

The Determinants of the Bank's Excess Liquidity and the Credit Crisis: the case of Cape Verde

Gentil Pontes**

Fátima Teresa Sol Murta*

Abstract

A situation of excess liquidity characterizes the banking sector in Cape Verde, with consequences in bank's profitability and in the conduct of monetary policy by the Central Bank (BCV). The country is very dependent of capital inflows and its financial system is under-developed. The BCV imposes high reserve requirements and it does open market operations in order to sterilize the excess liquidity.

The main objective of this work is to study the determinants of the excess reserves hold by the Cape Verde banks, and to test for its changes after the beginning of the 2007 financial crisis. We estimate a model of the demand for reserves, by the method of the instrumental variables, which includes precautionary factors and involuntary factors of the demand for reserves.

Our main conclusions are: the precautionary variables are not important in an environment of excess liquidity and it's the involuntary determinants that cause it, especially the low development of the financial sector. Also, we conclude that the 2007 financial crisis had a negative impact over the excess balances in Cape Verde banks.

Key words: banks; excess liquidity; financial crisis, Cape Verde

JEL Classification: G01, G21, E52, O55

* GEMF- Grupo de Estudos Monetários e Financeiros, FEUC – Faculdade de Economia da Universidade de Coimbra, Av. Dias da Silva, nº 165, 3004-512 Coimbra, Portugal; Tel: 351 239 790559, Fax: 351 239790514; e-mail:fasol@fe.uc.pt

** FEUC – Faculdade de Economia da Universidade de Coimbra, Av. Dias da Silva, nº 165, 3004-512 Coimbra, Portugal; Tel: 00238 9717881; Fax: 351 239790514; e-mail: dino_pontez@hotmail.com

1. Introduction

Banks perform an activity of financial intermediation that involves risk. One of the main risks that banks need to manage is the liquidity risk. The bank's intermediation activity is characterized by the acceptance of short-term deposits (demand and term deposits) and the granting of medium and long term loans. They must be prepared to meet their withdrawals of deposits at any moment of time. In order to do so, banks hold two types of reserves: required reserves, imposed by the central bank; and excess reserves, demanded by precautionary reasons. Holding reserves entails an opportunity cost but it represents an insurance against liquidity risk. The traditional models of the demand for excess reserves had been well developed in economic literature, and applied to USA and Euro Area.

However, there are economies characterized by a persistent situation of excess liquidity, where excess balances are not only hold by precautionary purposes, but also for involuntary reasons, due to the insufficient development of financial markets, a high degree of risk aversion, or high capital inflows, among other reasons. This is the case of developing countries and, in particular, of a large number of African countries. These excess liquidity situations raise concerns about bank's profitability, inflationary pressures and the transmission mechanism of monetary policy and its effectiveness. Although the potential problems related to the excess liquidity situation affects a huge number of countries, the literature that studies this subject is limited.

Moreover, the emergence of the financial crisis triggered by the US subprime mortgage credit meltdown, and its consequences for the excess liquidity situation of these countries, has not yet been studied in the literature.

One of the countries where the banking sector faces a situation of accumulation of excess balances is Cape Verde. This is a small African country, an archipelago situated in the

Atlantic Ocean. In spite of having macroeconomic stability and favorable growth¹, the country is short on natural resources, is vulnerable to external shocks (a raise in oil or food prices, for instance), and can be described as a MIRAB² economy. The national currency is pegged to the Portuguese currency³, contributing to inflation stability, uncertainty reduction and investors' confidence, but without a reduction of imports dependence. In the banking sector there is a low number of banks, and although the situation of excess liquidity, the lending rates are high and the expansion of credit is limited, consequence of financial sector structural deficiencies.

The main objective of this work is to study the demand for excess reserves by the Cape Verde banks, its determinants, and how it changed with the beginning and development of the credit crisis. Our study is focused on the period 2003-2009 and uses data provided by the regular publications of the Central Bank of Cape Verde (*Banco Central de Cabo Verde – BCV*).

This article proceeds as follows: Section 2 provides a review of the literature. Section 3 characterizes the Cape Verde economy and details the institutional features of the reserve system imposed by the BCV, allowing the comprehension of the framework in which Cape Verde banks hold reserves. Section 4 describes the data and the behaviour of market variables and presents the results of the estimation. Concluding remarks can be found in Section 5.

2. Review of the literature

The bank's demand for precautionary money balances has received considerable attention in the economic literature, since the seminal works of Orr and Mellon (1961) Poole

¹ According to the IMF and the BCV the Cape Verde GDP grew more than 6% by year in the period 2003-2009.

² Brito (2009) classifies it as a MIRAB economy. This is an economy whose development process is very dependent of external aid flows and of emigrants' remittances. Bertram and Waters (1985) first classified the islands of the Pacific South as MIRAB economies, where MI = migrations, R=remittances, A = aid and B=bureaucracy.

³ Cape Verde has a strong economic cooperation with Portugal, and the Cape Verde escudo (CVE) was pegged to the Portuguese escudo. In 1999, the CVE was indexed to the Euro (1€=110,265 CVE).

(1971), Frost (1971) and Baltensperger (1974)⁴ and the surveys of Baltensperger (1980) and Santomero (1984). Allen (1998), Nautz (1998), Dow Jr. (2001), Selgin (2001), Heller and Lengwiler (2003) and Bindseil et al. (2004) presented new applications of traditional models⁵. According to the reserve management models, the objective of the bank is to minimize the expected cost of holding reserves, which has two fundamental determinants: the uncertainty that affects the net cash drains and against which the reserves represent a buffer (illiquidity entails a penalty) and the opportunity cost of holding reserves. The model's optimality condition implies that banks hold an amount of reserves in which the marginal cost of holding reserves is equal to the marginal reduction in expected liquidity costs.

