

Foreign Exchange Interventions as an Unconventional Monetary Policy Instrument — An Empirical Review

Bogdan Badescu

Abstract—The crisis showed the assumption that keeping inflation under control is a sufficient condition to ensure a stable economy is not valid anymore. As economies are more and more interconnected and the flow of capital is free, foreign exchange interventions become a tool used by many economies in order to protect against unfavourable fluctuations in the exchange rate. Empirical research has shown that it cannot be provided a recipe that guarantees the success of such operations and that a successful stance cannot be maintained for a long period of time, because the necessary adjustments will be inevitable. Also, maintaining foreign exchange reserves and intervening on the market involves costs. Overall, foreign exchange interventions remain a research topic of interest, because the exchange rate fluctuations affect the balance sheets of banks, companies and, increasingly, even households.

Index Terms—FX intervention, exchange rate, monetary policy, sterilization.

I. INTRODUCTION

Before the crisis, the principle was that the central bank must deal with inflation, which is its primary objective, using a single instrument, the policy rate. Therefore, monetary policy had to be autonomous. The theory was that inflation kept under control should ensure the prerequisites for a stable economy, as the market will allocate resources efficiently. Experience has shown, however, that things are not so simple and that any disruption in the financial sector has serious repercussions on the real sector. Moreover, the emerging economies that allowed free capital flows and which have adopted the strategy of inflation targeting have not made clear statements if the exchange rate stability will be a target as well. If we were to judge by Article IV, Section I (iii) of the International Monetary Fund's (IMF) articles of agreements, where is explicitly requested that "members ... should not manipulate exchange rates ... to gain an unfair competitive advantage over other members", the answer seems to be that such an objective should not be pursued. In reality, almost all central banks in these economies are carefully watching this variable as an unfavourable swing in the exchange rate has negative consequences. Thus, it becomes clear that a central bank that pursues both objectives cannot use a single instrument to achieve them, so, in addition to the policy rate, it

should take into account the use of foreign exchange (FX) interventions as well. Consequently, the new view is that the policy rate should be used for inflation targeting, while FX interventions should aim at assuring exchange rate stability (Blanchard, 2011) [1]. Therefore, in this paper I will present an empirical review of some issues about how these interventions work and what challenges they involve.

II. LITERATURE REVIEW

The dedicated literature abounds with studies on the effects that FX interventions have had in countries all over the world and on the general rules which should govern these operations. For instance, Tapia and Tokman (2004) analysed the case of Chile and concluded that the interventions made to appreciate the Chilean currency (the central bank sold US dollars) were successful, calculating that an intervention of USD 500 million influenced the exchange rate by 1% [2]. Guimares and Karacadag (2004) investigated the case of Mexico and noted that a number of 14 interventions made by the central bank and totalling USD 2.9 billion caused a 0.4% appreciation of the peso for every USD 100 million sold [3]. Eichengreen (2008) identifies the risk that an exchange rate managed by the authorities may cause problems as big as those caused by a market failure in managing the exchange rate and provides the examples of Bretton Woods and of the Asian crisis from 1997-1998. Risks are induced by the intervention to resist either a depreciation of the exchange rate, which may hinder economic activity, either an appreciation, which may lead to currency wars and an excessive accumulation of reserves [4]. Adler and Tovar (2011) investigate the effect of FX interventions in 15 economies, most from the Latin America and conclude that they can slow down the pace of the appreciation of the national currency, but are less effective in countries where capital flows are free [5]. After Ostry *et al.* (2012), interventions in the foreign exchange markets have increased dramatically in the past decade [6]. This observation is also supported by IMF's the latest report on exchange arrangements and exchange restrictions, which shows that both emerging and smaller advanced economies have constantly intervened in the FX market in response to the pressure put on exchange rates due to the volatility of capital flows [7].

III. GENERAL CONSIDERATIONS

A. Objectives of the Interventions

FX interventions are an unconventional monetary policy tool used by central banks, especially in emerging economies

Manuscript received November 5, 2014; revised January 13, 2015. This work was co-financed from the European Social Fund through Sectorial Operational Program Human Resources Development 2007-2013, project number POSDRU/159/1.5/S/142115 "Performance and excellence in doctoral and postdoctoral research in Romanian economics science domain".

