



INTERVENTION STRATEGIES IN FOREIGN EXCHANGE MARKET

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“Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough.”

Mario Draghi, former ECB president, speech in London on July 26, 2012

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Abstract: The goal of the paper is to present the intervention strategies used by central banks in order to influence the value of the domestic currency, transparency versus discretion when it comes to publishing data about FX intervention and the cost and effectiveness of intervention. It is rarely that nowadays countries allow for an exchange rate to be formed on the market basis through the effects of supply and demand for foreign exchange on the foreign exchange market. The central bank buys or sells a foreign currency in the foreign exchange market in order to increase or decrease the value of its national currency in comparison to the foreign currency. The reasons for the intervention are the reduction of short-term oscillations of the exchange rate, the impact at the level of foreign exchange reserves, as well as the maintaining the price and financial stability as the ultimate goal of most central banks. The paper will present intervention strategies on foreign exchange market, which involves the implementation of interventions in the market of options, forward, foreign currency repo and foreign currency swaps. Then, on the spot market, interventions using an auction, as well as the application of foreign currency indexed certificates.

Keywords: FX intervention, FX market, swaps, forward, option

JEL classification: D53, E58, F31, G15

1. Introduction

The main objectives of the monetary policy of almost all central banks are securing monetary and financial stability. In order to achieve these goals, central banks manage money and interest rates to achieve a low, stable and predictable inflation

rate, creating an environment that leads to sustainable economic development and employment growth. In the conducting of monetary policy, the central bank can use various instruments, such as reference rate, standing facility (e.g. deposit and credit facility), required reserves and foreign exchange (hereinafter referred to as FX) intervention. Intervention strategies in the FX market can be done by using different instruments and implementing them on a different market. Exchange rate management is motivated by economic reasons that countries have to manage their exchange rates instead of letting them freely float in foreign exchange markets (Lukas, 2012).

The aim of the paper is to present different intervention strategies on the foreign exchange market. Foreign exchange interventions, regardless of whether they are effective and whether they affect the exchange rate or not, are the subject of research in the extensive academic literature. The subject of the research of the paper is to present the theoretical concepts of foreign exchange strategy on the one hand, while on the other hand the subject is focused at presenting the practical application of these strategies in selected countries. The hypothesis from which we proceed with the analysis in the paper is whether the National Bank of Serbia is using appropriate strategies of intervention in the FX market.

By implementing FX intervention, central banks are influencing the FX rate of the domestic currency against FX currency. This is done in order to downsize short-term volatility of the FX market, influencing the level of FX reserves (mostly in sense of increasing their level), but also to preserve financial and price stability. This can be done by implementing FX intervention on spot, forward and options market, but also on FX repo, FX swap and FX index certificate market. The choice depends on financial market development of the certain country, financial literacy, and experience of participants in the FX market, but also in relation to regulation which allows this transaction. This paper is structured as follows. In the first part, we are going to present literature preview, after which analysis is focused on presentation of different intervention strategies on the FX market. Then, the focus is on the presentation of transparency versus discretion when it comes to publishing data about the FX intervention and analysis of cost and effectiveness of intervention. In conclusion, we are going to summarize the main points of the paper, open question and to propose topics for future analysis.

2. Literature review

Literature regarding intervention strategies on the FX market includes an impressive and still growing number of works because this topic provides great opportunity for research. The research potential of this material is focused on a different topic, such as cost of FX intervention and its effectiveness, the connection among FX intervention and the level of FX rate in the long run, but also the success of FX intervention (e.g. whether monetary authority sterilises or not the impact of

intervention). It is assumed that sterilised intervention influences the FX rate over two channels: through the impact on portfolio balance, and/or through its role in signaling policy change (King, 2002). On the other side, Chang et al. (2017) indicate that there are three channels through which might affect the foreign exchange market indirectly: (1) the portfolio balance channel (to sterilize intervention changing the relative supplies of bonds denominated in different currencies), (2) the signaling channel (signal information about future monetary policy), and (3) the coordination channel (intervention might be important in coordinating the expectations of market participants).

Official intervention is said to be sterilised when authorities simultaneously or with a very short lag-take action to offset or „sterilise“ the effect of a change in official foreign asset holdings on the domestic monetary base. On the other hand, no sterilised intervention occurs when authorities buy or sell foreign exchange, normally against their own currency without such offsetting actions (Sarno&Taylor, 2001). The crucial distinction between sterilised and unsterilised intervention is that the former constitutes a potentially useful independent policy tool while the latter is simply another way of conducting monetary policy (Neely, 2001).

Central banks can conduct FX intervention for different reasons. From November 2013 till April 2017, Czech National Bank exchange rate was used to prevent deflation, in case of the Swiss Central Bank as a way to deal with a massive overvaluation of the Swiss franc, which was posing an acute threat to the Swiss economy and carries the risk of a deflationary development (FX intervention was implemented in the period from September 2011 till January 2015) and in case of Bank of Israel as a way to increase its FX reserves by purchasing foreign currency in the open market in the period from March 2008 until August 2009 (Martin, 2018).