Recently, there have been several contributions about the causes and consequences of the huge increase in excess reserves in USA, during the financial crisis triggered by the subprime mortgage credit. Keister and McAndrews (2009) say that the level of total reserves in the banking system (after the collapse of Lehman Brothers) is almost all determined by the central banking initiatives and not by the lending decisions of banks. This accumulation of excess reserves does not cause necessarily inflation because the central bank can adjust short-term interest rates. They suggest that the payment of interest on reserves contributes to maintain inflation at the desired level. Martin et al. (2011) present a model in which the interest on reserves determines the marginal lending rate; therefore this rate is not dependent of the quantity of reserves. Also, according to Hornstein (2010) and Gray (2011) this measure creates a floor on the interbank market rate, helping the objective of controlling this rate. Sol and Garcia (2010) studied the effects of the financial crisis over the demand of excess reserves by Euro Area banks and they concluded that the spread (EURIBOR - minimum MRO rate) is its most important determinant. The high level of uncertainty that characterizes

⁴ These are inventory models that analyses the individual demand of money for precautionary reasons. See (Baumol, 1952)

⁵ See Sol (2006) for more details about these developments.

the credit crunch is not significant in the demand for excess reserves, due to the management of liquidity and the refinancing conditions of the ECB.

Although the development of models of the demand for reserves, the study of the situation of excess liquidity in less developed countries (LDCs) is still insufficient. The existence of a general excess liquidity situation in LDCs is recognized in Agénor et al. (2004) and Aikaeli (2006) for the case of Tanzania, Fielding and Shortland (2002) for Egypt⁶, Khemraj (2006) for Guiana and Saxegaard (2006) for the CEMAC countries⁷, Nigeria and Uganda⁸. Agénor et al. (2004), Agénor and Aynaoui (2009) and Saxegaard (2006) distinguish two concepts of bank's excess liquidity in LDCs: the **precautionary** excess liquidity and the **involuntary** excess liquidity. The precautionary balances are those above minimum requirements, needed to meet the withdrawals of deposits and other uncertain payments. The balances that are in excess of these precautionary needs are the involuntary cash balances.

The literature classifies the determinants of the involuntary excess liquidity in **structural** factors – due to macroeconomic and financial development – and **cyclical** factors. One of the structural determinants of involuntary liquidity is the low degree of financial development. Agénor and Aynaoui (2009) say that the strong demand for liquidity by bank's clients, an inefficient interbank market⁹, and the high costs of financial operations (like evaluation and monitoring costs) contributes to the maintenance of a high level of reserves by banks. Also, as referred by Saxegaard (2006), in CEMAC countries the bond markets, including public bonds markets, are underdeveloped, and there are no remunerative alternatives for excess liquidity¹⁰.

⁶ The authors find that in Egypt, political violence is the main determinant of excess liquidity.

⁷ CEMAC – Central African Economic and Monetary Community.

⁸ The accumulation of reserves is also an issue in China and other emerging market economies. See Ma et al. (2011)

⁹ A low developed interbank market can be the consequence of a persistent situation of excess liquidity in the banking sector, that disincentive lending operations between banks.

¹⁰ The transportation of cash between banks is also referred as cause of excess liquidity by Saxegaard (2006).

The second structural determinant is the high degree of risk aversion that causes banks to demand a high risk premium and lowers private sector credit demand. According to Agénor and Aynaoui (2009), the degree of risk aversion is related with macroeconomic instability, thus explaining the long term positive correlation between inflation and excessive liquidity.

In the case of Sub-Saharan African countries, other structural factors are referred by Saxegaard (2006), like asymmetric information and lack of competition in the banking sector¹¹, leading to a bank's weak offer of credit.

On the cyclical factors, Agénor and Aynaoui (2009) indicate inflation as the first one: a rise in inflation causes higher volatility in relative prices and higher uncertainty in the risk degree of investment projects and in the value of collateral. Thus, banks demand higher interest rates on loans, the demand of credit decreases and excess reserves increase.

Another cyclical determinant is the huge capital inflows, consequence of the oil commerce receipts, foreign direct investment (FDI) associated with liberalization of capital flows and/or foreign aid, as noted by Saxegaard (2006). Agénor and Aynaoui (2009) mention the measures to eliminate restrictions on capital inflows for non-residents (maintaining the restrictions on capital outflows), that combined with privatization of state enterprises, contributed to large inflows of capital intermediated by banks.

Finally, a crisis environment, accompanied by a high degree of uncertainty, causes the accumulation of reserves by banks, which see lending as a riskier activity. Agénor et al. (2004) showed that the accumulation of reserves in Thailand, during the Asian financial crisis, was the consequence of the decrease of lending by banks and not the result of lower credit demand. Ashcraft et al. (2009) found evidence that, during the financial crisis of 2007-2008, banks in USA increased their holdings of reserves and decreased lending, as a buffer against liquidity shocks.

¹¹ In Ethiopia, a single state-owned bank has 75% of banking assets. In Guinea-Bissau a single state-owned bank stays in the market, after the closing of 2 other banks during the civil war.

In this work, we will analyze empirically the determinants of the demand for excess reserves in Cape Verde banking sector, for which there is no specific economic literature.

3. The Cape Verde banking system and its liquidity situation

The Cape Verde financial system is strongly dependent into the banking sector: the total banks assets, excluding off-shore banks, represented in 2009 more than 80% of total financial assets. The BCV¹² is the banking authority, responsible for financial supervision. Its main objective is the maintenance of price stability and it is also responsible for promoting the liquidity and stability of the financial system. The BCV defines and implements the monetary and exchange rate policy, manages exchange reserves, acts as intermediary in the international government operations and advises government in financial issues.

In the end of 2009, there were 5 credit institutions in the onshore market, and 6 quasi-banking institutions¹³. On the offshore market, there were 12 institutions, 10 banking institutions as International Financial Institutions (IFI) and 2 quasi banking institutions. The five (onshore) banks had 91 branches 40 of which were located in the Santiago Island.

The stock exchange has 5 years of functioning: the market is small, illiquid and low diversified. The insurance activity has no expression and there are only 2 insurance companies.