Bogdan Badescu is with the Bucharest University of Economic Studies, Bucharest, Romania (e-mail: bogdanbadescu82@yahoo.ro).

or in those advanced economies that have already reduced the monetary policy rate to 0%. The reason is that in emerging economies a significant number of transactions are denominated in foreign currency, making them more vulnerable to fluctuations of the exchange rate and in the advanced economies that have lowered the policy rate to 0%, further monetary policy easing can be achieved using the exchange rate. Consequently, the FX intervention can be defined as the practice of the central bank to buy or sell currencies, with the primary purpose of influencing the exchange rate between those currencies and the local currency. After Kriljenko et al. (2003), FX interventions can also aim to: moderate imbalances in the foreign exchange market, accumulate foreign exchange reserves and supply foreign currency to the market [8]. The exchange rate is of interest for the emerging economies because an appreciation of the domestic currency may cause a loss of export competitiveness and a tendency to contract debt denominated in foreign currency, while a depreciation of it may lead to inflationary pressures and difficulties in repaying the debt denominated in foreign currency. Regarding the accumulation of foreign reserves, the reasoning is that a high coverage of imports (usually the imports' value in three months) or that of the short-term debt helps to gain investors' confidence. However, recent data shows that foreign exchange reserves held by emerging economies, especially China, are above the levels considered to be optimal and the only reason for this is that those countries want to have a better control of the exchange rate.

For example, maintaining an undervalued exchange rate helps the local exporters in their competition with exporters from other countries, so there is a mercantilist motivation. Bini Smaghi (2010) estimates that the reserves of emerging economies are significantly beyond any measure of optimality that may be defined in relation to ensuring protection against external shocks [9]. Fig. 1 and Fig. 2 below show how the FX reserves evolved in these economies overall and excluding those that maintained an undervalued exchange rate (the most prominent case is that of China).

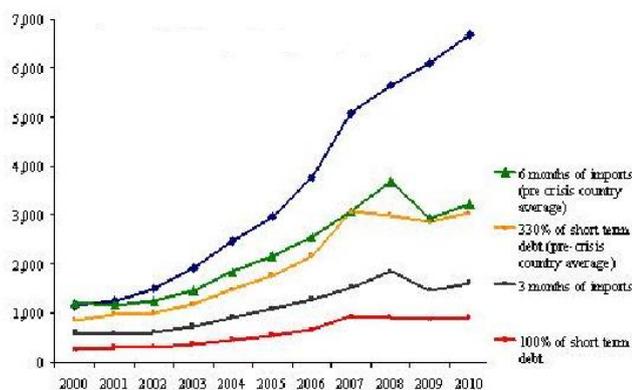


Fig. 1. Total emerging economies holdings of FX reserves (USD billions).

The black and red lines show the required levels of reserves to meet the traditional criteria i.e. the value of imports for three months and 100% coverage of the short-term debt (the Guidotti-Greenspan rule). The green and yellow lines represent the actual coverage of these indicators, so it can be observed that there is a very significant difference,

somewhere around three times higher than the values considered to be normal. In other words, if the normal values would have been respected, the total requirements of FX reserves would have fallen to a third of what they actually are.

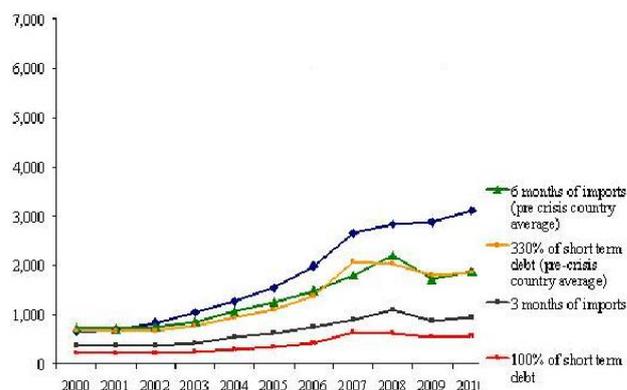


Fig. 2. Total emerging economies holdings of FX reserves without countries with undervalued exchange rates (USD billions).

B. Rules or Discretion

Like the monetary policy, the FX interventions were subject to this discussion. In both cases, the central bank needs some room for manoeuvre, because a rigid behaviour in terms of the exchange rate may cause it losses due to speculative activities of market participants. In addition, the difficulties of estimating an accurate equilibrium exchange rate do not recommend targeting a certain level of it, but rather set some comfortable boundaries between which it may float.