Communication of monetary authorities is of crucial importance when it comes to the effectiveness of FX intervention. In this sense, it is important to have a good transmission channel between the central bank and FX traders, who are concluding FX intervention transactions with the central bank. Secret interventions are usually defined as foreign exchange operations that are not disclosed to market participants, at least not contemporaneously (Beine&Bernal, 2005). Also, it is significant to analyse whether there is a relationship between intervention and market expectations. Depending on circumstances, interventions can have succeeded in effecting traders' expectations of future exchange rate movements in line with the policymakers' objectives and that impact varies considerably across episodes (Galati&Melick, 2002).

Most central banks nowadays are targeting inflation, but also take enormous care of the movement of FX rate, which is particularly present in highly dollarised countries where it is the high pass-through effect of the exchange rate on inflation, i.e. it is assumed that the depreciation of the domestic currency spills faster on the inflation rate. In this case, there should be coordination between intervention and

conducting monetary policy (Mohanty&Turner, 2005). BIS bank conduct research in 2005 and 2013 on the topic, why central banks intervene in the FX market and their conclusion is that the most common reason cited for emerging market central banks to intervene in FX markets was to limit exchange rate volatility and smooth the trend path of the exchange rate (Chutasripanich&Yetman, 2015). Besides that, other reasons can be added such as managing or accumulating FX reserves, ensuring liquidity and reducing exchange rate misalignment. Next part of the paper focuses on presenting intervention strategies in the FX market.

3. Intervention strategies in the FX market

Different central banks use different intervention strategies on the FX market in order to downsize the volatility of domestic currency against foreign currency. All available instruments and its mechanism for FX intervention are presented in *Table 1*.

Table 1: Instruments used for FX intervention

Instrument	Mechanism	Effects			Examples
		Provide hedge for FX exposure	Support FX market liquidity	Economise on use of FX reserves	
FX spot transaction	Central bank sells/buys FX spot	Yes	Yes	Yes	Serbia
FX swap or FX repo	Central bank sells FX spot and purchases FX forward	Yes, against market risk or FX maturity mismatch	Possibly	Yes; only temporary supply on FX	Korea (FX swap), Brazil and Russia (FX repo)
Currency forward (non-deliverable, settled in local currency)¹	Central bank pays domestic currency related to change in FX value	Domestic currency payment offsetting FX valuation losses	Possibly, if FX demand declines	Yes; no foreign currency payment	Turkey (FX forward), Brasil, Peru
FX index certificate	Central bank pays domestic currency equivalent of change in FX value	Domestic currency payment offsetting FX valuation losses	Possibly, if FX demand declines	Yes; no foreign currency payment	Peru
FX option	Central bank sells options to buy FX from its reserves if local currency depreciation exceeds threshold	Yes	Yes; supplies liquidity when demand for FX increases	Yes, partly. FX reserves sold only when market initiates purchases (i.e. options are exercised)	Colombia

Note: 1) Referred to as swap cambial (currency or FX swap) in Brazil.

Source: Domanski, D. Kohlscheen, E., and Moreno, R. (2016). Foreign exchange market intervention in EMEs: what has changed? *BIS Quarterly Review*, September 2016, p. 71 and supplemented by the author

The choice of the certain instrument for FX intervention depends on regulation, financial market development, financial literature and previous experience of market participants, but also of the cause and the level of exchange rate volatility. In the continuation of the paper, the authors will show which instruments are available to the monetary authorities for conducting FX interventions.

3.1. FX intervention in the spot market

Since the beginning of 2009, the National Bank of Serbia has pursued inflation targeting. Moreover, its primary objective is price stability over the medium term. The National Bank of Serbia also aims to maintain the stability of the financial system. In Decision on the Dinar Exchange Rate Regime (RS Official Gazette, No. 95/2010), it is prescribed that National Bank of Serbia should implement a managed floating exchange rate regime for the national currency. This FX regime means that the exchange rate of the dinar against the euro is formed freely on Interbank Foreign Exchange Market and the National Bank of Serbia intervenes only in cases to mitigate excessive daily oscillations of the dinar exchange rate, to ensure financial stability, and to maintain an adequate level of foreign exchange reserves.

