2000-2005 (picture 1).



Sources: International Monetary Fund, www.imf.org, the authors’ calculations
 Picture 1 – Current account balance and GDP growth in developing countries

After the crisis currency appreciation in developing countries complicated economic growth, decreased competitiveness of internal production and stimulated

import. Moreover, average consumer price growth in developing countries decreased from 40% in the middle of 1990-s to 4.2% in 2017 (picture 2).



Source: International Monetary Fund, www.imf.org

Picture 2 – Average consumer price growth in developing countries

According to Cavoli (Cavoli, 2009), Levy-Yeyati, et al. (Levy-Yeyati, et al., 2007), Pontines (Pontines, et al., 2011) the inflation targeting central banks had so-called “fear of appreciation”. Unlike “fear of floating”, “fear of appreciation” shows that the inflation targeting central banks are more inclined to increase their participation during the periods of appreciation of the national currency, than in the periods of its depreciation as it was in the 1990s.

Considering that the central banks fully control the volume of currency interventions, the Pontines et al. (Pontines, et al., 2011) examine the change in the value of foreign exchange reserves in response to appreciation / depreciation of the national currency. In the general case, the minimized loss function of the central bank can be represented as follows:

$$L_t = \frac{1}{2}(R_t - R^*)^2 + \frac{\lambda}{2}\{(\tilde{e}_t - e^*)^2 + \frac{\gamma}{3}(\tilde{e}_t - e^*)^3\}, \quad (1)$$

where:

R_t – currency reserves;

R^* - optimal volume of currency reserves;

λ – coefficient of the central bank aptitude;

e_t – dynamic of nominal or nominal effective exchange rate, in %

e^* - targeted exchange rate growth (for inflation targeting countries is equal to zero);

γ – coefficient of asymmetry in the preferences of the central bank relative to changes in the exchange rate (exchange rate appreciation promotes the increase in the central bank's losses). That's why $\gamma > 0$ means that the exchange rate in the function of losses of the central bank will enter with greater weight than in case of depreciation of the national currency.

Minimizing equation (1), we obtain the intervention function of the reaction of the central banks, which can be represented as follows:

$$R_t = R^* - \lambda a_1 E_{t-1} \left\{ \tilde{e}_t + \frac{\gamma}{2} (\tilde{e}_t)^2 \right\} \quad (2)$$

Transforming (2), we obtain:

$$R_t = R^* - \lambda a_1 E_{t-1} \tilde{e}_t + \frac{\gamma}{2} (\tilde{e}_t)^2$$

$$R_t = c + a \tilde{e}_t + \beta (\tilde{e}_t)^2 + v_t, \quad (3)$$

$$\text{where } a = -\lambda a_1, \beta = -\lambda a_1 \frac{\gamma}{2}$$

Hereby, the calculated coefficient of asymmetry of the central bank's preferences takes the form:

$$\gamma = 2\beta/a \quad (4)$$

The authors estimated the coefficient of asymmetry in two specifications with nominal and nominal effective exchange rates (increase in the exchange rate means appreciation of the national currency). They used Generalized Method of Moments. The variables used in the model are:

$$R_t = (\Delta \log \text{Reserves}_t) * 100;$$

$$\tilde{e}_t = (\Delta \log e_t) * 100.$$

Lagged values of R_t , \tilde{e}_t as well as U.S. federal funds rate are used as instruments. The research covers the time period from January 2000 to July 2009. They used monthly data. Table 3 reports their results.

Table 3 – Estimations of central banks' intervention functions

Country	Coefficients				
	c	a	β	$\gamma = 2\beta/a$	J-test
<i>e_t is measured using the nominal exchange rate of the US dollar per local currency</i>					
India	1,958* (0,160)	-2,663* (0,231)	-0,308* (0,050)	0,232* (0,025)	15,45

Korea	0,479* (0,092)	-0,447* (0,045)	-0,104* (0,013)	0,467* (0,074)	14,78
Philippine	0,459* (0,169)	-0,872* (0,127)	-0,284* (0,070)	0,651* (0,113)	14,15
Singapore	0,589* (0,123)	-0,297* (0,9)	-0,105* (0,037)	0,707* (0,360)	12,94
Thailand	0,552* (0,159)	-0,571* (0,114)	-0,165* (0,041)	0,578* (0,196)	13,95
Indonesia	0,681* (0,2)	-0,894* (0,166)	0,062* (0,017)	0,140* (0,020)	11,66
<i>e_t is measured using the nominal effective exchange rate</i>					
India	1,202* (0,089)	-0,432* (0,102)	-0,148* (0,035)	0,687* (0,123)	16,25
Korea	0,568* (0,086)	-0,131* (0,032)	-0,019** (0,007)	0,291*** (0,155)	14,58
Philippine	1,328* (0,138)	-1,014* (0,093)	-0,132** (0,054)	0,259* (0,103)	14,05
Singapore	0,991* (0,144)	-0,923* (0,302)	-0,716* (0,236)	1,551* (0,529)	12,66
Thailand	0,506* (0,084)	-0,437* (0,086)	-0,997* (0,078)	4,567* (0,647)	13,69
Indonesia	1,621* (0,151)	-0,722* (0,104)	-0,041* (0,012)	0,113* (0,022)	16,62

