

INTERNATIONAL RESERVES AND STERILIZATION IN INDEBTED AND DOLLARIZED COUNTRIES: AN EFFECTIVE MONETARY POLICY?

Layal MANSOUR

Université Lumière Lyon2-Gate St Etienne-France
mansour@gate.cnrs.fr

Abstract

The primary aim of this paper is to explore the effectiveness of Hoarding International Reserves and Sterilization for dollarized and indebted countries such as Turkey and Lebanon, by measuring the sterilization coefficient, and the offset coefficient. It also focuses on exploring the link between the sources of Reserves and the external debt. Using quarterly data collected from the International Monetary Fund and from the Central Banks of Turkey and Lebanon between 1995 and 2010, we applied a 2SLS regression models and we identified explanatory variables that enabled us to estimate the aforementioned coefficients. Our results showed that despite their theoretical practice of sterilization policy, economic constrains of these countries contribute to weaken the efficacy expected from monetary policies.

Keywords: Monetary policy, International Reserves, Foreign Liabilities, Dollarized countries, Turkey, Lebanon.

JEL: E52, E58, F30, F34

1. BACKGROUND

Hoarding of international reserves (IR) is often conceived as exclusive to the emerging market countries (EMC). They shared around 65% of global reserves in 2008. In 2010, six Asian countries¹ were among the world's largest holder of IR. The basic source of the IR growth is the persistent current account surplus. The first mainly reason for hoarding IR, as described by Aizenman and Marion (2004), Calvo (2006), Aizenman and Lee (2007, 2008) and Aizenman et al (2010), is that it offers a precautionary self-insurance against financial crisis². In fact, those

¹ China, India, Taipei, Korea, Singapore and Hong-Kong.

² According to these authors, International reserves are considered as buffer stock, which allows greater flexibility of exchange rates and provides domestic authority with access to hard currency to cover basic living expenses and mitigate to adverse consequences of capital flight.

countries have suffered from sudden stop crisis, which caused a *psychological impact*³ in the region, and made EMC look for a buildup ample war chest of IR to protect themselves eventually against a new same type of crisis. The second mainly reason of hoarding IR is that it occurs a mercantilist export promotion. This means that buying foreign currencies permit to hold down domestic currencies and therefore improve external competitiveness and promote exports. Finally, Calvo and Reinhart (2002) explain that growth of IR offers exchange rate stability after systematic foreign market interventions.

The process of hoarding IR is followed by a policy called sterilization. When a Central Bank (CB) decides to buy IR, it will either add to the fund by increasing the Reserve of Monetary Base (MB) also known as Reserve Money (RM), which is potentially inflationary, or reduces its Net Domestic Assets (NDA), which sterilize/neutralize the impact on Reserve of MB⁴. Countries, which hoard IR also sterilizing them, this trend started in the 90s. Therefore hoarding IR and Sterilization are complementary policies. The success of hording IR was so remarkable in the recent years that it became more and more desirable. Thus, post crisis countries that were previously expressing the “*fear of floating*” described by Calvo and Reinhart, (2002), are nowadays expressing the “*fear of losing International Reserves*” as mentioned by Aizenman and Lee (2007).

However the efficiency of these policies is not automatically guaranteed. First, the implementation of the monetary policy should be compatible and matches with the internal economy of the country and respects the context of Mundell Trilemma⁵, called by Obsfeld et al (2004) “the guide of the political structure”. In addition to the latter, the financial markets must be developed and the instruments used in sterilization should be liquid, otherwise, according to Caballero and Krishnamurthy (2001), IR and sterilization policy become a sort of “International Liquidity Illusion”. Second, as proved in several studies of authors cited above, the domestic and foreign bonds should be perfect substitutes and the domestic interest rate should be less than the international one (otherwise the interest cost of sterilization bond becomes unsustainable). Finally, an adequate level of hoarding IR for every country should be determined⁶. The “Grennsparn-Guidotti” Rule⁷ was considered as

³ Expression used by Aizenman et al 2010

⁴ Indeed, the Central Bank can bring out the effect of hoarding on the monetary base in several ways, including the sale market instruments such as government bonds or use the swap or other.

⁵ Mundell Trilemma explained the impossible to match simultaneously financial integration and stability of exchange rates with a monetary independence.