The history of banks in Cape Verde is long¹⁴ but the banking activity remains traditional: the options offered to the clients for the application of funds, beyond deposits and some bonds, are limited, and the investments are retained until their maturity date. The

¹² The BCV was created in 1975, after the independence from Portugal, with the functions of issuing money, managing the foreign exchange reserves, government banker and also commercial and development bank. After 1993, BCV performs only central bank's functions, including supervision functions.

¹³ According to the *Decreto-Lei 3/V/96* that regulates the constitution and functioning of banking and quasi-banking institutions, these are companies that are not credit institutions, but that can perform some credit function or other activity with effect in money, financial and exchange markets. We emphasize the currency exchange offices and the credit card management company – the *Sociedade Interbancária e Sistemas de Pagamentos (SISP)*.

¹⁴ The first bank was born in 1865, the *Banco Nacional Ultramarino (BNU)*, as an issuing and commercial bank and it was, during 111 years, the most important banking institution in the country

deposits represent almost the totality of banks liabilities and, according to its origin, the emigrants' deposits are the most important source of funding for banks, representing in 2008 2009 and 2010, respectively, 34,6%, 35,2% and 34,9% of deposits¹⁵.

Bank's assets are mainly loans to small and medium enterprises and loans to individuals (mortgage loans, small consumer loans and university loans). According to the BCV (Report of Financial Stability, 2009) the credit to the private sector was, in 2009, 54,92% of bank's assets. The mortgage credit was 63,11% of the loans to individuals. The government bonds hold by banks represented, in 2009, 17,98% of total assets.

However, the gradual entry of international banks in the Cape Verde banking sector contributes to the modernization of the sector. The number of branches is augmenting; in special the ones directed to business sector, the quality of customer service is improving as well as the use of new instruments of payment (ATM's, POS and credit cards). The population per branch was, in 2009, 1 branch to 5640 inhabitants¹⁶.

3. 1. The minimum reserve system and other monetary policy instruments in Cape Verde

The BCV requires credit institutions, which receive demand deposits, term deposits and other liabilities up to 2 years to hold minimum reserves¹⁷. The coefficient of minimum reserves is 16%, helping to absorb the excess liquidity¹⁸¹⁹. The minimum reserves are calculated according to an average provision, along a maintenance period of about 14 days. In each month, the maintenance period spans from day 4th day until 18th day and from 19th day until 3th day of the following month. The calculation and the maintenance period are

¹⁵ See the BCV's Annual Reports, 2009 and 2010.

¹⁶ Report of Financial Stability, 2009.

¹⁷ The minimum reserves are designated by *Disponibilidades Míminas de Caixa (DMC)*.

¹⁸ In the USA the coefficient ranges from 5% to 10%, according to the deposits maturity. The Eurosystem imposed a coefficient of 2% since January 1998, but decreased it to 1% recently (December 2011), in the context of the financial crisis.

¹⁹ The coefficient applied to liabilities which maturity is over 2 years is 0%.

simultaneous. The items that constitute the reserve base are deposits in domestic money or foreign currency²⁰. Liabilities due to central bank or other institutions that hold minimum reserves, and non-residents deposits²¹, are excluded from the reserve base. The minimum reserves balances are held in reserve accounts on the central bank and they are not remunerated²². When credit institutions fail to comply with their reserve requirement, the BCV imposes one of several sanctions, applied to the amount the institution failed to provide: a payment up to 2 percentage points above the marginal lending rate; a payment up to 4 percentage points above the same rate applied to the same amount; or, finally, the suspension of the access to standing facilities and open market operations.

The BCV uses the open market operations to signaling the stance of monetary policy, to manage the liquidity situation and to steering interest rates. These operations are conducted as reverse operations, definitive operations, collection of fixed-term deposits, or BCV' debt securities issuance. The BCV issues (weekly) debt securities, the *Títulos de Regularização Monetária (TRM)*, with fixed interest rate and maturity ranging from 1 day to 14 days, and *Títulos de Intervenção Monetária (TIM)* with market interest rate (auction determined) or fixed interest rate, and maturity up to 1 year. These securities are used in open market operations. The interest rate of the TRM is the policy rate and it must behave, as far as possible, according to the level of interest rates in the Euro Area.

Finally, the BCV offers two standing facilities: the marginal lending facility at which banks can obtain overnight liquidity and the deposit facility at which banks can make

²⁰ The reserves of foreign currency deposits are maintained in domestic money. Kovanen (2002) says that the management of reserves in countries with exchange rate instability is more difficult. For instance, when domestic money depreciates, the value of foreign exchange money deposits increase (in domestic money) and minimum reserves also increase. In the case of Cape Verde, the national money is indexed to the Euro and this relationship was stable in the last years, with some advantages to the economy (price stability, uncertainty reduction and investors high level of confidence).

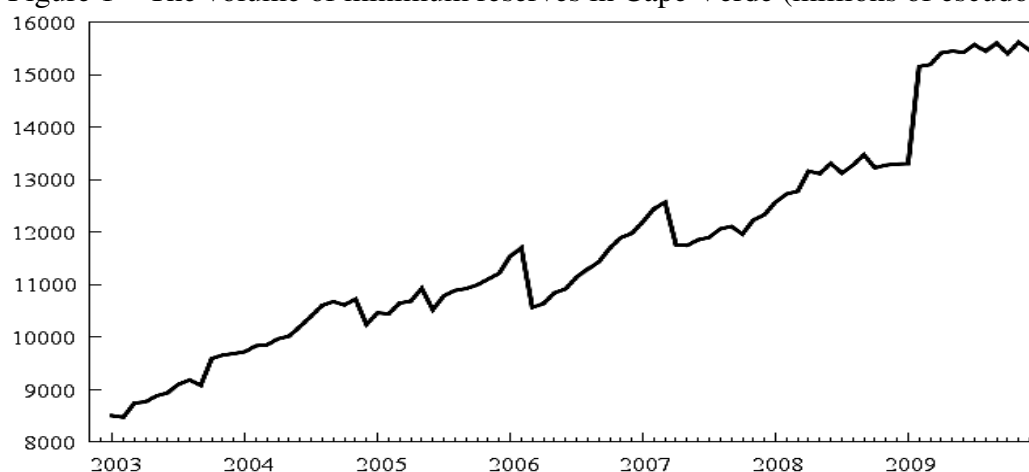
²¹ The high interest rates of deposits attract non-residents deposits that are not subject to minimum reserves. The emigrant's deposits are classified as resident's deposits.