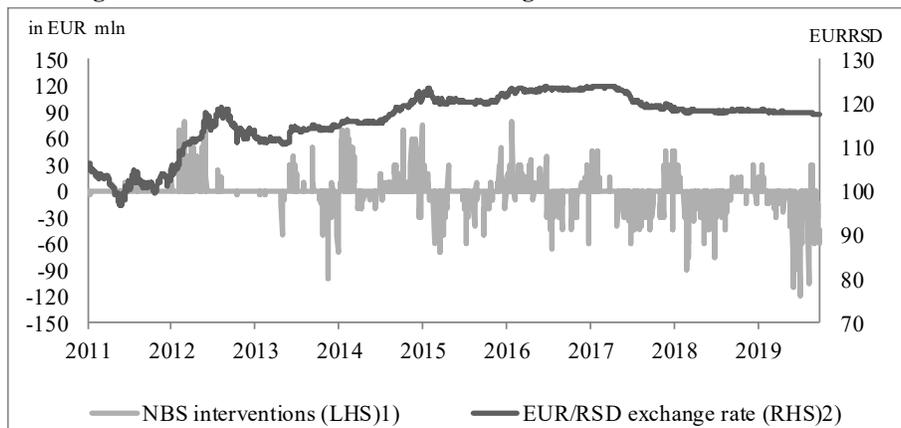
The National Bank of Serbia is conducting majority part of FX intervention in the spot market. Besides this instrument, according to the Decision on Operating Terms and Procedures in the Foreign Exchange Market (RS Official Gazette, No. 10/2011, 109/2012, 55/2014, 51/2015, 17/2016, 91/2016, 82/2017, 37/2018 and 86/2018), it was allowed for National Bank of Serbia to use direct auction purchase/sale of foreign exchange which was last applied in April 2012. This auction was organized at variable method – multiple exchange rates of the dinar against the euro. The National Bank of Serbia intervened strictly under market conditions, as a price taker, dealing at prices quoted by banks. The majority of interventions is implemented via the Reuters Dealing System.

In 2018, the National Bank of Serbia by conducting FX intervention bought on Interbank Foreign Exchange Market EUR 1,835 million and sold EUR 255 million (*Figure 1*). The dinar in 2018, end of the period, strengthened against the euro by 0.2%. In major part of appreciation trend in 2018 was present further improvement of macroeconomic indicators (GDP in 2018 was 4.4% and is the highest rate in the last ten years) and an improved credit rating outlook (in November 2018 Fitch Ratings affirmed Serbia's long-term foreign and local-currency issuer default ratings (IDR) at BB with stable outlook and in December 2018 rating agency Fitch revised its outlook from stable to positive and confirmed credit rating at the level of BB/B. Moody's Investors Service during 2018 kept for Serbia stable outlook and rating at the level of Ba3).

After moderate depreciation pressures in January 2019, conditioned primarily by the seasonally higher demand of energy importers for foreign currency, appreciation

pressures, which prevailed in the past two years as well as, renewed as of February. Mild depreciation pressures emerged at the end of August, against the background of the contracted activity in the domestic FX market, but were of a temporary character, as pressures toward strengthening of the dinar prevailed thereafter. To ease the excessive short-term volatility of the dinar against the euro, the National Bank of Serbia intervened in the Interbank Foreign Exchange Market purchasing EUR 2,105 million net (purchasing EUR 2,295 million and selling EUR 190 million) since the beginning of the year (as of September, 30). Since the beginning of the year, the dinar saw a nominal strengthening against the euro by 0.6% (as of September, 30). Rating agency Fitch affirmed a stable outlook for Serbia and its BB rating in May 2019 and Standard & Poor's affirmed positive outlook for Serbia, keeping rating at BB level in June 2019. The rating agency Moody's has upgraded the outlook on Serbia's rating to positive from stable and affirmed the Ba3 rating, while Fitch upgraded Serbia's rating from BB to BB+ with stable outlook in September 2019. Therefore, owing to the maintained stability and transformation of its economy, the Republic of Serbia was, for the first time, only one step away from Fitch's investment grade, characteristic of economies offering a high security of investment. On September 18, EMBI Serbia touched, at that time, its all-time low (49 b.p.)

Figure 1: Movements in EUR/RSD exchange rate and NBS FX interventions



Note: 1) + sale; - purchase.; 2) EUR 1 in RSD and 3) Data as of September 30, 2019

Source: National Bank of Serbia, www.nbs.rs/internet/english/index.html, accessed: October 10, 2019

The above indicates that the chosen strategy of intervention in the foreign exchange market provides relative stability of the dinar exchange rate against the euro, which achieves the certainty of business for the corporates and households. The data shown in *Figure 1* indicate that in the last seven years, exchange rate stability has contributed to price and financial stability as the ultimate goals of the

monetary policy of the National Bank of Serbia. Thus, we accept the hypothesis and conclude that the National Bank of Serbia applies an adequate intervention strategy in the FX market.

When conducting FX intervention, the National Bank of Serbia has proven that it is objective and impartial and intervenes in case of need, equally on the side of the purchase and on selling side. The information on FX intervention (if any) is published on the daily level along with the official middle level of euro against dinar for the next working day, but also this information is announced in the various reports such as Monetary Policy Report, Inflation Report, Statistical Bulletin, and Annual Financial Stability Report. This provides a high level of transparency in the operation of the National Bank of Serbia in the FX market. The intervention technique itself is regulated by confidential internal procedures in all central banks, as is the case with the National Bank of Serbia. That is precisely why no central bank, or even the National Bank of Serbia, gives insight into the way in which FX interventions are conducted. This is ultimately the preservation of the independence of the central bank in the implementation of monetary policy. Nevertheless, the National Bank of Serbia carries out interventions based on market principles and equity criteria, while none of the banks have a privileged position.