* Denotes rejection of the null hypothesis that the true coefficient is zero at the 1% significance level;

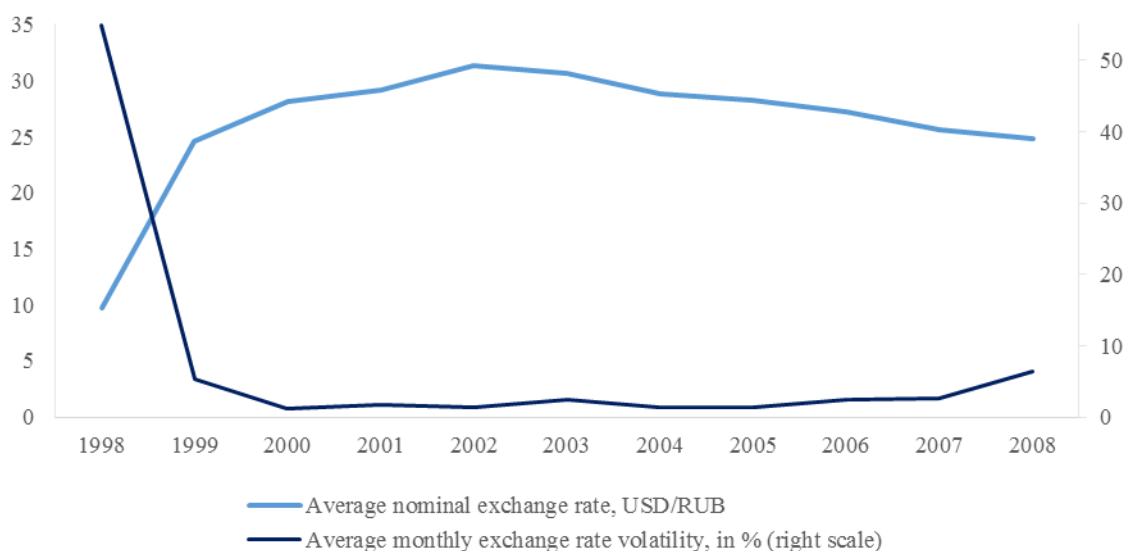
** Denotes rejection of the null hypothesis that the true coefficient is zero at the 5% significance level.

Source: Pontines V., Rajan R.S. Foreign exchange market intervention and reserve accumulation in emerging Asia: Is there evidence of fear of appreciation? Elsevier, Economics Letters, 111, 2011.

The authors' results testify that "fear of appreciation" was typical for the central banks of developing countries. Among them are the inflation targeting central banks (the central banks of Indonesia, Thailand, Philippines, Korea). The similar approach was used to test the hypothesis of a "fear of appreciation" for the Bank of Russia for the period from 2000 to 2016.

The experience of the Bank of Russia

For a long time the Bank of Russia de-jure applied the managed floating exchange rate with no predetermined path. But de-facto the volatility of the exchange rate of the ruble was limited by 2% (picture 3) due to growing export revenues and international borrowings inflow which is typical for an exchange rate targeting regime. Before 2004 the nominal exchange rate of the ruble was fixed to the dollar, and then to the bi-currency basket, which consisted of the dollar and the euro.



Sources: The Bank of Russia, authors' calculations

Picture 3 – Average growth rate and volatility of the exchange rate of the ruble

In massive foreign currency inflow such strategy resulted in the quick growth of the central bank international reserves from \$12 bln in 2000 to \$598 bln in August 2008.

The situation changed dramatically during the global crisis as a result of the decrease in the export revenue inflow and outflow of the foreign capital. The Bank of Russia began consistently weakening its exchange rate policy by widening the operational corridor and decreasing the volume of its interventions. In 2014 the Bank of Russia declared a transition to a floating exchange rate, while retaining the right to conduct currency interventions in the event of threats to financial stability. But as the domestic foreign exchange market stabilized in February 2015, the regulator completely refused to conduct currency interventions.