²² The BCV suspended the reserves remuneration since 2003. Kovanen (2002) defends that the non-remuneration of reserves is an implicit tax on banks, in particular if the coefficient of minimum reserves is high. Baptista (2006) argues that, in Cape Verde system, the non-remuneration adds 5,63 p.p. to the spread, but this statement is controversial.

overnight deposits. The two interest rates of the two facilities²³ are determined by the BCV that also determines the volume of funds to lend to each institution, guaranteed by collateral²⁴. The lending facility is used by small banks due some instability in the situation of excess liquidity. The interest rate of deposit facility is (naturally) small but, the banks use it frequently, which reflects the weak dynamism of the money market.

The figure 1 shows the volume of minimum reserves. It increased by a large amount, although the consecutive reductions in the coefficient of minimum reserves: in December 2004 the coefficient was reduced from 19% to 18%, in May 2005 it decreased to 17%, in February 2006 it decreased to 15% and finally, in April 2007 the BCV fixed it in 14%. In the beginning of 2009 it increased to 16% with a consequent augmentation in the volume of minimum reserves²⁵. This increase was proposed by the BCV with the aim to invert the trend of reduction in foreign currency reserves due to selling operations with banks during 2008²⁶. Recently, in December 2011, the BCV augmented the coefficient to 18%.

Figure 1 – The volume of minimum reserves in Cape Verde (millions of escudos)



Source: Authors' calculations²⁷ based in the bank's balance sheet.

²³ The policy rate is always between these 2 rates.

²⁴ The eligible assets are assets that counterparties can use as collateral: treasury bills and bonds, TIM and TRM.

²⁵ At this time the increase in minimum reserves was also a result of the increase in the volume of deposits.

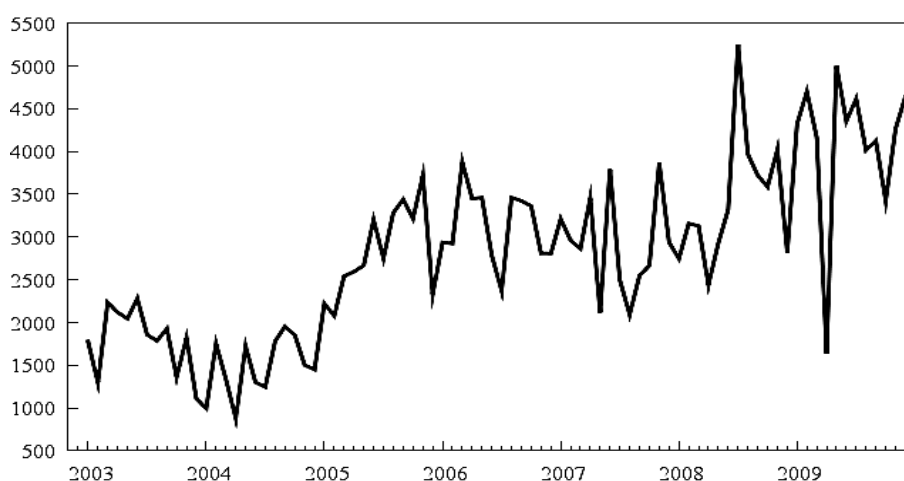
²⁶ When the coefficient of minimum reserves increases, banks sell more currency to BCV, in order to receive national money and hold minimum reserves.

²⁷ Due to the lack of data, the level of minimum reserves was computed related to the reserve base that was determined by the banks consolidated balance sheet - total deposits(demand, term deposits and savings deposits, foreign currency deposits, from residents and emigrants) and other liabilities (except repurchase agreements) – of each month, assuming that commercial banks are required to constitute reserves at these moments of time

3. 2. The liquidity excess in Cape Verde

The period 2003-2009 is characterized by excess liquidity. In 2009, the annual average excess reserves increased 129%²⁸ relative to 2003. We calculate the excess reserves as the difference between bank's total reserves (deposits in the BCV and vault cash) and minimum reserves and represented in the figure 2. Banks demand precautionary reserves but they are not remunerated, thus implying an opportunity cost. According to the BCV²⁹, the large and persistent excess liquidity is due to the non-controllable autonomous factors, like foreign aid, emigrant's remittances and foreign investment. These inflows, associated with low developed money and public debt markets, are usual in small and under-developed economies.

Figure 2 – The volume of excess reserves in Cape Verde (millions of escudos)



Source: Authors' calculations based in the bank's balance sheet.

The small number of banks, related with a high degree of concentration, is also a structural factor that explains this phenomenon. In 2009 two banks represented 74% of bank's assets, 74% of total credit and 77% of total deposits. The degree of competition is weak, and the money market is limited³⁰, contributing to explain a high level of excess reserves.