3.2. FX intervention in the FX swap market

The example of using FX swap is Korea where two institutional bodies are in charge of conducting FX intervention such as the Ministry of Strategy and Finance and the Bank of Korea (<https://www.bok.or.kr/eng/main/main.do>). From December 1997 Korea's exchange rate system was shifted to a free-floating system and before that, there were daily fluctuation limits for the interbank exchange rate (*Table 2*).

Table 2: Change of Exchange Rate Bands

Effective dates	March 1990	September 1991	July 1992	October 1993	November 1994	December 1995	November 1997	December 1997
Band width (%)	± 0.4	± 0.6	± 0.8	± 1.0	± 1.5	± 2.25	± 10.0	± free

Source: Bank of Korea, www.bok.or.kr/eng/main/main.do, accessed: October 10, 2019

The foreign exchange market in Korea is divided into OTC markets and exchanges. The OTC markets consist of a customer market, where foreign exchange banks deal with customers such as importers, exporters, travelers and nonresidents, and an interbank market, where foreign exchange banks deal among themselves. Participants in the foreign exchange market buy and sell in spot market and trade foreign exchange derivatives such as forwards and foreign exchange swaps. The Bank of Korea began to participate in the FX swap market in September 2007 in order to ease the imbalances in the foreign exchange market of the country. During the global financial crisis in 2008, the Bank of Korea also concluded the US 10.27

billion to foreign exchange banks through swap transactions by a competitive bidding method. The central bank also through lending transaction provide US 16.35 billion and the fund are provided through using a currency swap deal with the US Federal Reserve. The Korean FX authorities do not publicly disclose any information related to intervention, because they believe that such information could stimulate speculative trading in the FX market (Ryoo et al., 2003).

Another example of using FX swap for intervention in the FX market is Brasil. According to the Resolution 2,939, 3.26.2002 Central Bank of Brasil is authorised to carry out swap operations referenced to interest rates and exchange rate fluctuations, for monetary and exchange policy purposes. The Central Bank of Brazil used FX swaps as instruments of intervention in the FX market, for the first time since March 2002 when the central bank applied FX swap (so-called Brazilian FX Swaps) and reverse currency swaps. Brazil, in addition to swap intervention, also applied intervention in the spot market, and the intervention programme was completed, based on the spot and swap transactions, in August 2013. Formally, Brazilian FX swap contracts were structured in order that, at maturity, the Central Bank of Brasil could pay its counterparts the observed exchange rate variation against the dollar plus the ex-ante Cupom Cambial (i.e. the Central Bank of Brasil overnight rate) and receive the ex-ante SELIC (short-term interest rate) rate in return. In other words, a positive return is made if the observed exchange rate depreciation falls short of initial expectations and makes a loss otherwise (Nedeljkovic&Saborowski, 2016). The net exposure of the central bank by using FX swap was below US 2 billion in the period from 1st January 2011 to 31st March 2013, while in same period FX reserve were between US 346 billion and US 379 billion (Kohlscheen&Andrade, 2014). High level of FX reserves means not only that the central bank was in a position to cover open FX swap positions, but also was in a position to fight against external shocks. In the period 2013-2015 Central Bank of Brasil used the so-called „daily feeding programme“ and in the stated period central bank scheduled daily auctions of FX swaps, which were considered as an equivalent to sales of future USD. These contracts were equivalent to more than 7% of the Brazilian GDP (Macalos, 2017).

3.3. FX intervention in the FX repo market

Besides the intervention in the FX swap market, the Central bank of Brasil used FX report in 2013 as a response to a Fed announcement that started tapering and consequently by the end of June Brazilian real (BRL) lost more than 12% of its value against the US Dollar. By using FX repo, the Central bank of Brasil was selling at spot USD to the commercial banks and at the same time made an agreement to buy that amount in the future. Repo lines started to be auctioned by the end of June 2013. Only after the announcement of a formal programme FX repo was organised on Friday (from Monday to Thursday FX intervention was conducted by using FX swap) in the amount of USD 1 billion of repo lines. From December 2013 FX repo

auctions were only on demand (Garcia&Volpon, 2014). The FX repo auctions immediately decreased international reserves and were offered with a repurchase agreement on the USD spot market. The Central bank of Brasil immediately “sterilised” this liquidity shortage in local currency using open-market operations to preserve monetary policy targets (Barbone Gonzalez et al., 2018).

In the period from November 2014 until October 2017, the Bank of Russia was conducting FX repo in order to maintain financial stability. These repo auctions had the maturity of one-week, 28- and 365-day (*Table 3*). According to the information from the website of the Bank of Russia FX repo auctions were usually variable price auctions with a set maximum allotment amount conducted in the American manner (bids are closed at indicated prices) (<https://www.cbr.ru/eng/>). Only competitive bids with the indicated repo rate (in % p.a.) are accepted for the FX repo auction. Noncompetitive bids were not accepted. The minimum acceptable bid rates were linked to LIBOR rates in the respective currencies (US dollar and euro) and for the respective terms. The spread to market rates was determined for each term with a due account for the situation in the FX market.

