# THE ADEQUACY LEVEL OF FOREIGN RESERVE HOLDINGS: A NEW APPROACH

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Aknowlegments

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**Note**: The views expressed in this working paper are those of the authors and do not necessarily reflect the views of the Bank of Albania.

The paper is based on data published up to 2012Q4.

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## ABSTRACT

This paper examines the optimal level of foreign reserve holdings for Albanian based on optimal model approach proposed by Gonçalves (2007). The model is grounded on a set of economic fundamentals and crisis inspired indicators, such as debt level, capital account and sudden stops patterns, risks to large deposit withdrawals during crises, which has achieved less attention previously. Our results show that actual level of international reserve in Albania is closed to optimal level especially during the last two years, but below the optimal level if the government chooses to fully guarantee the foreign currency deposit withdrawal. Consequently, in the medium term, Bank of Albania should try to increase its foreign reserves in line with the optimal approach.

Keywords: Foreign reserve holdings, Current Account Adjustment; Short-term Capital Movements,

JEL Classification: C52, F32.

# I. INTRODUCTION

Over the last decade, the stock of global foreign reserve holdings (alonaside with China) has increased considerably. Thus, if at the beginning of 2003, their stock on the global level was approximately \$3.1 trillion, in 2012 it reached approximately \$11 trillion or nearly 24% of the World Domestic Product [IMF (2013)]. These developments, but also the impact that the recent global financial crisis had on further accumulation of foreign reserves, once again highlighted the main motives of their retention. On the one hand, the crisis highlighted once again the importance of foreign reserves as a crucial instrument to boost consumption<sup>1</sup> and to inject liquidity in the economy. On the other hand, this crisis urged developed and developing countries to re-schedule their strategies on managing the reserve holdings, and accounting the various potential risks that may hit the economy. However, still nowadays, there is not yet a full consensus on the optimal stock based on the perspective of the precautionary and opportunity cost inspired motives.

The main reasons for reserve holdings consists those of international collateral function; providing foreign currency liquidity for government transactions; limiting exchange rate volatility "leaning against the wind"; ensuring adequate capacity for foreign exchange market intervention; financing balance of payments (providing buffer for balance of payments shock); expanding the set of domestic monetary policy instrument (e.g. in countries with low supply of government securities in countries with low public debt); increasing national wealth and generating revenue; lender of last resort in foreign currency; providing ultimate resources for extreme global financial collapses; and managing liquidity shortages on foreign currency swap market [Antal and Gereben, (2011)].

The theoretical literature review identifies that the main approaches to assess the optimal level of reserve are based on: (i) the international rule-of-thumb metrics, which determine the adequate level based on the

<sup>&</sup>lt;sup>1</sup> During this time global reserves dropped from a peak of almost \$7.5 trillion in mid-2008 to just under \$7 trillion by February 2009, primarily as countries tried to manage currency depreciation and used reserves to fund stimulus packages. By the end of the first quarter of 2009, foreign reserves had once again begun to rise and that trend continued in 2011 and 2012.

main assumption of reserve serving as an insurance against balance of payment shocks. The most well-known rules-of-thumb are: "imports rule", "M2 rule"; "Guidotti-Greespan rule"; etc; (ii) the Buffer Stock model of Frenkel and Jovanovic (1981) that treats optimal stock levels as a source for smoothing consumption to sudden stop of external credit and the fall of output that accompanied it; (iii) and the optimized model approach [Jeanne and Ranciere (2006), Gonçalves, (2007) and Valencia (2010)], where the optimal level of reserve is defined to mitigate the drops effect of output in domestic consumption during balance of payments and banking crises in dollarized economies.

Despite the theoretical background, assessing the optimal level of reserve is yet an open and continues debate among the main economic actors across the world, especially after the latest global financial crisis, where all countries have been affected by different shocks. Moreover, estimating the optimal level of reserve is an essential issue due to the importance that this policy instrument has for the monetary and exchange rate policies, to increase the market's confidence, to limit external vulnerability and to absorb different shocks during crisis times, etc.