Regarding the quantitative part of the intervention, i.e. with what amounts to intervene, again a discretionary approach is preferable. It is obvious that the central bank cannot intervene to defend indefinitely an artificial exchange rate, so the focus should be on eliminating the reasons that cause this imbalance. For this reason, the IMF imposes in some of its programs that the beneficiary must always meet a minimum level of net foreign assets. These assets show how active is the central bank in the FX market. For example, a sale of foreign currency against national currency, an operation which is designed to appreciate the exchange rate of the latter, leads to a decrease in the net foreign assets.

C. Transparency

For the public, transparency is important because it helps to assess the performance of the central bank. If in terms of an inflation targeting regime such transparency is obvious, being sufficient to simply compare the inflation target with its actual values, in the case of FX intervention the discussion can vary. In this case, the consensus seems to be that a certain lack of transparency is preferable. On one hand, a public commitment to defend a particular level of the exchange rate in conjunction with a failure to do so undermines the credibility of the central bank. Besides, a currency should reflect the fundamentals of the economy, so that a long series of interventions to support it casts doubt on the government's ability to manage the economy. On the other hand, a public commitment to an exchange rate incompatible with the state of the economy could cause a speculative attack.

D. How to Intervene

Broadly speaking, the intervention method means deciding whether the central bank must intervene in secret or not and if the intervention should be sterilized. A pre-announced intervention is more likely to succeed, because of the signal transmitted by the bank. On the other hand, as I have shown, maintaining discretion on the details of the intervention can help avoiding problems caused by speculators. Empirical data show that most central banks prefer the latter. As for sterilizing or not the intervention, an unsterilized intervention has lasting effects on the exchange rate as the monetary base changes. For example, if the central bank buys national currency to prevent its depreciation and does not sterilize the operation, this leads to higher interest rates in response to the reducing of the amount of national currency available, which can be an impediment to the economic activity. Otherwise, an excess of local currency entails a reduce of the interest rates so that monetary policy may become looser than actually wanted, with impact on prices. In practice central banks want to avoid such changes, so the “unwritten” rule is to sterilize interventions so that their effects are kept strictly on the exchange rate.

A sterilized intervention implies that any change in the monetary liabilities of the central bank needs to be offset by an equivalent change in the net foreign or domestic assets, so this relationship can be written as: Δ monetary liabilities = Δ net foreign assets + Δ net domestic assets.

To maintain the above mentioned equilibrium, the central bank can act in several ways, but the most common is through open market operations, by which the bank sells securities to attract the liquidity that was created as a result of the purchase of foreign currency. Thus, the degree of sterilization in this way can be measured through the ratio Δ Net Domestic Assets / Δ Net Foreign Assets. Usually the values of this indicator are between 0 and 1, showing how sterilized the intervention was. A value equal to 0 signifies no sterilization and a value equal to 1 corresponds to full sterilization.

Other means of sterilization are the making of deposits by the government at the central bank, but this method typically involves the existence of a budgetary surplus. It is important that this surplus is achieved naturally, without interfering on government spending. Otherwise, any blocking of public financial resources in accounts at the central bank is likely to affect negatively the economy. Among the most aggressive ways to sterilize an intervention is the rise of the reserve requirements, which forces commercial banks to block more resources at the central bank. Here the problem is that, given the low rates at which these reserves are remunerated, the banking system will try to recover the opportunity cost by making banking products more expensive, which can affect the economy.

IV. A SIMPLIFIED EXCHANGE RATE MODEL

The exchange rate can be modelled as the price of an asset, in which the log exchange rate, s_t , reflects the present value of private agents' expectations about future developments in economic fundamentals, f_{t+i} . Such a model could be:

$$s_t = (1 - \theta) \sum_{i=0}^{\infty} \theta^i E_t(f_{t+i} | \Omega_t) \quad (1)$$

where θ is the discount factor and Ω_t is the public information set at time t [10].