Table 3: FX REPO transaction amount outstanding

at the beginning of the day; mln. US dollars

Year	Funds provided to credit institutions under repo first leg				Funds to be repaid by credit institutions under repo second leg ¹⁾			
	Term			Total amount	Term			Total amount
	1 week	28 days	12 months		1 week	28 days	12 months	
2014	5.085	87.137	51.138	143.361	5.080	85.956	51.005	142.040
2015	106.780	1.897.909	5.387.200	7.391.888	106.713	1.852.946	4.607.506	6.567.164
2016	10.158	2.624.401	948.971	3.583.530	10.148	2.594.257	743.157	3.347.562
2017	23.372	696.619	742	720.733	23.382	692.815	634	716.831
Total	145.395	5.306.065	6.388.051	11.839.511	145.322	5.225.973	5.402.302	10.773.597

Note: 1) Amount of funds to be repaid by credit institutions under second repo leg may be decreased by the sum of the margin and coupons on securities. In case the value of securities decreases below the permissible level established by the Bank of Russia, credit institutions will make cash margin payments which reduce their obligations to the Bank of Russia under the second repo leg. Upon the receipt by the Bank of Russia of payments (coupon income, partial repayment of the nominal value) on the securities transmitted by credit institutions under first repo leg, the credit institutions' obligations to the Bank of Russia under second repo leg are adjusted for the similar amount, i.e., the said payments are accounted for repayment of credit institutions' debts. In view of the above factors, the amount under the first repo leg may exceed the total amount of second repo leg.

Source: Bank of Russia, www.cbr.ru/eng/, accessed: October 12, 2019

Maximum allotment amount in FX repo auctions, the Bank of Russia based on the estimated demand of the banking and non-financial sectors for US dollars and euro. This estimation was based on the forecast of the key balance of payments components (including the expected external debt repayments) and factors in the balance between banking sector assets and liabilities, including their maturity. The Bank of Russia had considered financial stability objectives and developments in the interbank FX market, including FX and interest rate swaps.

3.4. FX intervention in the forward market

During currency crises in 1997, Korean monetary authority intervened, both on the spot and forward market. In order to defend Korean won the Bank of Korea during February and March sold US 6 billion in the spot market and US 3.8 billion in the forward market. Second round of intervention happened in the period from April until November during which the Bank of Korea sold US 12 billion in spot market and 6 billion in the forward market. One reason why the Bank of Korea, beside an intervention in the spot market, started to use FX forward is that the Korean monetary authorities wanted to camouflage the decline in foreign reserves because there were little reserves left (Moon&Rhee, 2006). Korean experience indicates that forward intervention was ineffective and caused destabilization of the exchange rate (at the end of November Korean won reached the level of 1.109 against US dollar in comparison with 852 won per US dollar in the end of January).

The second reason for official intervention in the forward market is to fight against and deflect a speculative attack on its currency as it was the case in Thailand (Chunanuntathum, 2002). In the period from November 1996 until July 1997 total open position, both on offshore and onshore, forward and swap was increased from the US 0.05 billion (offshore) and US 0.8 billion (onshore) to US 19.77 billion (offshore) and US 9.74 billion (onshore), respectively. The longest maturity of forward position was one year, but the majority had matured up to six months.

The central bank of Turkey announced in November 2017 that since December it would start implementing Turkish Lira settled forward FX sale auction against the US dollar, the maturity of one, three and six months. Since then calendar for all FX forward maturity has published on the quarterly level. In August 2018, the Central bank of Turkey announced that these transactions will also be conducted on the Derivatives Market (VIOP) operating under Borsa İstanbul (BİST) to contribute to the effective functioning of foreign exchange markets. This FX forward transaction Central bank of Turkey is concluded with domestic banks, domestic customers (authorised institutions and individual/corporate customers in Turkey), offices and branches abroad (foreign offices and branches) and corporations and customers abroad. During September 2019 average daily FX forward concluded with domestic banks was US 56 million, with domestic customers US 209 million, with corporations and customers abroad US 145 million, while there were no FX forwards with offices and branches abroad (www.tcmb.gov.tr/wps/wcm/connect/en/tcmb+en).

3.5. FX intervention in the FX index certificate market

As a way to stabilise the domestic currency, Peruvian Sol (PEN), the Central Bank of Peru implemented FX intervention by using over the counter (OTC) purchases and sales, net swap operations, certificates of deposit in USD and operations with the public sector. Besides that, there is the possibility of implementing an FX intervention on swaps and reverse swaps is used mainly when there are pressures

from the non-delivery forward (NDF) market that could force banks to transfer this pressure into the spot market (Rossini et al., 2013). The decision of the Central bank of Peru to intervene was on the discretionary basis (Broto, 2012).