In Albania, the accumulation of reserve holdings has been an integral part of the Albanian monetary policy to balance of payment approach, outlined as a bottom rule-of-thumb level sufficient to cover up to four months of imports of goods and services. Over the past two decades, the level held by monetary authorities in Albania has satisfied this ratio throughout each period and even exceeding it. By contrast, the empirical evidence on this topic in the case of Albania is limited, while it has received newly interest only recently through the studies by Manjani (2009) and Shijaku (2012). The former, focuses only on the rule-of thumb measures and comparison with other countries. The material presents evidence on developments related to the dynamics of foreign reserves in Albania, and makes a comparative analysis of reserves in Albania with that of other countries. The latter study, analyses empirically the buffer stock model of Frenkel and Jovanovic (1981) to which results show that the accumulation of reserve is driven by the precautionary motives and balance of payments needs<sup>2</sup>. The author finds that the reserve holdings have been relatively close to the optimal level. However, the approach followed by Shijaku (2012)

<sup>&</sup>lt;sup>2</sup> These results are also re-confirmed by Shijaku and Dushku (2014).

does not take into account the possibility that a country is exposed to risks beyond the balance of payments or other risks such as deposits withdrawal, currency risk, etc. Therefore, the focus of this paper is to determine the optimal level of reserve based on the approach of Gonçalves, (2007), by taking into account the characteristic of a small open and dollarized as Albania.

Based on our empirical results we find that the actual level of reserve is close with the optimal level to guarantee nearly 30% of deposit withdrawal in foreign currency. While a higher level of coverage of deposits withdraws would require a higher level of foreign exchange reserves over the medium term. This material contributes to empirical literature by providing a new approach to the calculation of the optimal reserve expressed as a ratio to GDP (Gross Domestic Product), which takes into account various potential risks posed by financial crises or of those linked to sudden stop of capital. On the other hand, this paper leaves out issues related to moral hazard issues, as result of reserve accumulation and those relating to the credibility of monetary policy.

The rest of the material is structured as follows. In section 2 we review some stylized facts on the accumulation of international reserve in Albania. In section 3 we present an overview of the related literature and our applied model. Section 4 discusses the results. Finally, section 5 provides some conclusions.

# II. STYLISED FACTS

A country's foreign exchange reserves includes all financial instruments denominated in a foreign currency that embody claims on non-residents and are readily available to the monetary authority. Foreign exchange reserves therefore refer to a portfolio of financial assets, from which the monetary authority's liabilities towards foreign entities are not deducted<sup>3</sup>. In most of the cases, foreign exchange reserves are not part of the monetary authority's (country's) net wealth, as they are funded by central bank or government debt. The holding of foreign exchange reserves, therefore, refers to the maintenance of a characteristically liquid gross asset pool financed by debt, which entails economic benefits as well as indirect and direct costs. Pursuant to Article 161, paragraph 1, of the Constitution of the Republic of Albania, Bank of Albania manages the foreign reserves of the Republic of Albania. Further, in the Monetary Policy Document for the period 2012-2014, it is emphasised that:

- "...Consistent with its monetary policy, as a guarantee to cope with the severe shocks on the real sector of the economy, and in order to safeguard the country's financial stability, the Bank of Albania is committed to holding a sufficient level of foreign reserve. In line with the best international practices, the Bank of Albania will determine the sufficient level of foreign reserve based on the concurrent observance of these two quantitative criteria:
  - the maintenance, in the medium run, of foreign reserve levels sufficient to cover at least 4 months of imports of goods and services; and
  - the maintenance, in the medium run, of foreign reserve levels sufficient to cover the short-term foreign debt of the Albanian economy.

In order to increase the level of foreign reserve and contribute to the stabilization and development of the domestic financial markets, the Bank of Albania may intervene in the domestic foreign exchange market. These interventions, however, will not reflect the monetary policy; they will neither affect nor prejudice the achievement of the primary objective of the Bank of Albania. The Bank of Albania will intervene in the foreign

<sup>&</sup>lt;sup>3</sup> Based on the International Financial Statistics (IFS) standard

exchange market in accordance with the relevant internal regulations. The latter are made transparent to the public...".



The data show an increasing trend of the stock of reserve holdings by almost more than doubling since the beginning of 1998, from 331 million Euros in 1998 to nearly 2,004 million Euros at the end of 2012 (Figure 1). Besides, this upward shift, during the year 2009 the stock was reduced by nearly 32 million Euros, or nearly -8% annual growth rate. This loss in stock level was made to accommodate the volatility of the exchange rate and to provide foreign currency liquidity to the banking sector, as we will see below. As such, the global crisis during the period 2007-2009 and the lag consequences in our economy reflected a new reserve management strategy to support the banking sector, as well the financial stability of the country. Furthermore, we have compared the level of reserve holding in Albania with the most well-known rule of thumb such as the import cover ratio, "Greespan-Guidotti" rule and the broad money (typically, M2) measures.