The Bank of Russia took the decision to renew interventions in May 2015. The Bank of Russia announced that the goal of the interventions was to increase its international reserves but not to maintain a certain level of the exchange rate of the ruble. For this purpose, the Bank of Russia purchased \$191 ml every day which is less than 0.5% of the average daily turnover. Later at the end of July 2015 the Bank of Russia stopped its interventions. So, for more than two years the exchange rate of the Russian ruble has formed exclusively under the influence of the demand and supply of foreign currency on the domestic foreign exchange market which de facto meets the criteria of a free floating exchange rate, in accordance with the IMF methodology.

In order to check whether the Bank of Russia shows any "fear of appreciation" in accordance with Pontines et al (Pontines, et al., 2011), the GMM model has been constructed. The period of time from 2000 to 2016 has been divided in two subperiods. The first one is 2000-2007 and the second one is 2008-2016, when the central bank began weakening the exchange rate policy. Two specifications of the model are proposed with nominal and nominal effective exchange rate of the ruble. In both cases all variables are the logged first differences that allow us to use stationary series. The lagged variables of federal funds rate, reserves and the exchange rate are the instruments. The results are shown in the tables 4, 5.

Table 4 – The estimations of the intervention function of the Bank of Russia with the nominal exchange rate of the ruble

	2000-2007	2008-2016
c	3,2240 (1,178)	0,698 (0,310)
a	3,346 (1,044)	0,33 (0,112)
B	0,077 (1,382)	-0,24 (0,018)
J-тест	5,07	3,83
Instruments	reserves (-1), nominal exchange rate (-1) and (-2), federal funds rate (-1) and (-2).	reserves (-1), nominal exchange rate (-1) and (-2), federal funds rate (-1) and (-2).

Source: the authors' calculations

These results allow us to conclude that the Bank of Russia really showed the “fear of appreciation” before the global crisis in 2000-2007, which is fully consistent with macroeconomic development of Russia at that time. But after the crisis the Bank of Russia didn't pursue the goal to limit the appreciation of the ruble. The results show that the Bank of Russia did not experience the “fear of appreciation” in 2008-2016.

The opposite results have been obtained while testing the "fear of appreciation" of the nominal effective exchange rate. The lag values of the nominal effective exchange rate and the amount of reserves are used as instrumental variables in these models, as well as the federal funds rate. The results are shown in table 5.

Table 5 – The estimations of the intervention function of the Bank of Russia with the nominal effective exchange rate of the ruble

	2000-2007	2008-2016
c	2,60 (3,1)	1,67 (1,49)
a	-4,99 (-2,65)	-1,81 (-1,06)
B	1,40 (1,85)	-0,022 (-0,033)
J-тест	0,12	0,35
Instruments	reserves (-1), nominal effective exchange rate (-1), federal funds rate (-1).	reserves (-1), nominal effective exchange rate (-1), federal funds rate (-1).

Source: the authors' calculations

These results also show that during 2000-2007 the Bank of Russia didn't have any “fear of appreciation” of the nominal effective exchange rate. But in the model for 2008-2016 the b coefficient is insignificant, which doesn't allow us to draw an unambiguous conclusion. This may be due to the heterogeneity of the time period, and it requires further research.

At the moment the obtained results allow us to draw the following conclusions:

1. The exchange rate policy in developing countries remains the significant part of monetary policy after their transition to inflation targeting. At the moment there are not any developing countries whose monetary authorities fully deny participation in exchange rate framework. Even in those countries that adhere to a freely floating exchange rate (Chile, Mexico, Poland), if the increasing volatility of the exchange rate threatens financial stability, the monetary authorities renew currency interventions. Within the floating exchange rate framework the central banks' interventions are not aimed at maintaining any level of the exchange rate;

2. Foreign exchange interventions in inflation targeting countries are conducted in the pre-crisis period in order to limit the pace of national currency appreciation. The calculations have confirmed the inherent "fear of appreciation" of the nominal exchange rate during this period, while the appreciation of the nominal effective exchange rate did not stop the regulator. In the post-crisis period foreign currency interventions are conducted in compliance with the rule which describes the purpose, terms and conditions of currency transactions, solely for the purpose of easing exchange rate volatility and / or increasing foreign exchange reserves;

3. In the 2000s the central banks of developing countries were more inclined to carry out interventions during the period of appreciation of the national currency. The "fear of appreciation" inherent in them is associated with a large-scale foreign exchange inflow into the markets of developing countries that is typical for the period, and significant reduction in inflationary pressure.

4. Before the crisis the Bank of Russia, adhering to the de-jure managed floating exchange rate, conducted active currency interventions. The obtained results show that the Bank of Russia experienced the "fear of appreciation" only of the nominal exchange rate but not of the nominal effective exchange rate of the ruble. After the crisis the presence of the "fear of appreciation" has not been confirmed either with respect to the nominal exchange rate or the nominal effective one.

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