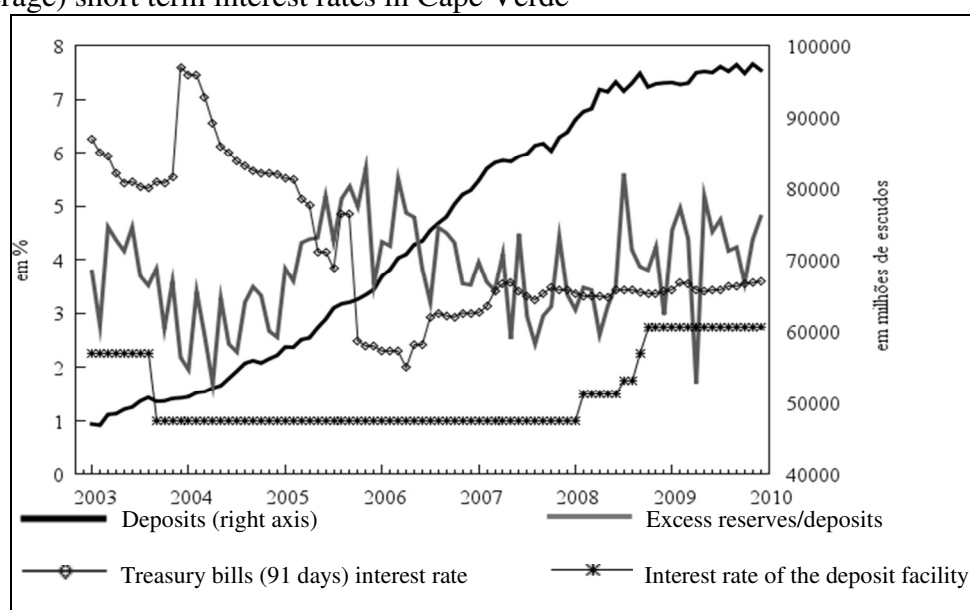
²⁸ In this work we do not consider the applications in TRM and TIM. Taking in account these securities, the increase is about 400%.

²⁹ See the BCV's Annual Report, 2009

³⁰ According to the BCV Annual Report (2010) the activity in the interbank market grew 17,3% in 2010 but the base is very small.

The commercial banks are important to the private sector of Cape Verde³¹. The market for government bonds is illiquid: the primary market is dominated by the national pensions fund, the *Instituto Nacional de Previdência Social (INPS)*, leaving the secondary market illiquid too^{32 33}. The banks hold the larger part of the domestic debt but they have reduced it. This behavior could be originated by an increase in the preference for shorter term investments like TRM and overnight deposits. Thus, the market for public securities is not competitive³⁴, like in other small LDCs, the depositors don't find other options to apply their funds and the excess liquidity depends from the level of deposits. The figure 3 shows the deposits, the behavior of excess reserves as a percentage of total deposits, the interest rate of the treasury bills (91 days) and the interest rate of the deposit facility.

Figure 3 – The behavior of deposits, the ratio between excess reserves and deposits and the (average) short term interest rates in Cape Verde



Source: BCV and authors' calculations

³¹ The functioning of the stock exchange is recent and limited. See the section 3.

³² More than 60% of the Cape Verde public debt is external debt, due to the World Bank and the African Development Bank. The domestic debt represents one third of total debt and it is represented by long term bonds hold by commercial banks and by the INPS (IMF, 2010).

³³ See IMF Country Report 10/349.

³⁴ The Cape Verde authorities are fully committed to the creation of a public debt market, liquid and dynamic, credible and transparent. The issuance of fungible public securities, with equal coupon and maturity dates, the realization of auctions, the publication of issuance calendars on one year in advance, and the use of internet banking as a way of individuals buy securities are planned measures. In 2010, the regulation of financial markets (*Código de Mercado de Valores Mobiliários*) was modified.

The average excess reserves was 3,8% of deposits. The interest rate of the treasury bills decreased during the period considered as a consequence of the situation of excess liquidity in the economy and of the reduction in the government's demand for funds³⁵. The interest rate of the deposit facility was always low.

4. Empirical Estimation

4.1. Data and Variables

To study empirically the determinants of excess liquidity in LDCs we need to taking in account macroeconomic variables, variables related to structure and level of development of the financial system and variables that characterize the non-controllable autonomous factors like foreign aid, emigrant's remittances and international trade receipts³⁶. Therefore, to study the determinants of excess liquidity in Cape Verde, we constructed a data base, collected from the Cape Verde consolidated deposit bank's balance sheet and from the statistical tables available in the BCV site. We analyze the period since January 2003, until December 2009, which makes 84 monthly observations.

The excess reserves holding by banks are calculated as the difference between total reserves deposited in BCV balance sheet plus the vault cash and the level of minimum reserves. The minimum reserves of each month are calculated applying the coefficient of minimum reserves to the volume of deposits (demand and term deposits, savings deposits, foreign currency deposits, residents and emigrant's deposits) and other responsibilities (with the exception of repurchase agreements)³⁷. In the period 2003-2009 the Cape Verde banking system was always in an excess liquidity situation. The excess reserves were mainly applied

³⁵ See the Annual Report of the BCV, 2005.

³⁶ According to Saxegaard (2006) in some countries of Sub-Saharan Africa, the oil receipts are very important.

³⁷ We did not take in consideration the maturity of the responsibilities due to non-availability of this information. However, the results are very similar with the minimum amount of reserves referred in the BCV reports. For instance, according the BCV, in 2009, the average minimum reserves were 15 417 millions of CVE and 15 253 millions of CVE in our calculations.

in overnight deposits and BCV's securities. These securities were not included in the calculation of excess reserves, thus, this application is not considered as an opportunity cost³⁸.

The dependent variable EL is the ratio between excess reserves and bank's total assets.

The exogenous variables represent the precautionary and involuntary factors. First, we include a variable that represents the illiquidity cost for which we use the interest rate of the BCV's lending facility, R_D . This is more appropriate than a money market rate because in Cape Verde there is not an efficient interbank market.

In order to include the role of uncertainty, we use the deposit volatility, computed as the moving average of the standard deviation of private sector deposits divided by the moving average of this variable³⁹, VOL_{PS} . This kind of variable is used in excess liquidity studies of LDC's⁴⁰. The variable VOL_C is the indicator of the volatility of the preference of the public by currency in circulation and is equal to the moving average of the standard deviation of the ratio currency in circulation/deposits divided by the moving average of this ratio. We expect a positive relationship between each one of these volatility variables and the excess reserves.