The import coverage ratio is the most traditional rule-of-thumb used to determine the level of stock of optimal reserves and shows the number of months of imports of goods and services that a country can hold if it experiences a possible sudden stop of capital inflows. This rule is widely applied to countries where the shocks mostly come from the current account. Based on this approach, most countries use as a sufficient benchmark level of foreign exchange reserves, that of ensuring to cover three or four months of imports of goods and services, even though empirical support for this benchmark is modest. In our case, as the single monetary authority, Bank of Albania has pre-determined the adequacy level of reserve holdings that covers 4 months of imports based on the Monetary Policy to Balance of Payment approach approved in collaboration with the IMF agreement and the Poverty Reduction and Growth Facility program. Bank of Albania has managed to successfully fulfil this benchmark level through the whole time, even though this ratio has been between 4 to 5 months of import coverage (see Figure 1).

Another standard international rule-of-thumb used to assess the adequacy level of foreign exchange reserves is the "Greesnpan-Guidioti" rule. This type of rule is used mainly as a standard indicator for emerging market countries. It proposes that reserve holdings should cover 100% of short-term external debt for one year. The short-term external debt is considered a potential risk for countries to penetrate foreign markets, and this indicator plays an important role in assessing the level of adequacy of reserves holdings. However, the formulation of this rule is arbitrary, because the duration of crisis could be much longer or shorter than one year, and because shortterm debt rollover rates do not fall to anywhere close to zero in crisis period. For this reason, some countries use an augmented version of this rule, meaning that the stock of foreign exchange reserves should also cover the current account deficit. In this way, the needs for external financing are better taken into account and a better overview of the risks is posed by the possibility of capital flight. In our case, (Figure 1), estimates show that over the last decade, the foreign exchange reserve expressed as the ratio of external debt coverage and current account deficit was above the rate set by Greenspan-Guidotir's rule, but this gap has been shrinking in recent years.

Holding foreign exchange reserves in relation to intermediate money (usually M2) tends to capture the risk of capital outflows due to the current account crisis, which may be associated with the outflow of residents' deposits. This indicator can be used as a measure of potential need for bank support in or after a crisis to offer higher liquidity external resources. Usually, this ratio is suggested to be around 5 up to 20% of broad money. Obstfeld, et. al. (2008), on the other hand, argue that a adequacy of reserve holdings should cover up to 50 % of M2. Nevertheless, this indicator is not very suitable for countries with a highly developed banking system. In our case, currently, the foreign exchange reserves holdings are nearly 42% of the M2, a rate that has been rising since 1998. In 2010, this rate was 44% due to the withdrawal of deposits from the banking system, as a result of the financial crisis and its effects on the economy.



Based on the analysis presented above, we showed that the stock of reserve holdings in Albania has been in line with the main rule-of-thumb, thus ensuring a sufficient level of reserves. However, the ratio mentioned above do not take into account other potential risks that may arise from banking crises or possible foreclosure of capital outflows and do not provide estimates for the optimal level of foreign exchange reserves.

# III. METHODOLOGY

Despite, the rule of thumb instruments presented above, two are the main theoretical approaches that deals with the adequacy level of reserve holdings of a country. The first approach is based on the "buffer-stock model" of Frenkel and Jovanovic, 1981, which considers the international reserves as a buffers stock to smooth unexpected and temporary imbalances in international payments. The second approach is based on optimal model approach developed by Jeanne and Ranciere (2006), which determines the level of reserve based on their role as insurance or as a buffer against balance of payment and banking crisis.

Based on first approach, the monetary authority should determine the optimal level of reserves by seeking to balance the macroeconomic adjustment cost with the opportunity cost of holding reserve. Theoretically, a country can decide to accumulate foreign exchange reserve to eliminate all or some of its consumption volatility, so in this case the level of reserves will increase with a country's risk aversion and output volatility. Empirical research on international reserves (Frenkel and Jovanovic (1981), Aizenman and Marion, (2002), Calvo (1998), Prabheesh, et. al. (2007), Bernard (2011)) by estimating reserve demand regression have confirmed a relatively stable long-run demand for reserves and a set of explanatory such as: economic size, exchange rate flexibility, opportunity cost, current and capital account vulnerability. Shijaku (2012) analyses the change and drivers of reserve holdings in the case of Albania and evaluates the optimal level from a cost opportunity perspective to which results confirm a long-run relationship between the level of foreign reserve and explanatory variables. The results showed that developments in current account are important drivers of reserve holdings and that the accumulation of reserve is in line with an increasing role of self-insurance and precautionary holding of reserves motives against the persistent current account deficit in Albania. Therefore, the approach estimation suggests that the level of optimal reserve holdings is more sensitive to precautionary rather

than mercantilist motives<sup>4</sup>.