In order to make the model dynamic, so that it can capture the fluctuations of the spot exchange rate, Δs_{t+1} , we shall add the differential between the interest rates of the two currencies (i_t^* is the interest rate for the local currency and i_t is the interest rate for the foreign currency) so that the new form of the model will be:

$$\Delta s_{t+1} = (i_t^* - i_t) + (1 - \theta) \sum_{i=0}^{\infty} \theta^i [E_{t+1}(f_{t+1+i} | \Omega_{t+1}) - E_t(f_{t+i} | \Omega_t)] \quad (2)$$

By including the foreign exchange risk premium, ρ , than the model will look like:

$$\Delta s_{t+1} = (i_t^* - i_t + \rho) + (1 - \theta) \sum_{i=0}^{\infty} \theta^i [E_{t+1}(f_{t+1+i} | \Omega_{t+1}) - E_t(f_{t+i} | \Omega_t)] \quad (3)$$

Sterilized interventions should not affect prices or interest rates, so they do not influence the exchange rate directly through these variables. The literature has identified that FX interventions could affect the exchange rate indirectly via three channels (Sarno and Taylor (2001)): the portfolio balance channel, the signalling channel and the co-ordination channel [11].

The portfolio balance channel is based on the observation that sterilized interventions change the offer of securities denominated in different currencies. Consequently, their prices adjust, affecting the spot exchange rate through the foreign exchange risk premium. Basically, if the central bank wants to appreciate the exchange rate of the national currency in relation to a foreign currency, it sells securities denominated in that currency and purchases securities denominated in national currency, thereby sterilizing the intervention. Following the occurrence of an excess of foreign currency securities while the monetary conditions have not changed, the only way to pay investors in these new titles is through the exchange rate.

The strength of this channel is that it does not involve a high level of credibility of the central bank, as the effect is guaranteed. For this reason, it is recommended for emerging economies. In practice, given the huge size of the financial market as a result of the financial integration of more and more economies relative to the amounts used in the intervention, its effectiveness is reduced.

The signalling channel influences the spot exchange rate by changing the market participants' expectations about future economic fundamentals, meaning that the FX intervention sends to the market information on how monetary policy will be conducted in the future. Thus, a sale of national currency against foreign currency will cause a depreciation of the exchange rate, but not necessarily because the intervention altered the supply and demand for those currencies, but because of the signal transmitted by the central bank, i.e. if there is no depreciation of the exchange rate, than a relaxation of the monetary policy (by lowering interest rates) will follow.

This channel's mechanism of operating shows that an important condition for its success is the existence of

transparency. It is likely that the central bank and the market participants have different views on economic fundamentals, so a clear message of how the central bank sees the economy can only strengthen the signal. On the other hand, I have shown that the current feeling is that maximizing the impact of the FX intervention requires at least some secrecy regarding its coordinates. The reason is simple, if the market observes that the central bank wants to “defend” a certain level of the exchange rate, than there is the risk of speculative attacks. When the economic fundamentals deteriorate, it becomes obvious that the exchange rate can go only in one direction: down. If the exchange rate depreciation is large enough to cover the cost of resources used for speculation, then through short sell operations a speculator can make consistent profits. One can study, for example, the success of George Soros in 1992, when he managed to win about one billion dollars, speculating against the Bank of England.

The co-ordination channel implies that the FX intervention may be useful for anchoring the expectations of market participants regarding the exchange rate movements. Several authors have stressed the importance of the communication by the authorities that, for example, the exchange rate deviates (substantially) from its long-term equilibrium value, in the sense that these public statements can push market participants to act in tandem with the central bank to move the exchange rate towards that level, thus multiplying the effect of the intervention. Basically, there is a transfer of information on market fundamentals from the authorities to the market, which is incorporated by the latter and the effect should be a volume of transactions that moves the exchange rate towards the natural equilibrium level. Examples of oral interventions: Robert Rubin, former Secretary of the US Treasury, saying that there should be pursued a policy to strengthen the dollar or the statement of the former President of the Euro group, Jean-Claude Juncker that “it is important that exchange rates reflect economic fundamentals”. Moreover, Citibank has introduced the “VIVIX”, meaning “Verbal Intervention Vulnerability Index”. The purpose of the index is to identify what makes a verbal intervention to be successful and what currencies are most susceptible to this. VIVIX is built on the hypothesis that verbal intervention is most likely to succeed when a currency is overvalued. The greater the value of the index is, the more vulnerable the currency in question is.