⁶ The ratio IR on Gross Domestic Product (GDP) can only determine a measure of IR accumulation, but this ratio cannot express the adequate level of hoarding IR

the most adherents and empirical support, which consists of hoarding IR that exceeds the total short-term external debt⁸. Recently, Obsfedl et al (2009) mentioned that despite the focus on the “Guidotti- Greenspan” rule and sudden stops in the literature, short term external debt is not a significant predictor of reserves holdings, though another variable often considered in more traditional models, the Trade/GDP ratio is. Briefly, either the first or the second ratio, the inclusion of Trade Balance and external debt should be considered.

2. INTRODUCTION

Some countries like Lebanon and Turkey are sharing the same post-crisis EMC behavior, increasing IR/GDP and sterilization. Turkey and Lebanon are of the highest holder of IR, ranked respectively the 17th and 27th if adding Gold⁹. The IR minus gold in GDP ratio in Turkey exceeds the 30%, and about 70% for Lebanon. The latter is considered having the 9th highest IR/GDP ratio in the world¹⁰ exceeding the ratio in China, Malaysia, Korea, and some other EMC. But Turkey and Lebanon internal economic structure are basically different from the EMC; suffering from almost the pre-crisis EMC flaws: 1- An important deficit Balance of Payment which depletes the stock of reserves and/or forces monetary authority to borrow reserves. 2- A high foreign liabilities which reduce the efficacy of IR as explained above and increase more and more debt (Calvo 1990). 3- A high dollarization rate (financial dollarization and/or currency substitution) going from about 30% in Turkey to 70% in Lebanon; due to the degree of country trust and currency trust. Thus, the condition of perfect substitutability of domestic bonds and foreign bonds is rejected. Eishengreen and Hausman (1999) and several authors later, called the 2 lasts cases using the term of « Original Sin¹¹ », to describe the impossibility for a country to borrow abroad in its local currency and its risky consequences.

Lebanon and Turkey are a sample of countries that are facing a paradox between the *buffer stock* expected by accumulating and sterilizing IR; and the possible vulnerability to crisis expected by the *Original Sin*.

⁷ Former chairman of the Federal Reserve Board, Alan Greenspan, and former deputy minister of finance for Argentina, Pablo Guidotti, published an academic paper in 1999 that suggested, to avoid a default, a country needs to maintain hard currency reserves equal to at least 100% of their short-term (maturing in the next 12 months) foreign debt.

⁸ Inn Jeanne and Rancière, 2006

⁹ According to the CIA World Factbook, 2011

¹⁰ If we add gold hold by the Central Bank (excluding the part in the IMF and UCB), Lebanon becomes the 3th holder in the world on international reserves relatively on his GDP.

¹¹ Untill 2005, definition of “original sin” has been modified several times by Eishengreen and Hausmann and others authors. It is now associated to dollarized countries with foreign liabilities.

Most of the previous studies focused on the exchange rate regime and the interest rate (the interest rate and its evolution is related to the exchange rate regime) to conclude conditions of efficiency of IR and sterilization monetary policy. In this paper, we emphasized on the Foreign Liabilities and the dollarization rate. Using a 2SLS regression model, we estimated the sterilization coefficient of Lebanon and Turkey, which consists of neutralizing the effect of the increase in foreign reserve (FR) inflow by reducing the Net Foreign Asset (NFA). We also estimated the offset coefficient of the capital flow equation, consisting of measuring the fraction of policy-induced change in the bank reserves, which is offset through the capital account. We concluded that although monetary policy of sterilization seems to be practiced like in the EMC, the offset coefficient indicated the effectiveness of such application. More precisely, the “Original Sin” characteristics affect the monetary policy and contribute in the reduction of the effectiveness of the monetary policies that are being used. In addition, decomposing the source of FR inflows, we found that monetary authority integrate partially the external debt, which defy the basic and theoretical definition of capital inflows of EMC.

3. ESTIMATION OF STERILIZATION AND OFFSET COEFFICIENT

3.1 Monetary Policy Reaction Function

We expressed the monetary policy reaction function from changes in NDA held by monetary authorities, and from changes of capital inflows NFA coming from abroad: $\Delta NDA = \alpha_1 + \beta_1 \Delta NFA + \delta_i X_i + \varepsilon_i$ (1)

where X_i represents other exogenous variables, which can affect the equation of the monetary policy reaction function. Thus, β_1 represents the sterilization coefficient. If $\beta = -1$, ΔNFA represents a full sterilization of reserves. The CB grants domestic credits to facilitate the increase of money demand (due to GDP growth) but prevents the expansion of domestic credit from NFR. If $-1 < \beta < 0$, there is a partial sterilization. The variables percentage change in GDP is always considered. In our study, we will study the impact of countries dependency on foreign currencies due to debt and due to local market demand, on the monetary reaction function. The MM is calculated by dividing the total M2 to RM. This variable argues that the control of money supplies relies on the authorities being able to control the base. It is therefore considered in several studies as an indicator of the largely impact of creating or withdrawing RM. But in a case of a (unofficial) dollarized country such Turkey and Lebanon where the dollarization rate is relatively high, the definition of Broad Money should be modified and corrected, then Effective Broad Money should be calculated (Feige, 2003). In fact, when the saving account in Commercial