The buffer-stock model and rule of thumb measures are criticized due to a lack of micro foundations in which are based. More recently several approaches have been developed based on optimization approach, where the level of reserve holdings is chosen to provide the optimal insurance for consumption against a sudden stop and a bank crisis. The most used framework is the approach developed by Jeanne and Ranciere (2006) that determine the optimal level of reserve by maximizing the welfare in a small open economy, by taking into account the probability of a sudden stop, the potential loss in output and consumption, the opportunity cost of holding reserve and the degree of risk aversion. In this paper, we are based on the approach followed by Gonçalves, (2007), as an augmented version of the model proposed by Jeanne and Ranciere (2006), which takes into account, among other things, the high level of deposits in foreign currency, as an inherent source of fragility of emerging economies and of the Albanian economy, taking into account the high level of dollarization in the country. A summary of this approach is given below.

In a simplified way, the role of reserves to smooth consumption over time can be given from national income absorption identities. Thus, real domestic absorption (At) in an open economy is the difference between real domestic output (Yt) and the trade balance (TBt), expressed as follows:

$$At = Y_t - TB_t \tag{1}$$

Where, trade balance is expressed as a function of financial account and change in reserves as follows:

$$TB_{t} = -CFA_{t} - IT_{t} + \Delta R_{t}$$
<sup>(2)</sup>

<sup>&</sup>lt;sup>4</sup> Similarly, Shijaku and Dushku (2014) yet again re-confirms that current account developments still exhibit a higher influence and are the main affecting force on the movements and accumulation of reserve holdings. Taking to account the effect of fiscal indicators, findings show that precautionary motives are the reason for reserve accumulation in the verge of persistent current account deficit and raising debt burden. Reserve was yet again found less sensitive regarding the opportunity cost and mercantilist motives but a higher adjustment coefficient implies a relatively more active reserve management strategy, in the verge of raising uncertainties due to financial and economic crisis.

Where, CFAt is capital-financial account, ITt is income and transfer from abroad and  $\Delta Rt$  is the change in reserves. If we combine equation (1) and (2), we can express domestic absorption as a function of domestic output, financial account, income from abroad and changes in reserve asset<sup>5</sup>.

 $A_{t} = Y_{t} + CFA_{t} + IT_{t} - \Delta R_{t}$ (3)

Intuitively, the equation above shows that cut of external credits due to a sudden stop, will results in a sharp drop of capital-financial account, persuading a fall in domestic absorption. If the effect of sudden stop will be accompanied by a crash on domestic output, we can expect that the effect on domestic absorption is higher. Thus, in order to protect consumption insurance and further cut on domestic absorption, a country can use its foreign reserves to offset the larger fall in the economic activity. The model by Goncalves, (2007) puts forward that the prudential role of foreign reserve is larger under high dollarization (euroisation) economies, due to the need to provide liquidity to the banking sector. To that, this model considers a "small open economy" that may face in discrete time a "sudden stop", defined as an exogenous loss of external credit. This sudden stop can be accompanied with other effects e.g. short-term foreign debt cannot be rolled over; a significant fraction of foreign currency deposit can be withdrawn from banking system; a fall in output and a depreciation of real exchange rate.

Based on this methodology<sup>6</sup>, the optimal level of reserve as a ratio of output,  $\rho$  is given as in equation 4. The main advantage of this model is that it has a closed form solution and gives a more realistic dynamic structure for holding reserve that came from crisis mitigation rather than crisis prevention.

 $|\Lambda|$ 

$$\rho = \lambda + \gamma + \frac{(1 - \gamma) \cdot \rho^{1/\sigma} \Delta q}{1 + [\rho^{1/\sigma} (1 + \Delta q) - 1] \cdot (1 - \Pi - \delta)} - \frac{\rho^{1/\sigma} \cdot (1 + \Delta q) - 1}{1 + [\rho^{1/\sigma} (1 + \Delta q) - 1] \cdot (1 - \Pi - \delta)}$$
$$\cdot \{1 - \frac{r - g}{1 + g} \cdot [\lambda + (1 - \Phi)\lambda_{D}] - (\Pi + \delta) \cdot (\lambda + \gamma)\}$$

<sup>&</sup>lt;sup>5</sup> In appendix I we have present the decomposition of real domestic absorption in Albania.

<sup>&</sup>lt;sup>6</sup> For a detailed explanation and derivation of optimal level of reserve, please refer to Goncalves, 2007

Where.

