An Empirical Test for the Effectiveness of Central Bank Interventions in Foreign Exchange Markets: An Application to the Canadian and Swiss Central Banks

ABBUY, Kwami Edem

UQAM Department of Economics

22 October 2018

An Empirical Test for The Effectiveness Of Central Bank Interventions In Foreign Exchange Markets: An Application To The Canadian and Swiss Central Banks

Edem K. Abbuy *

Abstract

This paper investigates the effectiveness of foreign exchange intervention of central banks of Canada and Switzerland. We examine the effectiveness of Canada and Switzerland intervention policies on $ Canadian dollar against $ US dollar and Swiss franc against $ US dollar exchange rates volatility over the 1980-2014 period. A behavioural equation is estimated with instrumental variables methodology. The main results indicate that interventions generally reduce exchange rates volatility. However, the Swiss National Bank seems to be more efficient by stabilizing the Swiss franc than the Bank of Canada, whose interventions, despite its effectiveness, remains weak.

Keywords: volatility, exchange rate, official international reserves.

JEL Class: E51, E52, E58.

*UQAM(Montréal), Department of Economics/ Centre interuniversitaire sur le risque, les politiques économiques et l'emploi (CIRPÉE)

Introduction

Volatility is one of the prevalent features of financial data including exchange rates. The impact of monetary policy on exchange rates has been the subject of a large body of empirical research since the early 1990s. Excessive exchange rate volatility is believed to interfere with the efficiency of the foreign exchange market, the international flow of goods, services, investment capital and the conduct of monetary policy (Rogers and Siklos,2003).

Since official intervention data becoming publicly available, the empirical literature on central bank foreign exchange intervention has been growing rapidly. Official exchange rate intervention in the foreign exchange market occurs when the authorities buy or sell foreign exchange, normally against their own currency in order to affect the exchange rate (Taylor and Sarno, 2001). Many papers have explored the determinants and efficacy of intervention (Edison, 1993; Sarno and Taylor 2000)

Under the Bretton Woods system of fixed exchange rates, interventions were used frequently to maintain the exchange rate within prescribed margins. The objective was to avoid the excessive volatility and prevent competitive depreciation (Dominguez, 1998). After the breakdown of the institution in 1973, interventions excessively increased.

In the current monetary system, many rich countries adopted laissez-faire approach towards foreign-exchange markets.Then, the exchange rates of major currencies such as the US dollar, Euro or the Yen fluctuate with market forces. Other medium-sized industrialized open economies, such as Canada, Australia and Switzerland, have also adopted a market-determined floating rate regime (IMF, 2000). Central banks have the option to intervene and often do so in an attempt to correct imbalances in the current account. It is, therefore of importance to understand the consequences of central bank intervention (Beltratti et Morana, 2000;Kearns and Rogobon, 2005).

In Neely's survey (survey of Bank for International Settlement on Foreign Exchange and Derivatives Market Activity),47 percent of the respondents claimed that foreign exchange intervention is aimed at resisting short-term trends, 22 percent suggested that its main goal is to eliminate misalignments from fundamental values, while the rest indicated different and unspecified reasons for intervention (Nelly, 2000).

Is Foreign exchange intervention, especially in small open economies such as Canada and Switzerland, effective? Why Canada and Switzerland? Historically, the Canadian and Swiss economies have similarities and differences. First, these countries are small and open industrialized economies. Their individual activities have no influence on the level of global activity. Secondly, both countries' currencies are viewed as being

sensitive to similar factors such as interest rate and inflation differentials vis-a-vis the US. Thirdly, they have an inflation target in their monetary policies formulations. The Bank of Canada aims to keep inflation at 2 percent, and its commitment to inflation targeting was considered more formal (Rogers and Siklos, 2003).However, the choice of these countries doesn't just rely on their similarities but also in their differences. Prior to September 1998, Canada's policy was to systematically intervene in the foreign exchange market to automatically counter excessive pressure on the Canadian dollar. This policy changed in September 1998. The Swiss central bank is known to be one of the most interventionist central banks in the world.
This paper aims to evaluate the effectiveness of interventions of central banks of Canada and Switzerland. The rest of this paper is organized as follows. First, we briefly summarize the extant literature. Section 2 describes data and econometric specifications, while Section 3 discusses the results. Section 4 concludes.

1 Literature Review

We summarise the literature on why central banks intervene in foreign exchange markets, how they intervene, and how interventions can work.