Bank is more expressed in foreign currency than in local currency¹², and when foreign currency in circulation -also known as “currency in hand” - is used as a medium of exchange, therefore, foreign currency deposit and foreign currency in circulation should be included in broad money aggregates. Therefore, in our calculation, we used first of all the Broad Money (MM); and then we used the Effective Broad Money (MMY), which consists of including the Foreign Currency in Circulation¹³ to see if there is any difference in results. The Interest rate “ITR” on T-bills of the Ministry of Finance, with one-year maturity is used in our function as an exogenous variable to measure the interest rates in the domestic financial market. This variable has been chosen as a regulated instrument and because of its important role in dollarized countries where US Dollar demand is high. The domestic Interest rate should be more attractive than the external one; therefore the domestic interest rate is strictly constrained by authorities to compete with US Dollar interest rate.

3.2 Capital-flow Equation

We estimated the impact of the Change in Net Domestic Asset (ΔNDA) on Changes in Net Foreign Asset (ΔNFA): offset coefficient. The NFA becomes the dependent one, which represents the ΔNFA in the CB's NFA as a proxy for capital inflows, while the main explanatory variable is ΔNDA , reflecting the effects of monetary policy. Other exogenous variables that may affect capital inflows are represented by vector Z_i in the equation: $\Delta NFA = \beta' \Delta NDA + \delta' Z_i + \varepsilon_i$ where β' is the offset coefficient going from zero to -1. If β' is equal to -1, this means that the sterilization policy is totally inefficient. In other words, every reduction in NDA is compensated by an equal increase in NFA, while the supply of money in the system remains unchanged and vice versa; thus, sterilization becomes ineffective, as described by Christensen (2004).

When the offset coefficient is equal to zero, this means that measures undertaken in the domestic market did not result in additional inflows. Variables used in the capital-flow functions to interpret the offset coefficient are known as control variables because of their role of motivating the capital inflow to the country. Montiel and Reinhart (1999)¹⁴ described the capital-flow function and called control variables incorporating as “push versus pull”¹⁵. Referring to their studies we

¹² The ratio foreign currency deposit / total deposit > 30%

¹³ In the sum of M2, we should add the M2Y which takes into consideration all foreign currency deposit (including accounts) of residents (real sector entities).

¹⁴ Inn Ouyang and Rajan, 2005

¹⁵ It consists in general of seven variables: 1- the M2, 2- the inflation, 3- the exchange rate, 4- the high lagged real output, 5- the high government expenditure, 6- the high exchange rate adjusted in the interest rate and 7-the

included, as exogenous variables, the percentage change in GDP because, theoretically, the GDP growth influences on money. We also included the ITR and MM and/or MMY (Broad Money, and Effective Broad Money in two steps as explained above) because we consider that facing excessive monetary expansion will push down the interest rate and the CB response by using the foreign exchange market (i.e. change in the NFA) while changing the monetary policy instruments at the same time (i.e. changing in NDA). In this paper, the foreign liabilities were included in our capital flow function, because of the following facts: First, increasing in debt may spur additional capital inflows directly (in the foreign market) and indirectly (if the government is financed by domestic banks that raise the necessary funds abroad). Second, because the BP deficit of Lebanon and Turkey may results in a contraction of bank reserves by an identical amount.