- $\rho$  is the optimal level of reserve as a ratio of output;
- $\lambda$  is the function of deposit withdrawal and short-term foreign currency debt, measured as  $\lambda = (\Phi - \alpha)\lambda_{\rm p} + \lambda_{\rm p} + \lambda_{\rm c}$ ;
- $(\lambda_{\rm p})$  and  $(\lambda_{\rm c})$  are respectively private and public short-term foreign currency debt;
- $(\phi a)\lambda_{D}$  is deposit withdrawal;
- $\phi$  is the function of resident and non-resident foreign currency deposits as percentage of total foreign currency deposit, SR and SNR, covered from government ( $C_p$  and  $C_{Np}$ ), such that  $\Phi = S_p * C_p +$  $S_{NR} * C_{NR};$ •  $\gamma$  is output loss;
- P is liquidity premium, that is function of  $\pi$ , probability of a sudden stop measured as  $\rho = (1 - \pi)(\delta + \pi)/\pi(1 - \delta - \pi)(1 + \Delta q);$
- $\delta$  is the term premium;
- $\Delta q$  is the real exchange rate depreciation;
- $\sigma$  is risk aversion;
- r is risk free;
- g is real long run growth.

The equation presented above balances the guasi-fiscal cost of holding reserve with consumption-smoothing benefits and states that optimal reserve are increasing with the magnitude of deposit withdrawals  $(\Phi \lambda_{\rm p})$ , private  $(\lambda_{\rm p})$  and public  $(\lambda_{\rm p})$  short-term foreign currency debt, the output cost  $(\gamma)$  and the likelihood of the crisis,  $\pi$ . Optimal level of reserves is positively related with the drop on consumption (caused from withdrawal of dollar deposits and sudden stop in foreign currency) and the higher the probability of such stop. Also, real exchange rate depreciation ( $\Delta q$ ) increases the burden of foreign currency liabilities, which led to further crash in consumption and higher need for reserves. To conclude the optimal level of reserves is negatively related with the cost of holding reserve or term premium ( $\delta$ ). In order to consider the characteristic of Albania economy the model needs to be adjusted to prevent some of the 2009's crisis patterns.

### IV. EMPIRICAL RESULTS

This section provides results with regards to the optimal level of reserve holdings in the case of Albania based on the methodology presented by Gonçalves, (2007), to which we have used Albanian data to calculate some main parameters and the rest of those are calibrated based on the theory. One key element of the optimal base approach is the identification of a crisis event. In order to identify a possible crisis event in the case of Albania, we have followed the methodology proposed by Eichengreen, Rose and Wyplosz, (1997), which estimate an Exchange Market Pressure index (EMPI)<sup>7</sup>, as follow:

$$\mathsf{EMPI}_{i,t} \approx \left[ (\mathbf{a} - \Delta \mathbf{e}_{i,t}) + (\mathbf{\beta} \Delta (i_{\mathsf{A}l,t} - i_{\mathsf{E}u,t}) - (\mathbf{\gamma} (\Delta i r_{\mathsf{A}l,t} - i r_{\mathsf{E}u,t})) \right] \tag{5}$$

Where,  $e_{i,t}$  denote the price of euro currency express in Albanian currency at time t; denotes reported and represent short term Euro area (Euribor 3 month average), denotes the ratio of reserves to narrow money (M1), and are the weights, which equalize the conditional volatilities of each component, as  $a = [(1/\sigma_e)/(1/\sigma_e + 1/\sigma_i + 1/\sigma_i)]$ . Furthermore in order to identify a crisis event, as Eichenberg, et.al. (1997) we have compared the EMP index in Albania with the threshold level defined as:

Threshold = 
$$\mu_{FMP}$$
 + 1.5\* $\sigma_{FMPI}$  (6)

Where,  $\mu$  is the average of the EMP index and  $\sigma_{\text{EMPI}}$  is the standard deviation. Based on our calculation during 2002-2012, the only crisis occurring is in 2009, where the level of EMP index is greater than the threshold level calculation in equation 6.

Also, we have analysed the developments in the Balance of Payment, External Debt level, foreign currency deposits and financial deepness to give an overall overview of the main macroeconomic indicators. Balance of Payment data, (see Figure, 4) indicate that most of current account (CA) patterns are dictated by trade balance, followed by current transfers (remittances), and at least by services

<sup>&</sup>lt;sup>7</sup> This index is estimated as a weighted average of exchange rate changes, reserve changes and interest rate changes. All these variables are measured relative to Euro area 17 (fixed composition), that represent our country reference.

and net income bal ances. Albania is classified as a net borrower given the country persistent CA deficit. The CA deficit peaked in the year 2008<sup>8</sup> at nearly 14% of GDP. The early sign of crisis were reflected through a CA adjustment in the year 2009, a tendency that has continued in the coming years to reach nearly 11% of GDP at the end of 2012.