In July 2002, the Certificate of Deposit indexed to the exchange rate (CDR) was created to smooth temporary imbalances in the forward dollar market which may lead to sudden fluctuations in the exchange rate. Index certificate Central Bank of Peru was used as a way to sterilise FX intervention in the spot market. Central Bank mostly intervened in the exchange market through OTC purchases and sales of US dollars aimed at smoothing sudden changes in the exchange rate without fixing maximum or minimum levels. In Q4 2005 Central Bank of Peru sought to counterbalance the depreciation pressures on the PEN by conducting net sales of foreign currency and placements of Re-adjustable CDR, financial instruments with a dollar-indexed yields that represent an option other than buying foreign currency for banks. In order to discourage holdings of these CDRs by non-resident investors the Board of Central Bank of Peru in 2008 established the Certificates of Deposit with Restricted Negotiation (CDBCRP-NR), initially restricting banks in the domestic financial system for purchasing these securities given that they were meant to serve as a monetary regulatory instrument and not as an investment one. In 2010, the Central Bank of Peru introduces auction of certificates of deposit payable in dollars (CDLD BCRP), which is a mechanism that can in part reduce the need for purchases of dollars in situations of exchange volatility. The Central Bank of Peru placed CDLD BCRP for a total of PEN 450 million between October and December 2010. In response to the depreciation pressures on the PEN during the second half of 2013, the sale of foreign currency was accompanied by auctions of certificates of deposit indexed to the exchange rate (CDR-BCRP), the balance of which increased to PEN 3.11 billion at the end of 2013. These FX index certificates were mostly sold in times of depreciation pressures such as following the Lehman crisis, the eurozone crisis, and following the United States Federal Reserve Board's announcement of unconventional monetary policy tapering (Tashu, 2014).

When it comes to the maturity structure of Certificates of Deposit of the Central Bank of Peru majority of placement is with the maturity of 1 day-6 month, while there is no placement for maturity longer than two years (*Table 4*).

Table 4: Evolution of Certificates of Deposit of the Central Reserve Bank of Peru (in PEN million)

Year	Quarter	1 day-6 months			7 months - 1 year			1 year - 2 years			Total		
		Placement	Maturity	Balance	Placement	Maturity	Balance	Placement	Maturity	Balance	Placement	Maturity	Balance
2017	Q1	19.480	19.477	8.363	1.220	95	10.314	970	207	11.409	21.670	19.779	30.086
	Q2	5.820	8.189	5083	520	620	9.540	120	150	12.159	6.460	8.959	26.782
	Q3	91.202	88.989	17.880	729	730	6.110	120	125	12.184	92.051	89.844	36.174
	Q4	11.804	15.407	14.575	153	290	6.124	150	620	10.048	12.107	16.317	30.747
2018	Q1	22.413	27.830	16.027	2.205	1.250	10.064	20	48	6.252	24.638	29.128	32.343
	Q2	2.244	2.528	12.438	255	520	8.339	150	120	5.798	2.649	3.168	26.575
	Q3	16.604	14.869	13.535	375	729	8.024	200	1.000	4.402	17.179	16.598	25.961
	Q4	9.056	9.249	13.463	1.126	183	10.636	100	120	3.862	10.282	9.552	27.961

Source: Central Bank of Peru, www.bcrp.gob.pe/en, accessed: October 5, 2019

According to the data from the weekly report of the Central Bank of Peru, the balance of BCRP certificates of deposit on October 9 was PEN 28.38 billion, with an average interest rate of 2.6 percent, while this balance at end-September was PEN 8.69 billion, with a similar average interest rate. (www.bcrp.gob.pe/publications/weekly-reports/weekly-report.html).

3.6. FX intervention in the option market

An example of intervention in the FX market by using options in Mexico, where these operations were conducted by the Foreign Exchange Commission composed of officials from the Ministry of Finance and Central Bank of Mexico. This form of intervention was implemented in two periods. In the first period, which lasted from August 1996 to June 2001, the intervention mechanism is based on purchasing US dollars through put options. The objective of intervention in this period was the accumulation of foreign exchange reserves. These options were offered by the Foreign Exchange Market Commission on the last working day of each month in the stated period in the original amount set at USD 130 million and later raised on five occasions to finally reach USD 250 million. The option holders had the right, but not the obligation, to exercise the option, partially or completely, within the month following the month of the auction. The option holders could sell US dollars to the central bank only if the exercise price, which represented the peso exchange rate against the dollar from the previous working day, was below its 20-day moving average. The option sale was completed in June 2001 after the central bank announced that a sufficient amount of FX reserves was accumulated and increased by US 12.2 dollar billion to US 40.8 dollar billion (FX reserves in June 2001). The second period in which the Foreign Exchange Commission used intervention through options is February 26, 2010 - November 29, 2011. During this period on the last working day of each month in the mentioned period, auctions were conducted in which banks sold the US dollar through the put option. The volume of these auctions was US 600 million per month. According to the information from the website of the Central Bank of Mexico on 29 November 2011, the Foreign Exchange Commission announced that the monthly auctions of the put options would be temporarily suspended and that dollar auctions with a minimum price would be reactivated until further notice (www.anterior.banxico.org.mx/indexEn.html).