3.3. Balance of Payment and its Components

Theoretically, inflows coming from abroad are from Current Account (CA) and capital account (K). Therefore, $\Delta NDA = \alpha_1 (CA + K) + \delta_i X_i + \varepsilon_i$ (2) Considering that the Balance of Payment (BP) is the sum of CA balance and K balance (CA + K) and is equal to the change in the central bank's NFA, which is approximated by the change in Foreign Reserves, the function (2) becomes written like function (1). Based on the study of Aizenman and Glick¹⁶ (2008), we estimated the essential sources of NFA, by expressing the change in the NDA using the following equation: $\Delta NDA = \alpha_1 + \beta_1 CA + \delta_1 K + \delta_i X_i + \varepsilon_i$ In our paper, in addition to the current account and the capital account, we included the external debt for two reasons: First, because the BP of representative countries is deficit and literature talk about borrowing external debt as the only alternative for accumulating NFA. Second, because the trends of hoarding foreign reserves and the foreign liabilities seem to be similar. In Lebanon, the important positive ΔNFA corresponds to the dates of new engagement in foreign currencies. In Turkey, the high positive ΔNFA corresponds to new engagement of external debt (66 Billion US Dollar in 1996 and 100 billion US dollar in 1999). In addition, since the Transition of the String Economy Program TSEP supported by the International Monetary fund and the World Bank in 2001 consisting of reducing the ratio of domestic debt/GDP and external debt/GDP, we can see that ΔNFA has decreased.

high volatility of exchange rate.

¹⁶ In their work, Aizenman and Glick they even divided K into Foreign Direct Investment and Non-Foreign Direct Investment .

4. RESULTS AND INTERPRETATIONS

We implemented the Augmented Dickey-Fuller Test to check for unit roots, and we found that all variables used are stationary. Variables are expressed in log-first difference form and are used in Two Stage Least-Square (2SLS) method. The Hausman endogeneity test¹⁷ has been carried out in order to check if there is problem of endogeneity. It has indicated that the OLS was not consistent, thus we used the 2SLS method.

4.1. Estimation of the Sterilization Coefficient

The estimated sterilization coefficient in Turkey and Lebanon is -0,97 and -0.81 respectively. Lebanon's sterilization is partial while Turkish CB does almost a complete sterilization¹⁸ of capital inflow. The GDP growth was positive and statistically significant in Turkey. Knowing that the sterilization coefficient is close to "-1", this indicates that the Central Bank supplies liquidity to the economy by increasing its claims in response to greater economy activity. In other way, a stronger economic activity requires a large volume of money and transactions, thus monetary expansion. GDP Growth is not statistically significant in Lebanon as the sign was negative. As for the other variables, we included the MM. It was statistically significant in Lebanon. The negative sign indicates that the higher MM, the more the CB will reduce its NDA so that in order to respect the counter inflationary objective of monetary policy. The sterilization coefficient increased from "-0.81" to "-0.95": this appears to be a direct response to inflation pressure. MM was not significant for Turkey. When we introduced the MMY, the variable was statistically significant in both countries. The coefficients of MM2 for Turkey and Lebanon were -1.21 and -1.3 respectively, pushing the sterilization coefficient to -1.03 and -0.97 respectively; thus showing the important impact of dollarization rate on the monetary reaction function. The variation of the Growth external debt, were statistically significant, and both had a negative sign. This can be explained by the accumulation of the FR coming from the external debt, during the deficit financed by the government borrowing in foreign currencies. The Interest rate was statistically significant for turkey and the negative sign indicates that the higher domestic interest rate, which induces higher capital inflows, requires stronger sterilization in the sense of reducing the central bank's NDA. Finally, including all variables in a regression, all variables were significant, and the sterilization for both

¹⁷ In fact, Ouyang, Rajan and Willet 2007 work on seeking to control for the possible endogeneity of the explanatory variables on sterilization regressions through instrument estimation, and they didn't find much effect on coefficient magnitudes and their standard errors, as compared to OLS. Inn Aizenman et al 2008.

¹⁸ The sterilization coefficient is nearly equal to -1

countries becomes almost complete.

4.2. Estimation of the Offset Coefficient

The offset coefficient for Turkey and Lebanon becomes -0.70 and -0.64 respectively. The offset coefficient is lower than the sterilization coefficient, this result indicates that the CB's sterilization policy, which is reflected in the reduction of NFA and withdrawal of RM through the reserves requirement instrument or open market operation, led only partially to additional capital inflows and ultimately to the increase in the central bank's NFA. The lower value of the offset coefficient compared to the sterilization coefficient indicates a certain degree of independence of monetary policy on neutralizing capital inflows. Once we add exogenous variables like we did in the previous equation, the offset coefficient becomes higher resulting in less effective sterilization policy. The MMY is more significant than the MM (MM is not significant in Turkey), which implies the impact of the foreign currencies in both equations. The sign of MMY and INTR is negative, which means that a rise of MMY might increase the domestic money and push interest rate down, hence reducing capital inflow. The variation of GED is significant too; in fact, higher is the deficit of BP, higher increasing the external debt will cover it. Finally, including all variables, the offset coefficient becomes -0.8 for Turkey and -0.92 for Lebanon. The offset coefficient is a little bit lower than the sterilization coefficient in Turkey and almost the same in Lebanon. This latter shows that almost every "one" unit of FR sterilized is offset. Sterilization policy is totally not effective in Lebanon, while it is very weak in Turkey. The GDP was not statistically significant for both despite its positive sign, which means that the growth of the domestic economy was not so strong to be accompanied by monetary expansion.