V. EFFECTIVENESS OF FX INTERVENTIONS

The most important issue related to FX interventions i.e. their effectiveness is the most difficult to assess. According to Neely (2005), FX interventions have a number of characteristics that complicate their study [12]. They are carried out sporadically, so there can be more interventions spread over several days or weeks and their policy rarely remains the same for long periods of time. Another problem is the lack of data, both ex-ante and ex-post and where data are available or can be estimated, the results are uncertain. This makes it difficult to assess whether the intervention of the central bank reduced exchange rate volatility or moved it in the desired direction.

In terms of theoretical models such as the one described above, one important assumption is that the securities

denominated in different currencies are not perfect substitutes, i.e. the public is not indifferent to the currency of denomination. As noted, due to FX intervention, there is a change in the composition of the market portfolio of securities, so that investors may demand a higher yield to accept the new bonds, which leads to currency depreciation. Another way of evaluating the effectiveness of interventions is the assumption that the central bank could provide clues about how it sees macroeconomic fundamentals, so that new information is sent to the market. If there is sufficient credibility, market participants will undertake FX market operations similar to that initiated by the central bank, thus influencing the exchange rate.

In the followings, I will make a brief empirical analysis of the effectiveness of FX interventions in the cases of Japan, the Czech Republic and Switzerland.

The Bank of Japan had an active program of interventions for the period 1991-2011. Data published by Japan’s Ministry of Finance shows that starting 2012 no interventions were made.

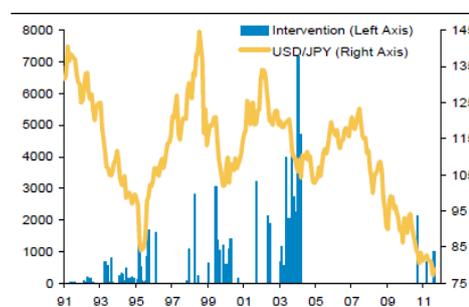


Fig. 3. Japanese official interventions between 1994 and 2011, yen billions.

Looking at Fig. 3, we can see that the Bank of Japan desired to prevent the strengthening of the yen against the US dollar, in order to protect Japanese exports. The results of the interventions are mixed, i.e. there cannot be said with certainty that they have achieved their goal, given that all assumed selling yens. The period 1991-2004 shows that those sales were able to induce a depreciation trend to the exchange rate, but by 2004 their effects become blurred. An interim conclusion that can be drawn from Japan's experience is that foreign exchange interventions are not a viable long-term solution.

In an attempt to stimulate the economic activity, the Czech National Bank (CNB) reduced the interest rate to 0% in the autumn of 2012, thus using at maximum this instrument. Further use of it implied negative interest rates, which was unrealistic. In such a situation, the policy rate loses its effectiveness and does not allow the central bank to continue targeting inflation. The reason for allowing an inflation of 2%, for example, is that it allows to be recorded negative real interest rates, so the depositors’ incentive will be to spend rather than to save and the investors’ to borrow and invest, given the low or even negative cost of credits. However, if the monetary policy was put into a passive stance (no further actions taken), the estimations showed that it was most likely to cause deflation and an appreciation of the exchange rate, which would have further delayed economic recovery. In consequence, the CNB began to use the exchange rate as an instrument for monetary policy, given that estimates showed

that a depreciation of the Czech crown would return the inflation towards the 2% target assumed, as Fig. 4 shows:

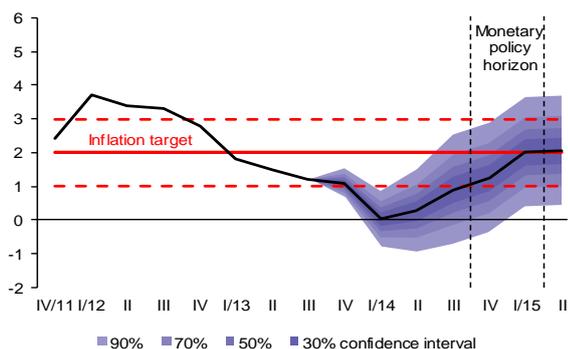


Fig. 4. CNB headline inflation forecast (%).

In practice, the CNB estimated that a depreciation of the CZK/EUR exchange rate of 4-5% would be sufficient to return inflation to the desired value and, consequently, proceeded to a monetary easing through this channel. The CNB action is captured by Fig. 5 (the CZK exchange rate

movements are shown by the blue line).