1.1 Why central banks intervene in foreign exchange markets?

According to Adler and Mora (2011), the real motives for intervention can be grouped as: influence the level of the exchange rate, reduce the volatility of the exchange rate or increase the official reserves for precaution.
For Chutasripanich and Yetman (2015), the real motives of the monetary authorities can be summarised into four main purposes:
- Leaning against the wind: the central banks used to intervene in foreign exchange markets not only to limit exchange rate volatility but also to smooth the trend path of the exchange rate.
- Reducing exchange rate misalignment: Central banks intervene when the exchange rate is too high and can reduce a country's competitiveness or too low to lead to an unsustainable growth and inflation(Chutasripanich and Yetman, 2005).
- Accumulating reserves: According to Adler and Mora (2011), 50 percent of interventions by central banks on the foreign exchange market

between 2004-2010 were motivated at least by the desire to accumulate reserves.
- Ensuring liquidity Central banks also intervene in the market exchange rates to ensure liquidity in the market and to avoid financial stress.

1.2 How central banks intervene in foreign exchange markets

We first observe sterilized interventions and non-sterilized operations.Official intervention is said to be sterilized when the authorities simultaneously or with a very short lag take action to offset or "sterilize" the effects of a change in official foreign asset holdings on the domestic monetary base. On the other hand, non-sterilized intervention occurs when the authorities buy or sell foreign exchange, normally against their own currency without such offsetting actions (Sarno and Taylor,2001).However, The means by which central banks intervene in foreign exchange markets vary across a number of dimensions. Intervention can be rule-based or discretionary. According to Canales-Kriljenko (2003), central banks need discretion to determine when to intervene. Discretion has the advantage of allowing the central bank to adapt to market conditions and to plan strategies. Some others theoretical studies support that "rule-based" intervention can be more effective (Krugman,2001).

1.3 central banks intervention's channels

We identify at least two channels through which central bank intervention in the foreign exchange market can influence agents' behavior: the portfolio channel and the expectations channel.
Portfolio-balance channel: The portfolio-balance channel assumes that economic agents are risk averse, and that foreign and domestic bonds are imperfect substitutes for each other in an agent's portfolio. It operates when there is imperfect substitutability between domestic and foreign assets and the risk premium increases with the supply of domestic assets. That means that in closed financial markets the substitutability between domestic and foreign assets is likely to be low. If the central bank, as a major market player, influences the supply or demand of financial assets through its own trading activities, this is likely to result in other market participants rebalancing their financial asset portfolios (Sarno and Taylor, 2001)
Signalling or expectations channel: The second is expectations or

signaling channel. This channel works through the adjustment of expectations about future central bank policy. A highly-publicised transaction in foreign exchange markets may be interpreted as setting a precedent for future interventions, or revealing information about the level of the exchange rate that is considered desirable by policymakers (Chutasripanich and Yetman,2015) This channel is effective if agents revise their expectations of current or future policy and the resulting exchange rate (Rogers ans Siklos,2003).

Morana and Beltratti (2000) focused on evaluating the effects of sterilized central bank interventions on the FX market for the period 1992 to 1995 with high-frequency data. Their results revealed that the interventions are not particularly effective. Dominguez (2003) examined the intervention effects of the monetary authorities of United States, Germany and Japan on the US dollar/ deutsch mark exchange rate and the volatility of the US dollar/yen exchange rate over the period 1977-1994. His results suggested that interventions increase the volatility of exchange rates.Rogers and Siklos (2003) found for Canada and Australia an ineffectiveness of interventions. Both central banks are largely ineffective and constitute an additional source of volatility in the foreign exchange market. Fatum (2005) analyzed the effects of the Bank of Canada's intervention on the CAD/USD exchange rate for the period from January 1995 to September 1998. He concluded that the Bank of Canada has failed to reduce the volatility of the exchange rate and the impact of its sterilized interventions is very low on the volatility of the exchange rate. Conversely, some studies pointed the effectiveness of sterilized interventions. Ramaswamy and Samiei (2000) used daily data on the period 1995-1999 to estimate a simple prospective model of the exchange rate and concluded that foreign exchange interventions have weak but persistent effets on the yen-dollar exchange rate. Their results concluded that co-ordinated interventions by agreement between central banks, have a greater probability to reduce exchange rate volatility. Park (2008) examines the main features of daily foreign exchange intervention on the US dollar against the Australian dollar for the period 1983-1997. He finds a contemporary positive correlation between the direction of the intervention, the average and the conditional variance of exchange rate returns. His results suggests that large and sustainable interventions have a stabilizing influence in the foreign exchange market. Without these interventions, the market would have been exposed to more volatility.