<sup>8</sup> During 2008 this high level of current and financial account is due to higher infrastructure investment,

Meanwhile, capital and financial account (CFA) has increased from 4.7% at the beginning of 2002, in 17.5% of GDP during 2008, and at 8.2% at the end of 2012. The data show that CFA is mostly dictated by patterns in Foreign Direct Investment, followed by other net investments. The main responsible factor of such decline in the financial account is mainly due to the decrease in net other investments and deposit withdraws from the banking system. During year 2009, the financial account expressed as GDP ratio fell by 6.6 pp. This was the largest decline throughout the period, confirming the EMP index as the sudden stop event [Jeanne and Ranciere, (2006)<sup>o</sup>].

Regarding the debt patterns of public debt in Albania (Figure 5), at the end of the year 2012 it was 62% of GDP ratio. More than half of it consists of domestic liabilities, while external debt account to only 27% of GDP. The Ministry of Finance, based on better macroeconomic conditions, has attending during the last decade to implement a new strategy by issuing longer term debt. Therefore, the structure of debt burden has shifted to longer term debt, which in 2012 represents nearly 70% of domestic debt. However, as for the external debt developments, there is a growing tendency, both in terms of short-term and long-term maturity. During 2012, short-term external debt was nearly 12% of GDP.



<sup>°</sup> A sudden stop episode from the external credit is defined when the annual change of financial account to GDP ratio is greater than 5pp.

Another fact is related to the boosts in deposits in foreign currency (see Figure 6). Hence, prior to financial crisis in the year 2007, deposits in domestic currency consists nearly 67% of total deposits. After the crisis, during the period 2008-2012, there was a deposit structure change, shifting toward savings in foreign currency. As a result, deposits in foreign currency reach at 46% of total deposits, driving the country to be more exposed country against external drain.



In Table 1 we present the development of short-term foreign currency debt<sup>10</sup> and foreign currency deposit. These ratios are used to calculate alpha and lambda parameters in the case of Albania.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
$\lambda_{G}^{F}$	-	-	3.3	3.0	3.0	6.7	6.9	9.6	5.7	6.4	9.4	12.0
$\lambda_{p}^{\parallel}$	-	-	-	-	3.62	4.76	6.67	7.88	7.83	8.11	8.43	7.46
λ <sub>D</sub> <sup>///</sup>	15.7	15.2	14.5	15.7	19.1	23.0	27.9	25.5	27.7	32.6	36.0	37.8
S <sub>R</sub> <sup>N</sup>	-	-	-	-	-	89.9	96.0	95.6	95.5	96.9	95.6	96.3
S <sub>NR</sub> V	-	-	-	-	-	10.2	4.6	4.4	4.5	3.2	4.4	3.7
a_ <sup>VI</sup>									16.7	19.1	22.9	27.7
I.       public sector short-term foreign currency debt as % of GDP;         II.       private sector short-term foreign currency debt as % of GDP;         III.       total foreign currency deposit as % of GDP;         IV.       resident* foreign currency deposits as % of total foreign currency deposits;         V.       non-resident foreign currency deposits as % of total foreign currency deposits;         VI.       banks liquid foreign assets as a share of foreign currency deposit**;												

Table	1: Albania	specific model	parameters	(in	percentage)
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Data on the resident and non-resident credit loan are taken from the Monetary Policy Department. Disaggregated data started from 2006.

\*\* In the model, **a** represents the coverage of total foreign currency deposit (banks liquids foreign assets, (BLFA), as a ratio of resident deposits (Rd) plus non-resident deposits (NRd)), such as: a=BLFA/(Rd+NRd). In Albania, the drop of foreign deposits was due to the drop of resident foreign currency deposit, which accounts around 92% of total foreign currency deposits. So we have follow the same approach indicated by Goncalves, (2007) to maintain the same level of risk in all year of sample, we have assumed that in all previous year the composition of resident and non-resident deposit is the same as in 2012, correcting the coverage ratio as:  $a_v^{C}=BLFA/(Rd+NRd)=(BLFA/Rd)_{\gamma}*(Rd/(Rd+NRd))_{2012}$  Where,  $\gamma$  is the year under consideration.