In the autumn of 2012 CNB announced that it is ready to use other tools for further monetary policy easing. Since the Czech Republic is a small, open economy with a long-term surplus liquidity in the banking sector, the exchange rate was the best tool in this respect. This announcement's effect is shown by the first arrow from the bottom of the graph. After about nine months, its impact began to disappear, which forced the bank to intervene aggressively. According to published data, the CNB sold between November 10 and 20, 2013 an amount of CZK 201.3 billion, approximately EUR 7.8 billion. Afterwards, the CNB has undertaken to stabilize the rate at around 27 CZK/EUR.

The last case study to which I will refer is that of Switzerland. During 2009 and 2010, the Swiss National Bank (SNB) intervened in the FX market because the monetary policy had to be relaxed and the policy rate was already reduced to 0%.

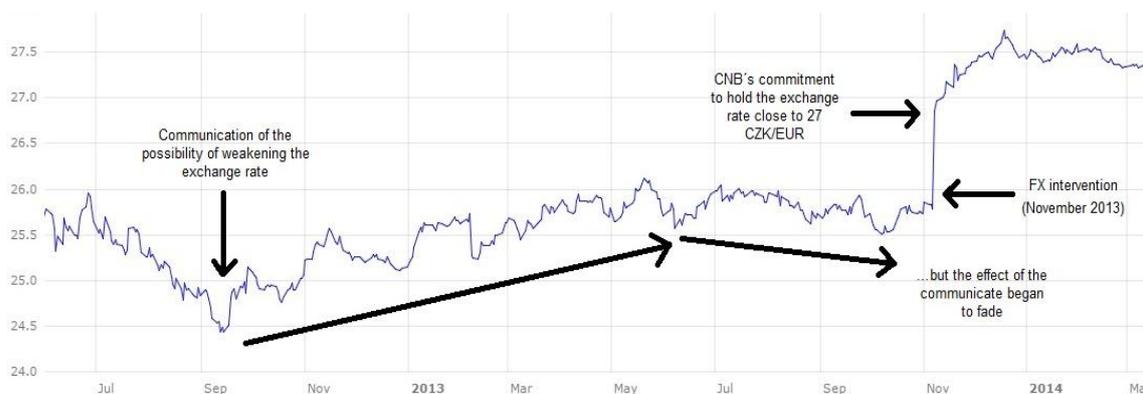


Fig. 5. CNB actions to depreciate the CZK.



Fig. 6. EUR/CHF 5 minute evolution on September 6, 2011.

The SNB's efforts were to prevent an appreciation of the Swiss franc against the euro, but because this currency was

perceived as a safe haven, the investors' preference for holding it in their portfolios caused the franc to appreciate despite major interventions made by the SNB, whose reserve stock rose to almost 45% of the GDP of Switzerland [13].

What could the SNB do further? One of the measures could have been restricting the free flows of capital, but such a measure would have entailed risks for Swiss banks and wouldn't have been accepted by the rest of the developed countries. Consequently, by a surprise move, the SNB announced on September 6, 2011 that it will set a minimum floor for the CHF/EUR exchange rate at 1.20 and it will be willing to buy foreign currency in unlimited quantities to defend this rate. Fig. 6 captures the evolution of the CHF/EUR exchange rate when the announcement was made.

SNB's experience has shown that the goal of weakening the national currency is more likely to succeed, because the central bank accumulates reserves, doesn't lose them. The other side of the coin is that these interventions required approximately CHF 250 billion, in an economy that was approximately CHF 565 billion. SNB's reserves increased from under 10% to over 40% of GDP as a result of the intervention. Furthermore, when the SNB left the franc to appreciate in 2010, its foreign exchange reserves devalued by approximately CHF 27 billion or 5% of the GDP of Switzerland.

Reference [3] shows another consistent empirical research over a sample of FX interventions for 15 economies (especially in Latin America) and their effectiveness in mitigating the appreciation of local currencies. The results showed that interventions can slow the pace of appreciation, but the effect is cancelled quickly by the free flows of capital and that interventions appear to be more effective when there are signs that the local currency is already overvalued. In terms of foreign exchange interventions in the G3 (Colombia, Mexico and Venezuela), these tend to be more successful in periods of volatility and exchange rates imbalances (overvalued or undervalued).