4.3 Sources of NFA

Only the coefficient of CA was statistically significant for Turkey. As for Lebanon, the BP account (Export) wasn't significant. In fact, despite the deficit of BP for both countries, Turkey's situation is much better than Lebanon's, and the deficit is remarkable lower. This difference explains the significance of the CA for Turkey. We should recognize that the replacement of CA and K by Export in the case of Lebanon makes the estimation and the conclusion not very robust, but only gives a general idea. The more the BP is decomposed, the more the source of NFA is precise. However, when we included the variation of the external debt, we had statistically significant results with a negative sign for both countries, which confirm that when the BP is deficit, borrowing foreign inflows is an alternative solution of foreign reserves. Therefore, monetary authority monetizes the external debt resulting in reducing the NFA.

5. IMPORTANT REMARKS

1-It should be noted that the sterilization coefficient and the offset coefficient are parameters determining the stance of monetary policy only but not the full meaning of monetary policy¹⁹. If we limited the definition of sterilization's efficiency to Disyatat and Galati (2005), we would only interpret the efficiency of the foreign exchange interventions (i.e. conversion in capital inflows) only by measuring the extent to which they have been sterilized (i.e. quantifying their impact on RM only). However, the efficiency of sterilization and especially the efficiency of the foreign intervention depend on many other macroeconomic and financial variables and on market conditions.

2- Our Paper treated precisely the impact of foreign liabilities and dollarization rate on the sterilization's policy, especially for countries with trade deficit, which induces external debt growth. We estimate the sterilization coefficient to notice if it exceeds the value of the offset coefficient to see if sterilizing capital inflows policy induced partially or totally additional inflow of foreign funds. In some studies, the inflation rate volatility and/or exchange rate volatility although considered as an anchor of monetary policy is/are added as exogenous variables affecting the monetary policy reaction function and the capital flow equation. Concerning the Inflation rate, quarterly data of inflation rate was not given, and depleting annual data to monthly or quarterly was very difficult, due to its high volatility from a period to another. Concerning the exchange rate volatility, we should precise that despite their similar De Jure floated exchange rate regime, Lebanon's exchange rate regime is De Facto pegged to US dollar. Thus, since september-1999, the exchange rate volatility in Lebanon has always been zero.

3- IR and Sterilization studies are always completed with the cost of sterilization to estimate whether it is successful or not (in term of *tradeoff between control over bank reserves and control over foreign*) and/or whether it is in long term or short term sustainable or not. Sterilization cost based on interest rate studies will be treated in a paper separately.

6-CONCLUSION

Including the Dollarization rate in the hoarding monetary aggregate, and the foreign liabilities as exogenous variables, results showed that sterilization policy becomes less/not efficient. Every unit of net domestic asset decreased by the Central Bank for Turkey and Lebanon from the sterilization policy is almost replaced by additional unit of foreign exchange inflows and contributes to increasing the

¹⁹ Requires information about changes in private and public Banks' reserve requirement, discount etc.

International reserves of the NFA. These inflows need to be sterilized again, thus creating a vicious circle of rising capital inflows and the need for additional sterilization. In addition decomposing the FR into BP's account, sterilization coefficient obtained was not significant as previous ones, which in theory should be similar. However we found a significant negative relation between the gross external debt and the decreasing of the NDA, thus resulted by monetizing debt (Calvo 1990). Lebanon and Turkey, which suffered from a high dollarization rate, and a deficit BP, increase the IR (Dominguez 2009) by borrowing reserves after being depleted. This will on one side, increase the external debt (Obsfeld et al 2009), and on the other side, if IR is sterilized, it will prompt rises in domestic debt by monetizing it (Calvo 1990). The latter is as serious and as dangerous as the external debt (Calvo 2006), it represents the key barriers to economic progress and weakens the central bank role. We conclude that country which basically suffers from economic constraints; sterilization of IR becomes a source of macroeconomic vulnerability.

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²⁰ authorized for distribution by Pablo Moro