2 Data and econometric approach

Some differences remain regarding to the econometric approach to investigate the effectiveness of central bank interventions on the foreign exchange market. However, data about official interventions are very scarce.

To address the problem of intervention data paucity, some proxy variables have been constructed. Neely (2001) defended the use of changes in reserves exchange as a proxy for interventions by analyzing the correlation between interventions and international reserves of central banks. His paper concluded that changes in reserves are positively correlated with central bank interventions. His results have recently been supported by Suardi and Chang (2012) who have found that variations in international currency reserves of central banks are a good proxy for interventions. Variations in international reserves were used by Taylor and Sarno (2001) and Hodgson (2011).

We retain as variable for canadian and swiss interventions, the first difference in logarithm of international official reserves in US dollars as specified by Hodgson (2011). Using a theoretical macroeconomic model similar to the one of Taylor and Sarno (2001) and Adler and Mora (2011), we do not explicitly test through which channel interventions work, but simply if they affect the exchange rate variation. The central hypothesis is that intervention affects the exchange rate.

However, the decision to intervene is not independent of the movements in the exchange rate. Moreover, even after a central bank has decided to intervene, the quantity of currency it buys or sells and its timing will typically depend on the response of the exchange rate to its initial trades (Kearns and Rigobon,2005).Some papers have attempted to solve the problem of endogeneity by using high frequency data such as intraday data. The motive for using such data is that if the data are sampled at a higher frequency than the decision to intervene, then the contemporary relationship between interventions and the exchange rate would not be endogenous, but doubts that high-frequency data estimates are poorly informative about the persistent effects of interventions. According to Blanchard et al. (2015), low-frequency data such as quarterly data would be more appropriate for studying the macroeconomic effects of interventions we instrumentalize the intervention variable to mitigate the endogeneity problem by using the lagged international reserves.

The sample period runs from January, 1980 to september, 2014 for Canada and January, 2000 to september, 2014.

The theoretical equation is expressed as:

$$\Delta E_{i,t} = \varepsilon + \theta \sum_{P=1}^{2} I_{i,t-p} + \lambda X_{i,t} + \nu_{i,t} \tag{1}$$

where ε, θ are parameters. E_t is the natural log of the exchange rate variation (domestic currency price in US dollar). Δ is the first difference operator and ν_t the error term.
I_{t-p} stands for the natural log of interventions of central bank measured by lagged international official reserves in US dollar. X is a vector of macro-economic variables. The vector includes: interest rate differential (difference between domestic and US interest rates), inflation rate differential (difference between domestic inflation rate and the inflation rate of the United States),the trade balance (difference between exports and imports) of canadian and swiss economy, the growth rate of Canadian and swiss economies, the returns of the S&P 500 and the S&P/TSX (Standard&Poor's Toronto Stock Exchange) and Swiss Market Index. Returns are the first log difference in percentage of price of the asset.
According to Suardi and Chang (2012), most of studies on reserves consider that the demand for reserves is a negative cost function of official reserves.We use the US short-term interest rate at the end of the quarter (interest rate on 3-month treasury bills) and the canadian and swiss short term interest rates.
According to Rogers and Siklos (2003), the dollar and the swiss franc are sensitive to the variation gap between the american and canadian and american and swiss inflation rate.
The model to be estimated is:

$$\begin{aligned}\Delta e_{i,t} = \gamma_1 + \gamma_2 I_{i,t-1} + \gamma_3 I_{i,t-2} + \gamma_4 (s_t - s_t^*) + \gamma_5 (u_t - u_t^*) + \gamma_6 y_{i,t} \\ + \gamma_7 X_{i,t} + \gamma_8 Z_t + \gamma_9 T_{i,t} + \nu_{i,t}\end{aligned} \tag{2}$$