We also include variables that capture the involuntary factors. As proxies to weak development of the financial sector and low diversification of financial products we use the private sector deposits and the public sector deposits, divided by the total banks total assets, DEP_{PS} and DEP_{GOV} ⁴¹. The private and public sector deposits are also linked to the fast growth of excess liquidity in LCDs⁴². The economy of Cape Verde is strongly dependent of external aid inflows and emigrants' remittances. Due to the lack of data we cannot use these variables neither separate them from the referred deposits, like Saxegaard (2006) did it.

³⁸ Baptista (2006) studies the cost of financial intermediation in Cape Verde and does not considered this kind of application as an opportunity cost of reserves holdings.

³⁹ We use a period of 12 months in the calculation of the moving averages. This method implies a loss of information. Thus, we extended the analysis, and used more 11 months (January 2010 - November 2010) of BCV estimated data.

⁴⁰ See Saxegaard (2006).

⁴¹ We use variables similar to Khemraj (2006) and Saxegaard (2006).

⁴² See Saxegaard (2006).

However, we consider that external aid is part of public sector deposits, which include government deposits, and local authorities that are their main beneficiaries. Emigrants' deposits (in national and external currency) are included in the private sector deposits.

Another reason to the accumulation of excess reserves is the weak dynamism of credit; in Cape Verde the credit growth has been limited by the high cost of financial intermediation that leads to high credit interest rates. The variable CRED represents the ratio between credit⁴³ and bank's total assets. The variable BOND_{GOV} is the government credit (treasury bills and government bonds⁴⁴) divided by bank's total assets. We expect a negative relationship between each one of these variables and the dependent variable.

The variable IR represents the level of BCV's foreign reserves as a percentage of the bank's total assets. One of the BCV's functions is to hold and manage foreign reserves in order to achieve the sustainability of the exchange regime (peg to Euro) and the compliance with the goals of the Policy Support Instrument–PSI, negotiated with the IMF⁴⁵. The BCV obtains the main part of its foreign exchange currency⁴⁶ through its transactions with other banks, paying with national money. Usually, BCV buys more foreign currency than it sells, due to the objective of foreign exchange accumulation, and injecting liquidity in the banking sector. In order to remove/sterilize it, the BCV issues its own securities. If the sterilization is sufficient, all the liquidity injected in the market is removed and a negative sign on the coefficient of the variable IR is expected. The coefficient will be positive if the sterilization is

⁴³ This variable includes the credit to the private sector, government-owned companies and local authorities.

⁴⁴ We excluded from this variable the Títulos Consolidados de Imobilização Financeira (TCMF). The TCMF are securities issued by the State of Cape Verde in 1998 and represent units of participation in the International Support for Cabo Verde Stabilization Trust Fund (CVDTF), an off-shore fund created to support the conversion of internal debt and issue TCMF. At the same time, the government refinanced public debt, trading securities with the agreement of buying it in a maximum of 20 years.

⁴⁵ The PSI is an IMF's instrument that supports low-income countries that have broadly achieved and maintained a stable and sustainable macroeconomic position but seek to consolidate their economic performance with IMF monitoring and support. See <http://www.imf.org/external/np/exr/facts/pdf/psi.pdf>

⁴⁶ The foreign exchange currency stock has its origin mainly in emigrants' remittances, foreign direct investment and external aid inflows.

insufficient. This hypothesis is assumed by Khemraj (2006) when studying the excess reserves in Guyana.

Finally, we introduce the dummy variable *CRISIS*, in order to study the impact of the recent credit crisis on the demand for excess reserves in the Cape Verde. It takes value 1 after August 2007 and 0 before⁴⁷.

All the variables are expressed in logarithms, with the exception of the dummy variable.

4.2. Estimation

The aim of this work is to study the determinants of excess reserves in Cape Verde.

The estimated equation⁴⁸ is:

$$EL_t = \alpha_1 + \alpha_2 R_{D_t} + \alpha_3 VOL_{PS_t} + \alpha_4 VOL_{C_t} + \alpha_5 DEP_{PS_t} + \alpha_6 DEP_{GOV_t} + \alpha_7 CRED_t + \alpha_8 BOND_{GOV_t} + \alpha_9 IR_t + \alpha_{10} CRISIS_t$$

where the variables are the ones described in the previous section.

All the series were submitted to ADF (Augmented Dickey-Fuller) tests that are presented in appendix 1, table A.1. From an economic point of view we expect that all the variables are stationary, in particular those that were transformed in ratios as well as the BCV's refinancing rate⁴⁹. However, according to the results presented in table A.1, some variables contain a unit root. This evidence can be the consequence of the size of the data base, which is too short to allow the rejection of the null hypothesis of the existence of a unit root. Another explanation is the fact that the null hypothesis of a unit root has low power against the alternative of stationarity⁵⁰. Therefore, we performed the KPSS test that has a null

⁴⁷ A similar procedure was used in Sol and Garcia (2010) to the Euro Zone.

⁴⁸ The estimations were performed with the program GRET 1.9.4.

⁴⁹ Khemraj (2006) and Saxegaard (2006) say the same about their variables of other countries.

⁵⁰ See Saxegaard (2006).

hypothesis of stationarity⁵¹. The results presented in table A.2, appendix 1, reinforce the evidence that the series are stationary: to the variables DEP_{SP} and DEP_{GOV} we cannot reject the H_0 at the 10% significance level, to the variable IR we cannot reject the H_0 at the 5% significance level and to the variables EL , R_D , VOL_{SP} , $CRED$ and $BOND_{GOV}$ we cannot reject the H_0 at the 1% significance level.

There are several empirical studies that recognize the endogeneity of the majority of the explanatory variables referred, as, for instance Saxegaard (2006). In this case the Ordinary Least-Squares (OLS) method is not adequate. Therefore we used the Two-Stage Least Squares (TSLS)⁵², or Instrumental variables (IV) method. The endogenous variables are R_D , DEP_{SP} , DEP_{GOV} , $CRED$, $BOND_{GOV}$ and IR ⁵³. These variables are under the control of both the banks and the central bank. We also performed tests that did not allow us to reject the null hypothesis of no autocorrelation and no heteroskedasticity.