In addition to Mexico, the Central Bank of Colombia had a significant use of options in the foreign exchange market, which began its implementation since November 1999. FX intervention in Colombia is undertaken to maintain an adequate level of international reserves, to remedy short term exchange rate misalignments and on occasion, to curb excessive exchange rate volatility (Vargas et al., 2013). The Central Bank of Colombia issued the following types of options contracts (Mandeng, 2003):

a) options for increasing (decreasing) foreign currency reserves - the bank issued put (call) option with maturity of 30 days, that are auctioned each month and in which the commercial banks were granted the right, but not the obligation to sell (buy) dollars to the central bank (from the central bank). Realization of the options was possible only if the peso did not appreciate (call option) / depreciated (put option) more than twenty-day arithmetic moving an average of the past day's currency fixing.

b) „volatility“ options - put (call) option with a maturity of 30 days was auctioned US 180 million, in cases where the pesos FX rate is more than 4% depreciated (appreciated) that its 20/day arithmetic moving average until maturity. For six months of 2002, the average daily volume of the exchange market was US 300 million and only call volatility options were auctioned.

4. Transparency versus discretion in conducting the FX intervention

In the previous part of the paper, the authors have presented all major types of FX intervention, conducting on a different market. When it comes to announcing information about FX intervention, many central banks decide to keep this information secretive. For example, Swiss National Bank (SNB) conducted an intervention in the period from September 2011 till January 2015 as a way to deal with a massive overvaluation of the Swiss franc, which was posing an acute threat to the Swiss economy and carries the risk of a deflationary development. Information about FX intervention SNB publishes only in the Annual Report (the amount and side of intervention). Also, SNB after meetings of monetary council release announcement in which in a verbal way indicates FX intervention and says „negative interest and the willingness to intervene are important in order to counteract the attractiveness of Swiss franc investments and thus ease pressure on the currency“. (Swiss National Bank, Press release, Monetary policy assessment of 19 September 2019)

National Bank of Poland (NBP) only in Annual Report announced information whether there was FX intervention and in the report for 2018 central bank declared that under the existing monetary policy strategy, NBP might purchase or sell foreign currency in the foreign currency market against the Polish Zloty. In 2018, the NBP did not conclude any such operation (https://www.nbp.pl/en/publikacje/r_roczny/rocznik2018_en.pdf). For previous years, when there was FX intervention (such as in April 2010 and in June 2013) the NBP did not specify amount, side and market of FX intervention. On the other hand, the Central Bank of Romania does not publish any information about FX intervention.

During the period from November 2013 till April 2017, Czech National Bank exchange rate was used to prevent deflation and defend the exchange rate of the koruna against the euro is close to CZK 27. Information about the level of FX

intervention Czech National Bank publishes on the monthly level with a two months lag and it announces only collective figures for certain months. Last time, Czech National Bank conducted FX intervention in April 2017, when it bought EUR 653 million (USD 713 million) and this intervention was applied on the spot market (www.cnb.cz/en/).

On the other hand, the central banks in Serbia and Croatia immediately publish data on the day of FX intervention. National Bank of Serbia publishes data about FX intervention on its website, in part, of the financial market and this information contains the size of the intervention (expressed in millions of euro) and side of intervention (FX buy or FX sale) along with official middle rate EURRSD for next working day. Croatian National Bank mostly conducts FX intervention by spot action and after each auction central bank publish information about the size of the intervention (expressed in millions of euro), side of information (FX buy or FX sale) and average exchange rate EURHRK. Last FX intervention was held in August 2019 when the Croatian National Bank purchased from banks EUR 322.05 million at an average rate of EURHRK 7.396732 (www.hnb.hr).

5. Cost and effectiveness of FX intervention

Besides of presenting all types of FX intervention on different market and the way of publishing information about intervention it's equally important to analyse the cost and effectiveness of FX intervention. In theory and practice, it is presented debate about the cost of building and holding a high level of FX reserve on the one hand and to using those reserves for FX intervention purpose, on the other. At the end of Q2 2019, according to the IMF currency composition of official foreign exchange reserves (COFER), total FX reserve on the global level account to the level of US 11,732.57 billion from which almost 58% was allocated in US dollar and 19% in the euro [<http://data.imf.org/?sk=E6A5F467-C14B-4AA8-9F6D-5A09EC4E62A4>].

Dutt (2018) defines the cost of foreign exchange intervention as the deviations from uncovered interest parity. This quasi-fiscal cost of holding reserves calculation is based on the spread between short-term sovereign bonds and US Treasury Securities. In this calculation, gold is excluded from the cost of holding reserves because no interest is received on reserves held in the form of gold. Sometimes literature refers to costs of FX intervention and the cost of holding reserves indistinctly. This argument is valid only in case when an accumulation of FX reserve is based on FX intervention. But at this point, it is necessary to make the following distinction. FX intervention should be understood as an operation that changes the net FX position of the central bank, without necessarily changing its net liquidity position (an increase in liquid foreign assets matched by an equal increase in short-term liabilities). This is different from reserve accumulation, which relates to a portfolio reallocation within FX assets meant to increase liquidity or reduce debt maturity (Adler&Mano, 2016).