$e_{i,t}$ denotes the log of the nominal exchange rate (against the US dollar) for country i at time t . We introduce the variable in first and second differences for ensuring that is stationary.The volatility is measured by the first quadratic difference in exchange rate returns (Dominguez, 1998).
$I_{i,t-p}$ is the lagged official intervention of central bank also used us instruments to address the endogeneity issue when $(s_t - s_t^*)$ is the difference between domestic (domestic policy interest rate) and US interest rates (interest rate on 3-month treasury bills).
$(u_t - u_t^*)$ is the difference between domestic inflation rate and US inflation rate.
$y_{i,t}$ is the domestic economic growth rate.
$X_{i,t}$ is the domestic assets returns. To capture the impact of domestic and foreign financial markets on the Switzerland franc and the Canadian

dollar, we use the returns of the Swiss Market Index (SMI), S&P/TSX (Standard&Poor's /Toronto Stock Exchange) returns.
Z_t is the returns of the S&P 500. Returns are built as the first difference as percentage of the log of asset prices.
$T_{i,t}$ is the domestic trade balance. Canada and Switzerland are major producers of raw materials. The demand for these products and their prices on world markets are also determinants of the value of the Canadian dollar and Switzerland franc. Canada and Switzerland are highly dependent on their exchange rate vis-à-vis the american dollar. The United States remains the second largest bilateral trading partner of Switzerland and the first bilateral trading partner of Canada . We introduce the trade balance of Canada and Switzerland to capture the impact of international trade on the exchange rate of each country. $\nu_{i,t}$ is the error term.

3 Results and discussion

Table 1 presents the results for instrumental variables regression analysis estimating the effectiveness of interventions on exchange rate volatility. The Sargan-Hansen overidentification test concludes on the validity of the instruments. (P-val=0.843). The results show that over the sample period, (first quarter of 1980 to the third quarter of 2014) the Bank of Canada's interventions were effective by changing the path of the exchange rate and reducing the volatility of the $ canadian. There is a negative relationship between interventions of Bank of Canada and the volatility of Canadian dollar exchange rate against the US dollar . The negative sign associated to the interventions coefficient means the Bank of Canada is acting on the exchange rate in the direction desired. An increase (decrease) in international official reserves induces a depreciation (appreciation) of the exchange rate. An increase of one percentage point of international official reserves is significantly associated with 0.019% exchange rate depreciation. Monetary interventions are therefore essentially stabilizing the volatility of the exchange rate of the Canadian dollar against the US dollar. Thus, in order to reverse a pronounced upward trend in the rate of its currency or to slow down the rate of appreciation of its currency, the Bank of Canada is selling on the foreign exchange market its own currency from its own cash in exchange for american dollar. That result confirms the the conclusions of Adler and Tovar (2011) and Daude et al (2014).
Furthermore,The results reveal a positive and significant relationship between the interest rate differential between Canada and United States and the volatility of the exchange rate. A 1% increase in the differ-

ence between Canadian and US interest rates induces an increase in the volatility of the exchange rate of 0.005%.
The coefficient of inflation rate differential remains very marginal and weak on the volatility of exchange rate. This is partly explained by the fact that in the beginning of 1980s, the inflation rate in United States experienced a downward trend because of the restrictive monetary policy and the control of inflation. Over the same period, the level of inflation has significantly decreased in Canada especially from 1984 to the decade 1990-2000. The variability of the inflation differential has been low between Canada and the United States over the 1980s and 1990s.
A surplus of the trade balance induces a variability in the order of 0.0045% of the exchange rate between Canadian and US currencies. Both american and canadian financial markets affect the canadian dollar differently. While the S&P 500 appears to be positively and significantly correlated with the volatility of canadian dollar, the S&P/TSX affects negatively the exchange rate. Investors' portfolios in the US financial market affect the volatility of the Canadian dollar. In fact, changes in interest rates applied to assets by affecting the costs and returns of different financial assets generally lead to speed movements in financial stocks as investors rebalance most of their portfolios. In doing so, the financial markets re-adjust very quickly and the exchange rate over-reacts strongly so that the financial markets can recover their balance. This creates exchange rate volatility. S&P/TSX negatively and significantly impacts the volatility of the Canadian dollar by reducing about 0.20% of the volatility of Canadian dollar against the US dollar.
equation (1) reports the estimation over the entire sample period. equation (2) and (3) report the Chow test results for 1980Q1-1998Q3 and 1998Q4-2014Q3.