Another question that links to FX interventions' effectiveness is how long their effects last. Unfortunately, this question cannot be given a clear answer, because the high degree of financial integration of economies and free flows of capital make impossible a correlation between asset price developments and FX interventions. Empirically, Miyajima (2013) investigated four emerging economies (Brazil, Peru, Korea and Malaysia) and found that sterilized interventions had little influence on the exchange rate movement in the direction desired by central banks [14]. Moreover, in some cases central bank intervention caused the exchange rate forecasts to change in the opposite direction. This conclusion shows that even if the central bank can influence the spot exchange rate, in the long run these efforts only delay the necessary adjustments, be them either appreciation or depreciation. He shows that attempts to halt the appreciation of the exchange rate of the national currency by buying foreign currency can create a feeling that the appreciation trend will continue in the future, so that the country may face increased capital inflows, as the increased stock of reserves lowers the risk of the country.

VI. PROBLEMS WITH FX INTERVENTIONS

Besides the difficulty of assessing their effectiveness, the biggest problem is the costs that they require. One cost stems from the fact that fiat money lose their purchasing power over time due to inflation, so the real value of the reserve stocks decreases and in order to combat this loss central banks should steadily increase their quantity. More important, however, are the opportunity costs that arise due to the fact that reserves are placed in risk-free assets that offer low interest so that it becomes clear that excessive accumulation of reserves is not the best way to use public resources. These costs can be measured by several methods. The first is to compare the interest rate on government debt to that at which reserves are invested, usually being an unfavourable difference between them, because securities issued by various economies and especially emerging ones have a higher return yield than those denominated in reserve currencies such as USD and EUR. This return differential must be then adjusted with the exchange rate movements between the reserve currencies and the national currency, because a depreciation of the reserve currency (as was the case of the USD) may cancel this differential. Alternatively, it can be used for comparison the average return of an investment in that economy.

From the central bank's point of view, the FX reserves require funding and therefore have costs. The need for funding (or otherwise said sterilization) is generated by the fact that releasing a quantity of the local currency as a result of the purchase of foreign currency leads to, *ceteris paribus*, putting pressure on short-term interest rates i.e. they may fall under the targeted levels, which means expansion of bank credit and the emergence of inflationary pressures. An alternative of funding is increasing the bank's equity, but without affecting the monetary base, i.e. not from existing deposits [15]. Other ways involve changes in other balance sheet items, such as net domestic assets or the minimum reserves held by commercial banks. These ways of funding the intervention will expose the central bank to different risks and costs.

VII. CONCLUSIONS

The crisis showed that the assumption that keeping inflation under control is a sufficient condition to ensure a stable economy is not valid (anymore). As economies have become increasingly interconnected and the flow of capital was left free, FX interventions become necessary to protect against possible abrupt fluctuations in the exchange rate.

Empirical research has shown that it cannot be provided a recipe that guarantees their success, as it is dependent on several factors, out of which one of the most important is the stance of the market. The fact that FX interventions are carried out sporadically, meaning that there can be more interventions spread over several days or weeks and their policy is rarely the same for long periods of time in conjunction with maintaining a lack of transparency about their coordinates makes it difficult to assess whether the intervention was successful or not. What can be said with certainty is that a potential success implies the existence of a

match between the scope of the interventions and those of the monetary and fiscal policies. Also, a successful stance cannot be maintained for a long period of time, because even if the central bank can influence the spot exchange rate, these efforts are only delaying the necessary adjustments i.e. either an appreciation or a depreciation of the national currency.

The costs of these operations are not negligible. In terms of opportunity costs, which arise due to the fact that reserves are placed in risk-free assets that offer a low yield, it becomes clear that excessive accumulation of reserves is not the best way to use public resources. For example, a comparison between the interest rate on government debt and that at which reserves are invested, usually shows an unfavourable difference, because securities issued by various economies and especially emerging ones have a higher return rate than those denominated in reserve currencies such as USD and EUR. Alternatively, it can be used for comparison the average return of an investment in that economy. From the central bank's point of view, FX reserves require funding and therefore have costs. The need for funding is generated by the fact that releasing a quantity of the local currency as a result of the purchase of foreign currency leads to, ceteris paribus, putting pressure on short-term interest rates i.e. they may fall under the targeted levels, which means expansion of bank credit and the emergence of inflationary pressures. Funding sources can be an increase in the bank's equity or changes in balance sheet items such as net domestic assets or the levels of minimum reserves requirements. Each of these alternatives will expose the central bank to different risks and costs. However, the costs can be reduced through a careful selection of the sterilization instruments. Another cost may come from adverse movements in exchange rates. An appreciation of the domestic currency results in a depreciation of foreign exchange reserves. Favourable situations occur when the economy grows, so there is a need of monetary expansion. Consequently, the monetary base increases, so some of the foreign reserves can be financed by issuing currency. This may limit the costs of sterilization.