Source: Bank of Albania and Ministry of Finance

Parameters	Baseline for Albania	Range of Variation (Jeanne and Ranciere, 2006)
Risk aversion, ( <b>o</b> )	2	1-10
Probability of a sudden stop, ( $\pi$ )	7.5%	0-25%
Accumulated output loss, (γ)	6.7%	0-20%
Term premium, (δ)	1.45%	0.25 %-5%
Risk free rate, (r)	2.6%	
Long run real GDP growth rate, <i>(g)</i>	5%	
Real exchange rate depreciation, ( $\Delta q$ )	8%	
Coverage of Residents deposits, ( $C_{R}$ )	100% (30%, 50%)	-
Coverage of Non-Residents deposits, (C <sub>NR</sub> )	100% (30%, 50%)	
Source: authors calculations		

#### Table 2: Calibrated parameters

<sup>10</sup> Total short term foreign currency debt is referring to private and public debt in a remaining maturity basis. Public foreign currency debt includes both domestic and external debt.

Table 2 presents some of the calibrated coefficients for Albanian economy following the main assumption made by Jeanne and Ranciere, (2006, 2009) and Gonçalves, (2007). Country specific measures, such as long-run output growth rates and output loss are calibrated based on the features of the Albanian economy. The main assumptions that we have made are presented following in more details.

Thus, the risk aversion parameter is set 2, which is a standard estimation in the business cycle literature. The probability of a crisis is calibrated at 7.5 % a year for Albania, which means that a crisis occurs every 15 years, the same as Gonçalves, (2007). Jeanne and Ranciere (2006)<sup>11</sup> estimated the probability of a sudden stop to be around 10%, which means that a crisis happens every 10 years. In Albania, during 1996-2012, despite1997 (pyramid scheme), the only crisis that we can identify based on the EMP index, is the year, 2009.

The average of risk free short term euro interest rate is set at 2.6%, which corresponds to the average return in reserve, measured by German Government Bond index during 2000-2012. While term premium is set at 1.45%, equal to the average rate of the differences between the yield on 10 year- Eurozone T-Bills and the key interest rate of ECB during 2000-2012. Long-run real GDP growth in Albania is calculated at 5%, which correspond to the average real GDP growth rate during 2000-2012. While the real exchange rate depreciation is calibrated at 8%, which corresponds at the same level of ALL/euro exchange rate depreciation during October and December (2009). To calibrate the output loss in Albania we have followed the approach proposed by Jeanne and Ranciere, (2007). The output loss is measured as the cumulative loss of GDP in two continues years, where GDP loss per se is measured as the difference between average real GDP growth in normal time and growth rate of GDP during sudden stop period. We have found that the real output growth falls by 3.0% in the first year (2009) and 3.7% in the second year after the crisis, so we have calibrated the accumulated output loss  $\gamma$  equals 6.7%

In 2009, the rate of withdrawal of deposits in foreign currency was at the level of 2%, even though this period was accompanied by

<sup>&</sup>lt;sup>11</sup> Based on a cross-country Probit Model.

capital injection. Given the high risk of foreign currency deposits, we have considered the assumption proposed by Gonçalves (2007), which implies that the optimal level of foreign exchange reserves should cover a significant fraction of the of foreign currency deposits' withdrawal from the banking sector. Thus, we have assumed three different scenarios for deposit cover, at the level of 30%, 50% and full cover. Consequently, these scenarios will serve us to analyse the degree of sensitivity of the optimal reserve holdings level as a result of the change in the coverage deposits withdrawn rates.

Based on the above assumptions, the estimations of the optimal level of reserves in Albania are given in table 4. Additionally we have calculated also the optimal level of reserve based on Jeanne and Ranciere<sup>12</sup> approach, (2006), who does not consider the vulnerabilities caused from dollarized deposits. Overall, the estimated results showed that the actual level of foreign reserves as a ratio of GDP is rather close to the optimal level of foreign reserves, considering that the government will cover only 30 % of deposit withdrawals. While when we increase the level of coverage, we see a wider app between the optimal level of foreign reserve and the actual ratio. However, when the optimal level of reserve is calculated based on Jeanne and Ranciere, (2006) model without taking into account the considerable deposits dollarization, the obtained results showed that actual reserve is significantly above the optimal level. These results indicate that during and after the recent alobal financial crisis, other additional risks should be considered to managing the foreign reserve.