Table 1: Estimation of canadian behavioural exchange rate equation

variables	equation (1)	equation (2)	equation (3)
official reserves	-0.0197*	-0.0151**	0.0161
	(0.0078)	(0.0045)	(0.0218)
inflation rate	0.0036	0.0041	-0.0022
	(0.0004)	(0.0003)	(0.0004)
growth rate	0.00451	0.00227	0.00667
	(0.0036)	(0.0026)	(0.0053)
S&P 500	0.247*	0.0164	0.720**
	(0.123)	(0.0898)	(0.279)
interest rate	0.0056*	0.0069**	-0.0047
	(0.0028)	(0.0015)	(0.011)
trade balance	0.0045**	0.0011	0.0096**
	(0.0013)	(0.00083)	(0.0018)
S&P TSX	-0.201**	-0.0919*	-0.320**
	(0.0619)	(0.0359)	(0.0706)
constante	-0.0869	-0.0157	-1.521*
	(0.145)	(0.0960)	(0.683)
Sargan and Hansen Test	0.813	0.128	0.1011
statistic F instruments	F =169,2	-F =133,4	F =238,6
R^2	0.413	0.467	0.574

The results of the estimation of the behavioral equation by instrumental variables reveal that the interventions of the Swiss National Bank are effective. One percentage point increase in international reserves is significantly associated with 0.33% of reduction for the volatility of the Swiss franc. We conclude that the interventions of the National Bank Switzerland stabilize exchange rate volatility of Swiss franc against the US dollar. In addition, the associated coefficient for interventions in the foreign exchange market is significantly stronger (0.33%) than canadian interventions (0.019%).

The health of the Swiss economy has greatly affected the Swiss franc. Growth rate is negatively and significantly associated to the volatility of the Swiss franc. The good health of the Swiss economy in recent years has protected the Swiss franc from high volatility. When we consider the exchange rate between the Swiss franc and the US dollar, we are led to question the impact of Swiss health on its exchange rate. A 1% increase in the growth rate reduces volatility by 0.21% against the dollar American. However, if strong growth in Switzerland is followed by vigorous growth in United States, the effect on the demand for Swiss francs will be weak.

Table 2: Estimation of swiss behavioural exchange rate equation

variables	equation (1)	equation (2)
official reserves	-0.330**	-0.328**
	(0.0301)	(0.0327)
inflation rate	-0.0623	-0.0676
	(0.0680)	(0.0691)
growth rate	-0.218**	-0.214**
	(0.0524)	(0.0532)
S&P 500	-0.0327**	-0.0317**
	(0.00952)	(0.00998)
interest rate	-0.0781	-0.0744
	(0.0637)	(0.0663)
trade balance	-0.0208***	-0.0193
	(0.0122)	(0.0128)
SMI	-0.0257***	-0.0257***
	(0.0138)	(0.0138)
constante	0.0323	-0.0126
	(0.145)	(0.0960)
Sargan and Hansen Test	0.4797	0.5255
statistic F instruments	F =205.7**	F =184.3**
R^2	0.794	0.795

Furthermore, US and Swiss financial markets significantly affect the price of the Swiss franc against the US dollar. S&P 500 returns negatively and significantly reduces 0.032% volatility of the Swiss franc.

4 Conclusion

This paper is particularly interested in the effectiveness of Canadian and Swiss central bank intervention in the foreign exchange market. The recent excessive movements in the exchange rate of several economies relative to the US dollar have seen most monetary authorities intervene in the foreign exchange market to support their currencies.

The choice of Canada and Switzerland is based on a number of reasons: the Canadian and Swiss economies have similarities and divergences. They are small open industrialized economies. Moreover, these two economies have an inflation target in monetary policy formulation and their currencies are considered to be quite sensitive to factors such as the interest rate and inflation differentials vis-à-vis the United States. Finally, as divergences, Canada's policy is to intervene on the foreign exchange market in a discretionary rather than a systematic way, and only in exceptional circumstances when the Swiss National Bank is reputed to be one of the most interventionist central banks in the world. The interventions of the two central banks were effective and stabilizing the exchange rate of the two economies vis-à-vis the US dollar. Although

the economic literature presented in this study mentioned the various intervention channels, our study focused mainly on assessing the effectiveness of the interventions of the two central banks on their respective currencies. Subsequent works may involve explicitly testing which channel seems more effective in impacting exchange rate volatility through interventions.

References

[1] Adler, G. et C. T. Mora(2011). *Foreign Exchange Intervention : A Shield Against Appreciation Winds ?* IMF Working Papers no. 11/165, International Monetary Fund.

[2] Aguilar, J. et S. Nydahl (2000). *Central Bank Intervention and Exchange Rates : The Case of Sweden.* Journal of International Financial Markets, Institutions and Money,vol. 10, no. 3-4, p. 303-322.

[3] Basu, K. et A. Varoudakis (2013) *" How to Move the Exchange Rate If You Must : The Diverse Practice of Foreign Exchange Intervention by Central Banks and a Proposal for Doing it Better* . Policy Research Working Paper Series no. 6460, The World Bank.