4.3. Results

The results obtained in the estimation can be observed in table 2. Each one of the obtained coefficients has the expected sign.

We implemented several estimations and, consistently, we cannot find statistical significance on the precautionary variables⁵⁴. Specifically, in the period under analysis, the BCV's refinancing rate changed only four times, which can contribute to its non-statistical significance⁵⁵. The private sector deposits and government deposits are also non-significant.

⁵¹ This test, with the opposite null hypothesis is recommended due to difficulties in the interpretation of ADF test results. See Andrade (2004) and "Using gretl for Principles of Econometrics, 3rd Edition Version 1.31" available at www.learneconometrics.com/gretl/ebook.pdf

⁵² The *Gretl* produces automatically the Hausman test, whenever we use the TSLS method. In our case, the result obtained, allows us to reject the null hypothesis of the consistency of the OLS method.

⁵³ The list of instrumental variables includes the first lag of the endogenous variables, the first lag of the dependent variable and the others non endogenous variables.

⁵⁴ The variable VOL_C was excluded because, after several estimations, its coefficient is always non-significant.

⁵⁵ Khemraj (2006) and Saxegaard (2006) obtained similar results.

The use of a 12 months period to compute the volatility variables can have some effect on the estimation results (insignificance of these variables). Therefore, to evaluate the robustness of the results, we estimated the same model, but using a 6-months period on the calculation of volatility measures. The results are similar to the previous ones and are not reported here..

Table 2 - Results of the model estimation (TSLS) on the determinants of Cape Verde excess reserves

Variables (log)	Coefficient	Std. Error	z	p-value
<i>Constant</i>	-1.41273	17.7457	-0.0796	0.93655
<i>R_D</i>	0.738036	3.03172	0.2434	0.80767
<i>VOL_{SP}</i>	0.212797	0.177511	1.1988	0.23061
<i>DEP_{SP}</i>	10.1806	9.43464	1.0791	0.28056
<i>DEP_{GOV}</i>	3.06973	2.80887	1.0929	0.27445
<i>CRED</i>	-5.30865	2.39023	-2.2210	0.02635**
<i>BOND_{GOV}</i>	-3.5645	1.57937	-2.2569	0.02401**
<i>IR</i>	-1.4677	0.783732	-1.8727	0.06111*
<i>CRISIS</i>	-0.568838	0.282054	-2.0168	0.04372**

AR-1 Test	(0.620966)	Normality Test	(0.487624)
AR-2 ^{1/} Test	(0.556)	Sargan ^{2/} Test	(0.63568)
Heteroscedasticity Test	(0.758813)		

The dependent variable is the *log* of the ratio excess reserves/banks total assets.

The values between brackets are p-values.

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

The results allow us to conclude that the main determinants of excess liquidity in Cape Verde are the variables that represent the involuntary factors, CRED, BOND_{GOV} and IR. The credit and the public debt market are the most important causes of involuntary liquidity accumulation because they reflect the low development and weak dynamism of these markets⁵⁶. The credit demand is not a generalized phenomenon in Cape Verde and a major part of the investors does not make use of credit in their projects. The lending rates are high,

⁵⁶ Better opportunities for credit market are expected in the future: the first graduates in the new Universities of Cape Verde are entering the labour market. A young population, with higher level of instruction, higher wages and consumption needs will stimulate credit demand.

due to the policy of high deposit rates that aim to attract emigrant's deposits⁵⁷. The high level of the coefficient of reserves, and the non-remuneration of reserves, increase the intermediation costs, also contributing to the low level of credit in the economy. This policy contributes to an inefficient allocation of resources, leaving banks without alternatives on the application of excess reserves. Thus, for Cape Verde banks, the development of the credit market would represent an increase in profitability, directly and indirectly, due to decrease in its opportunity cost.

The negative coefficient on the variable IR shows that the central bank has been successful in its role of (efficient) liquidity sterilization. The BCV says in its 2009 annual report (pp 86) that: "The autonomous liquidity factors had a significant effect on the liquidity absorption, in particular, the Currency Operations, due the high volume of currency that the BCV purchases from the financial institutions". The negative sign on this variable also allow us to conclude that it is not all the excess reserves of banks that are hold by precautionary reasons. If it was all precautionary determinate, the BCV's sterilization was not necessary, as long as I doesn't cause inflationary pressures.

Finally, according to our results, the international financial crisis had a negative effect on the excess reserves. The effect of a crisis in the excess liquidity is not very well-documented in this kind of literature. Agénor et al. (2004) found evidence that, in Thailand, the huge accumulation of reserves during the Asian financial crisis in late 90's was the result of a decrease in the credit supply. Montoro and Moreno (2011) say that after the Lehman bankruptcy the capital inflows to emerging market economies contracted sharply. This contributes to explain the negative coefficient of the variable crisis in our study. The economy of Cape Verde is rather vulnerable and dependent of emigrants' remittances and foreign aid,

⁵⁷ See the graphic A.1 in the appendix.

which can be reduced in an environment of global crisis and high unemployment⁵⁸. The real estate market and the tourism sectors are strongly dependent of foreign investors. Although the Cape Verde banks do not invest in international toxic assets, they are vulnerable to the contagion effects due to high number of foreign banks operating in Cape Verde.

Finally, taking into account the empirical evidence, some course of action can be recommended, in order to reduce the excess liquidity in Cape Verde banking sector. The IMF Country Report⁵⁹ recommends the reduction of the minimum reserves coefficient, or the use of public funds to fulfill a part of the minimum requirements or the remuneration of reserves⁶⁰⁶¹. Lower reserve requirements could reduce the cost of banking services, specially the credit cost, contributing to the expansion of credit and the economy.