		1		1	/
Year	Actual level of reserve	Optimal le Gonçalves i in	Optimal level of reserve based on Jeanne and Ranciere		
		30%	50%	Full	(with depreciation)
2001-2004 (av.)	17.0	9.4	12.4	19	14.0
2005	17.6	9.7	13.5	21.7	14.0
2006	18.1	15.0	19.6	29.5	14.0
2007	18.8	17.8	23.4	36.4	14.0
2008	19.1	21.3	26.4	38.4	14.0
2009	19.1	17.7	23.2	36.2	14.0
2010	21.2	18.6	25.1	40.7	14.0
2011	20.4	20.9	28.1	45.0	14.0
2012	20.7	20.7	28.3	46.3	14.0
0 1 1 1	011.				

Table 3 Actual Reserve versus optimal Reserve (in % of GDP)

Source: Authors' Calculations

<sup>12</sup>  $\rho = \lambda + \gamma + (p^{(1)}\sigma - 1) \frac{1}{1 + (p^{(1)}\sigma - 1)} \frac{1}{1 - (r-g)/(1 + g)} \frac{\lambda + (\delta + \pi)(\lambda + \gamma)}{1 + (1 + g)^{(1 + g)}}$  defined as in Jeanne and Ranciere, 2006

Furthermore, to check the robustness of our results and to see how sensitive the optimal level of reserve is we have conducted a sensitive analysis based on different assumption for the main calibrated parameters. These shock analyses are presented in Figure 7 and 8. Results suggest that a raise in term premium by 1pp (from 1.4% to 2.4%) would bring a reduction in the adequacy level of reserve holdings by nearly 3pp, from 20.7% to around 17.7%. Meanwhile, an increase in risk free from 2.7% up to 3.7% would cause a boost in adequacy level from 20.7% up to 21%. This impact would be considered relatively smaller compared to previous reaction. We have found that the adequacy level would react positively to boosts in the probability of sudden stop or crises events and vice versa. Findings demonstrate that doubling the probability from 7.5% to 15%, such that a crises episode every 8 years would require extending reserve holdings from 20.7% to nearly 23.4%. The optimal level of foreign reserves would increase by nearly 1.2pp in reaction of an extend output loss by 1pp (from 6.7% up to 7.7%).





Meanwhile, if the risk aversion is considered to be 4 instead of 2, the optimal level of foreign reserve would raise by 3pp. We found a positive correlation between private debt and reserve. The adequacy holdings level would be required to increase by nearly 3.1pp to compensate for raising private debt burden from 37.8% to 47.8% of GDP ratio. This compensation ratio is found to be on a one-to-one relationship regarding rising in external debt burden. Meanwhile, possible exchange rate depreciation by 1pp would bring an increase in stock holdings to GDP ratio by nearly 1.33pp. Overall, these risk scenarios reveal that adequacy level would be more sensitive to calibrated parameters such us term premium, sudden stop probability and the risk aversion properties.



### V. CONCLUDING REMARKS

The monetary authority in Albania has accumulated foreign reserve based on the Monetary Policy approach to Balance of Payment. In the period under review, the stock level has been relatively higher than the four months of import coverage rule-of-thumb criteria. Recently, it has exceeded other benchmark levels relating to the national output, intermediate money and the Guidotti-Greenspan rule-of-thumb. Therefore, this paper adopts a new calibrating metric approach, based on the assumption that reserves provide insurance allowing countries to smooth domestic absorption against the disruption induced by a sudden stop in capital flows associated with a fall in output.

Results through optimal maximization approach show that the actual reserve level in Albania is close to the optimal level of reserves. This gap has been narrowing in the last two years, which shows that after the last global crisis, the management of foreign reserves has taken into consideration a lot of uncertainties from external shocks. Meanwhile, the actual level is found to be far below the optimal calibrated benchmark in the cases that the government has to support higher or even full cover of foreign deposits. The results presented here are given for three different scenarios in order to create an interval, which can be used by the Bank of Albania as a reference for the acquisition of international reserve. Therefore, the proposed optimal benchmark level should be viewed as an upper bound from Bank of Albania, which can be achieved in the medium term.

Nevertheless, the optimal level of reserves estimated from this model is sensitive to the assumptions made about cost and benefits of foreign reserves holding, and the assumed stylized economic structure, so this level have to considered ant to be interpreted with cautiousness. Even though the usefulness of this model in incorporating reserve as an instrument that stabilizes domestic absorption, this approach does not incorporate a role for reserves either in affecting the probability of a sudden stop or the cost of a crisis. So in the future, we suggest the adaption of other measures to check the robustness of this measure and to consider other potential risks such as a bankrupt or a shift in deposits structure, in the calculation of optimal level for the foreign reserve.

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# APPENDIX I: THE INCOME-ABSORPTION IDENTITY





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