Overall, FX interventions remain a research topic of interest, because the abrupt exchange rate fluctuations affect the balance sheets of banks, companies and, increasingly, even households.

ACKNOWLEDGMENT

This work was co-financed from the European Social Fund through Sectorial Operational Program Human Resources Development 2007-2013, project number

POSDRU/159/1.5/S/142115 "Performance and excellence in doctoral and postdoctoral research in Romanian economics science domain."

REFERENCES

- [1] O. Blanchard, "Monetary policy in the wake of the crisis," presented at the IMF Macro Conference, Washington D.C., March 7-8, 2011.
- [2] M. Tapia and A. Tokman, "Effects of foreign exchange intervention under public information: The Chilean case," *Economia*, vol. 4, no. 2, pp. 215-256, January 2004.
- [3] R. F. Guimarães and C. Karacadağ, "The empirics of foreign exchange intervention in emerging market countries: The cases of Mexico and Turkey," *IMF Working Paper*, July 2004.
- [4] B. Eichengreen, *Globalizing Capital: A History of the International Monetary System*, Princeton: Princeton University Press, 2008, ch. 7.
- [5] G. Adler and C. E. Tovar. (July 2011). Foreign exchange intervention: A shield against appreciation winds? *IMF Working Paper*. [Online]. 11(165). Available: <http://www.imf.org/external/pubs/ft/wp/2011/wp11165.pdf>
- [6] J. D. Ostry, A. R. Ghosh, and M. Chamon. (February 2012). Two targets, two instruments: Monetary and exchange rate policies in emerging market economies. *IMF Staff Discussion Note*. [Online]. 12(1). Available: <http://www.imf.org/external/pubs/ft/sdn/2012/sdn1201.pdf>
- [7] The International Monetary Fund. (December 2013). Annual report on exchange arrangements and exchange restrictions 2013. [Online]. Available: <https://www.imf.org/external/pubs/nft/2013/areaers/ar2013.pdf>
- [8] J. I. Kriolenko, R. P. Guimarães, and C. Karacadağ. (July 2003). Official intervention in the foreign exchange market: Elements of best practice. *IMF Working Paper*. [Online]. 3(152). Available: <http://www.imf.org/external/pubs/ft/wp/2003/wp03152.pdf>.
- [9] L. B. Smaghi, "Reserve accumulation: the other side of the coin," presented at the Euro system Seminar, Sydney, February 10, 2010.
- [10] O. Rummel, "Effectiveness of foreign exchange interventions," presented at the CCBS Seminar, London, October 21, 2014.
- [11] L. Sarno and M. Taylor, "Official intervention in the foreign exchange market: Is it effective and, if so, how does it work?" *Journal of Economic Literature*, vol. 39, no. 3, pp. 839-68, September 2001.
- [12] C. J. Neely, "An analysis of recent studies of the effect of foreign exchange intervention," *Federal Reserve Bank of St. Louis Review*, vol. 87, pp. 685-717, December 2005.
- [13] J. P. Danthine, "Swiss monetary policy in the public eye," presented at the Money Market Event, Zurich, March 24, 2011.
- [14] K. Miyajima, "Foreign exchange intervention and expectation in emerging economies," *BIS Working Papers*, no. 414, June 2013.
- [15] M. S. Mohanty and P. Turner, "Intervention: What are the domestic implications?" *BIS Papers*, no. 24, pp. 56-81, June 2005.



Bogdan Badescu is a PhD candidate at the Bucharest University of Economic Studies. He was born on December 8th, 1982, in Pitesti, Romania. He holds a bachelor degree in economics and an MBA degree from Barcelona Business School, awarded in 2006.