There is also a need to change and improve the institutional features of Cape Verde financial system. The development of a liquid public debt market could ease the management of reserves by banks and contribute to a better resources allocation. The issuance of fungible treasury bills, with identical interest coupon and maturity date, the realization of auctions and publication of issuance calendars with one year in anticipation and the use of internet banking allowing the people to buy securities in the secondary market are important measures that contribute to the emergence of public securities market⁶², similar to the advanced countries markets (IMF, 2010). Also, knowing that the INPS⁶³ dominates and distorts the public securities primary market, it is recommended that INPS applies a part of its funds abroad. The

⁵⁸ The BCV's 2010 Annual report says that, in 2010, the emigrants' remittances interrupted its downwards cycle, mainly due to the dollar evaluation.

⁵⁹ See International Monetary Fund (2010).

⁶⁰ Kovanen (2002) says that the remuneration of minimum reserves is a measure to be introduced carefully because it would impact on the profits of the central bank and would reduce the seigniorage earnings.

⁶¹ The monetary authorities of several emerging market economies changed the features of their reserve system after the beginning of the financial crisis. See Montoro and Moreno (2011).

⁶² In 2010 the stock market capitalization increased by 20,5% due to the issuance of new securities, in particular local authorities bonds and financial and non-financial companies bonds. See the annual report of the BCV, 2010.

⁶³ The INPS is the national pension fund, as we referred in section 3.2.

IMF also considers that a developed public securities market introduces more possibilities to the BCV achieves repo and reverse repo operations, using public securities, in order to inject/absorb funds over the financial system.

Although the structural problems in the macro development of Cape Verde, the recent reforms with the aim to improve the functioning of the primary market of securities and the investments on education, show that Cape Verde has accomplished an important effort in its modernization. However, there is yet a long way to become a competitive economy. The banking sector of Cape Verde could also use the fact that the domestic banks have Portuguese banks as a main shareholder. These have know-how, and operate in a modern and competitive market, and can make easier the transference of knowledge and technology, contributing to solve the Cape Verde financial system structural problems.

5. Concluding remarks

Banks need to manage the liquidity risk and to do so, they hold reserves. However, there are economies characterized by a persistent situation of excess liquidity, where excess balances are not only hold for precautionary purposes, but also for involuntary reasons, due to the insufficient development of financial markets, a high degree of risk aversion, or high capital inflows, among other reasons. That has been identified in the literature.

The aim of this work is to analyze the principal determinants of the situation of persistent excess liquidity in Cape Verde banking sector, and in particular the effect of the financial crisis, through the estimation of an empirical model of demand for reserves in the period 2003-2009.

We concluded that the accumulation of reserves by Cape Verde banks is involuntary, due to the lack of options to its application. The large excess of reserves is a consequence of

domestic credit market and public securities market insufficiencies and the lack of development of the financial sector. The non-statistical significance of the variables that measure the effect of the uncertainty over the demand for excess reserves, shows that the liquidity risk is not important in an environment of persistent excess liquidity.

The BCV' accumulation of foreign currency has an influence over the excess of reserves. The negative coefficient of this variable suggests that the sterilization of the purchase of foreign currency is efficient. Although in practice there are no restrictions on capital flows, the objective of foreign reserves accumulation by the BCV can limit the ability of banks to invest their reserves abroad.

Another factor analyzed in this work is the impact of the international financial crisis over the situation of excess liquidity. The negative coefficient of this variable is compatible with an economy strongly dependent of the international economic environment.

In modern economies banks perform an important financial intermediation activity that contributes to households and companies welfare. The existence of restrictions that limit the opportunities to lend to private sector and to use the funds obtained by banks – the small dimension of the domestic market, the asymmetries of information, the risk aversion – and the under-development of interbank and public securities markets explains that, whereas banks and depositors (emigrants in particular) don't find opportunities and options to apply their funds, the excess of liquidity will continue a structural problem in Cape Verde.

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Appendix 1

Table A.1 - Augmented Dickey-Fuller test (ADF)

Variable	Lags	constant		constant and trend	
		t-stat	p-value	t-stat	p-value
<i>EL</i>	1	-3.2472	0.01744**	-3.23655	0.0773*
<i>R_D</i>	5	-1.7740	0.3939	-1.48164	0.8361
<i>VOL_{SP}</i>	1	-3.7083	0.0040***	-4.80042	0.0004317***
<i>DEP_{SP}</i>	2	-1.1864	0.6827	-2.67336	0.2478
<i>DEP_{GOV}</i>	0	-3.8331	0.004***	-5.18973	0.0001***
<i>CRED</i>	3	0.4342	0.9844	-0.06866	0.9954
<i>BOND_{GOV}</i>	3	2.9819	1.0000	0.37291	0.9989
<i>IR</i>	1	-0.7894	0.8159	-3.26956	0.07966*

Note: The choice of lags was made according to the instructions of “Gretl User’s Guide” and “ Using gretl for Principles of Econometrics, 3rd Edition Version 1.31”. According with these manuals, a number of lags to small can distort the test results, and a number of lags to high reduce the power of the test. The ADF test in *Gretl*, by definition gives an estimation of the coefficient of autocorrelation of errors that must be small, if we chose the correct number of lags. It begins with a large number of lags and reduces it, until the correct number of lags is found.

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Table A.2 –Kwiatkowski, Phillips, Schmidt e Shin (KPSS) test

Variable	t-stat	Critical values		
		10%	5%	1%
<i>EL</i>	0.160036	0.121	0.148	0.215
<i>R_D</i>	0.207148	0.121	0.148	0.215
<i>VOL_{SP}</i>	0.198401	0.121	0.148	0.215
<i>DEP_{SP}</i>	0.079045	0.121	0.148	0.215
<i>DEP_{GOV}</i>	0.093739	0.121	0.148	0.215
<i>CRED_{SP}</i>	0.200365	0.121	0.148	0.215
<i>BOND_{GOV}</i>	0.199040	0.121	0.148	0.215
<i>IR</i>	0.129103	0.121	0.148	0.215

Note: variables with trend