Neely (2005) offers three approaches to measure the effect of FX intervention. First is using event studies with daily data which provide mixed support for the hypothesis that intervention influences exchange rates in the desired direction and also mixed conclusions as to its effect on volatility. Second, are intraday event studies which are based on using intraday data to evaluate the behaviour of exchange rates, at very high frequencies around the times of the intervention. The third is identified studies of intervention because not all studies of intervention can be classified as event studies.

It is important to estimate the effect on FX intervention. But this is very difficult taking into account that there is no unique way to measure the exchange rate which can be used as a proxy in the absence interventions. Also, the goal of central bank intervention may be different between intervention episodes, so real criteria of success can vary in time. Sometimes new information can be available in the market and can have an influence on the exchange rate movement. If the goal of intervention has primarily to do with the level of the exchange rate, however, then such volatility spikes do not necessarily indicate the ineffectiveness of intervention (Disyatat&Galati, 2005). Monetary policy framework and transparency of availability of data about FX intervention can influence its effectiveness. So, there is no simple answer whether FX intervention is or is not effective.

6. Conclusion

The aim of this paper is the presentation of intervention strategies in the FX market. Central banks are using FX intervention as an instrument to influence on the movement of the exchange rate and to downsize its volatility, but also as a way to influence the level of FX reserve and to keep prices and financial stability. As mentioned, different reasons stand behind FX intervention and different strategies can be used in order to fulfill these objectives.

The central bank can use intervention on the spot market, where the settlement of the transaction is two working days after concluding the transaction. This type of intervention support FX market liquidity and provides a hedge for FX exposure. FX swap intervention was used by the Bank of Korea, which in 2008 concluded swap transactions in value of US 10.27 billion by a competitive bidding method in order to combat the influence of global financial crises. Besides Korea, Brazil applied FX swap intervention on several occasions. Korea and Thailand used FX intervention by forward in order to fight against the consequences of currency crises in 1996-1997, while the Central Bank of Turkey is using forward intervention in order to decrease pressure on the Turkish lira. Peru implemented several types of FX index certificate as a way to smooth temporary imbalances in the forward dollar market which may lead to sudden fluctuations in the exchange rate. Mexico and Colombia

applied FX intervention in the options market and used both put and call options in order to purchase US dollars and to build up FX reserves.

Not all central banks reveal information about FX intervention. Some do not provide data about intervention (case of Central Bank of Romania), while other reveal that information only in the Annual Reports (case of the Swiss Central Bank and National Bank of Poland). The National Bank of Serbia and Croatian National Bank announce information about FX intervention in the day when that intervention was held. This indicates that some central banks keep intervention indiscretion, while another put effort to provide transparency of all operations.

It is important to measure the cost and effectiveness of FX interventions. This is not an easy task considering that there is no proxy for the exchange rate in case there is not intervention, data about intervention are not always available and monetary framework can influence on FX intervention effectiveness. The aim of FX intervention of the central bank can vary across time and can be different in the various economic cycles. All this indicates that measurement of cost and effectiveness of FX interventions needs to take into analysis a large number of indicators, large time series and goals of the central bank for conducting an intervention.

As the topic of FX intervention, is actual and present in many countries, not only in our region, but also globally, this opens the possibility of further analysis of this issue. Some open questions for further analysis are the possibility of introducing an intervention on some other market, besides spot, in the National Bank of Serbia, then to measure costs and effectiveness in conducting an intervention in Serbia, but also the presentation of how the National Bank of Serbia applies sterilization of intervention. This is a recommendation for further analysis not only for Serbia but also for other countries and their central banks, which the authors presented in this paper. Also, this is just a short list of available topics for additional research, because this paper offers significant potential for further analysis.

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STRATEGIJE INTERVENCIJA NA DEVIZNOM TRŽIŠTU

Apstrakt: Cilj rada je prezentovanje strategija intervencija koje koriste centralne banke da bi uticale na vrednost domaće valute, transparentnost naspram diskrecije kada je reč o objavi podataka o deviznim intervencijama i troškovi i efikasnost intervencija. Retko koja zemlja danas prepušta da se devizni kurs formira isključivo na tržišnim osnovama kroz dejstva ponude i tražnje za devizama na deviznom tržištu. Centralna banka kupuje ili prodaje stranu valutu na deviznom tržištu kako bi povećala ili smanjila vrednost svoje nacionalne valute u odnosu na stranu valutu. Razlozi intervencija su smanjenje kratkoročnih oscilacija kursa, uticaj na nivo deviznih rezervi, ali i obezbeđivanje cenovne i finansijske stabilnosti kao krajnji cilj većine centralnih banaka. U radu će biti prikazane strategije intervencija na deviznom tržištu koje uključuju sprovođenje intervencija na tržištu opcija, forvarda, valutnih repo i valutnih svopova, potom na spot tržištu, intervencija putem aukcija, ali i primena valutno indeksiranih sertifikata

Ključne reči: devizne intervencije, devizno tržište, svopovi, forvardi, opcije

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