[4] Beattie, J. F. F (1999). *An intraday analysis of effectiveness of foreign exchange interventions,*. Journal of International Money and Finance, vol. 12, no. 4, p. 368-389.

[5] Blanchard, O., G. Adler, et I. de Carvalho Filho. (2015) *Can Foreign Exchange Intervention Stem Exchange Rate Pressures from Global Capital Flow Shocks ?.* NBER Working Papers no. 21427, National Bureau of Economic Research.

[6] Canales-Kriljenko, R. G. (2003) *Official intervention in the foreign exchange market : Elements of best practise.* Journal of International Financial Markets, Institutions and Money, vol. 3, no. 3-4, p. 101-122.

[7] Chutasripanich, N. et J. Yetman. (2015) *Foreign Exchange Intervention : Strategies and Effectiveness.* BIS Working Papers no. 499, Bank for International Settlements.

[8] Dominguez, K. M. (1999) *The Market Microstructure of Central Bank Intervention.* NBER Working Papers no. 7337, NBER Working Papers no. 7337, National Bureau of Economic Research.

[9] Dominguez, K. M. et F. Panthaki (2006) *What Defines 'News' in Foreign Exchange Markets ?* . Journal of International Money and Finance, vol. 25, no. 1, p. 168-198.

[10] Dominguez, K. M. (2003) *The Market Microstructure of Central Bank Intervention.* Journal of International Economics, vol. 59, no. 1, p. 25-45.

[11] Egert, B. et L. Komarek (2006) *Foreign Exchange Interventions and Interest Rate Policy in the Czech Republic : Hand in Glove ?*. Economic Systems, vol. 30, no. 2, p. 121-140.

[12] Fatum, R.(2005) *Daily Effects of Foreign Exchange Intervention : Evidence from Official Bank of Canada Data.* EPRU Working Paper Series no. 05-07, Policy Research Unit (EPRU), University of Copenhagen. Department of Economics.

[13] Hodgson, D. J. (2011). *A Test for the Presence of Central Bank Intervention in the Foreign Exchange Market with an Application to the Bank of Canada ,*. Empirical Economics, no 41 : 681-701.

[14] Kearns, J. et R. Rigobon. (2005) *Identifying the Efficacy of Central Bank Interventions : Evidence from Australia and Japan.* Journal of International Economics, vol. 66, no. 1, p. 31-48.

[15] Kim, D. et J. Sheen. (2007) *Consumption Risk-Sharing within Australia and with New Zealand* . The Economic Record, vol. 83, no. 260, p. 46-59.

[16] Kim, S.-J., T. Kortian, et J. Sheen (2000) *Central Bank Intervention and Exchange Rate Volatility Australian Evidence.* Journal of International Finan- cial Markets, Institutions and Money, vol. 10, no. 3-4, p. 381-405.

[17] King, M. R. (2003) *Effective Foreign Exchange Intervention : Matching Strategies with Objectives* . International Finance, vol. 6, no. 2, p. 249-271.

[18] Menkhoff, L. (2010). *High-Frequency Analysis Of Foreign Exchange Interventions : What Do We Learn ?*. Journal of Economic Surveys, vol. 24, no. 1, p. 85-112.

[19] Morana, C. et A. Beltratti. (2000) *Central Bank Interventions and Exchange Rates : an Analysis with High Frequency Data* . Journal of International Fi- nancial Markets, Institutions and Money, vol. 10, no. 3-4, p. 349-362.

[20] Neely, C. J. (2001) *The Practice of Central Bank Intervention : Looking under the Hood.* Economic Review, no. May, p. 1-10.

[21] Park, S. G. (2008) *Solving Endogeneity in Assessing the Efficacy of Foreign Exchange Market Interventions.* Journal of International Money and Finance vol 7,no. 7-8, p. 201-222.

[22] Rogers, J. M. et P. L. Siklos. (2003) *Foreign Exchange Market Intervention in Two Small Open Economies : the Canadian and Australian Experiences.* Journal of International Money and Finance, vol. 22, no. 3, p. 393-416.

[23] Taylor, M. P. et L. Sarno. (2001) *Offcial Intervention in the Foreign Exchange Market : Is it Effective and, if so, How Does it Work ?.* Journal of Economic Literature, vol. 39, no. 3, p. 839-868.

[24] Suardi, S. et Y. Chang (2012) *Are Changes in Foreign Exchange Reserves a Good Proxy for Official Intervention ?*. Journal of International Financial Markets, Institutions and Money, vol. 22, no. 4, p. 678-695.