

Master Thesis

**Analyzing Deposits Formation in Georgia**

**Abstract**

This paper analyzes real deposits in Georgia from 1996 to 2008 using the monthly data. The deposits are defined as the difference between the real money balances and currency in circulation. The study is divided into three steps. The first step estimates the demand for broad money using the Johansen procedure. Next step, by applying the same method, evaluates the currency deposit ratio. The final step constructs the model for real deposits and by using the results from previous steps indicates the most essential factors affecting depositors' behaviour. The results suggest that the macroeconomic variables such as real GDP, interest rate, inflation, financial innovation etc. are essential in analyzing deposits formation in Georgia.

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# I Introduction

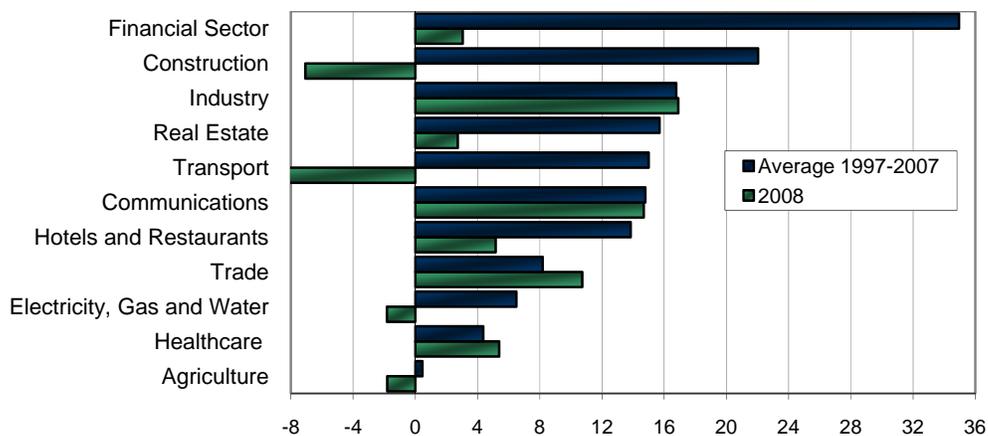
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In the modern world where the economic development of any country significantly depends on smooth and sustainable functioning of financial institutions and markets, analyzing factors determining financial stability acquires more and more importance.

The economy of the country represents a very complex organism, all the constituent parts of which are closely interrelated; therefore, the positive shock in any of the sectors will necessarily generate respective reaction in the economy as a whole, while negative shock in any of the sectors may significantly increase the risk level in the financial sector. Hence, when analyzing the financial stability of the country, not only specific financial institutions or financial and banking sector separately but also their interaction with all other sectors in the economy are necessary to be taken into consideration.

As the wider economic environment influences the financial system, the economic reforms undertaken in the last five years and the progress made in the economic development of Georgia have brought a considerable improvement of financial institutions as well.

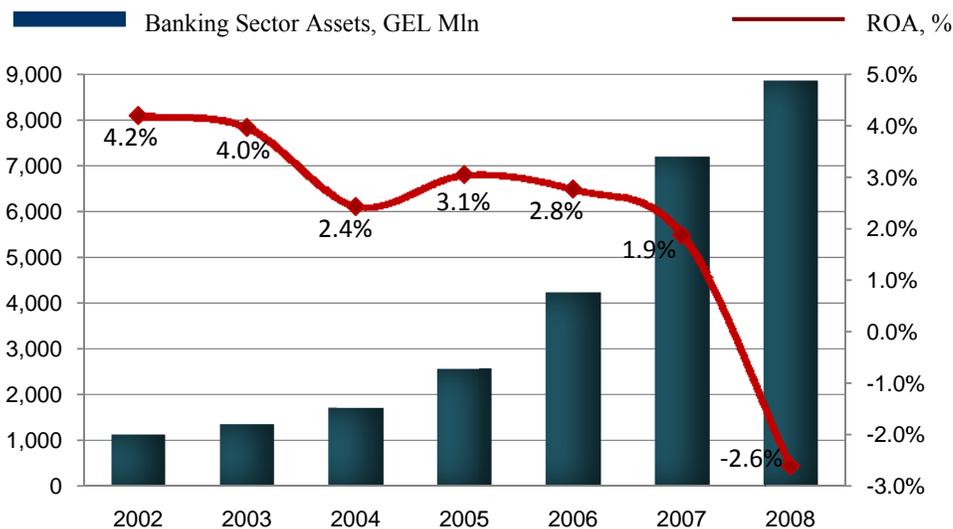
**Chart I.1 GDP Growth Rates by Sectors, 1997-2008**



Source: National Bank of Georgia

The country's sustainable macroeconomic development, foreign debt stability, strong financial performance and decreased country risks stipulated the financial system to become one of the most dynamic sectors of the Georgian economy with average annual growth rate of 35% over last ten years. However, the war with Russia in August 2008 and the international financial crisis was a negative shock for the whole country and caused a decline in the growth rates in almost all sectors of the economy. All these have reflected in the financial sector as well, which annual growth rate decreased up to 3% in 2008.

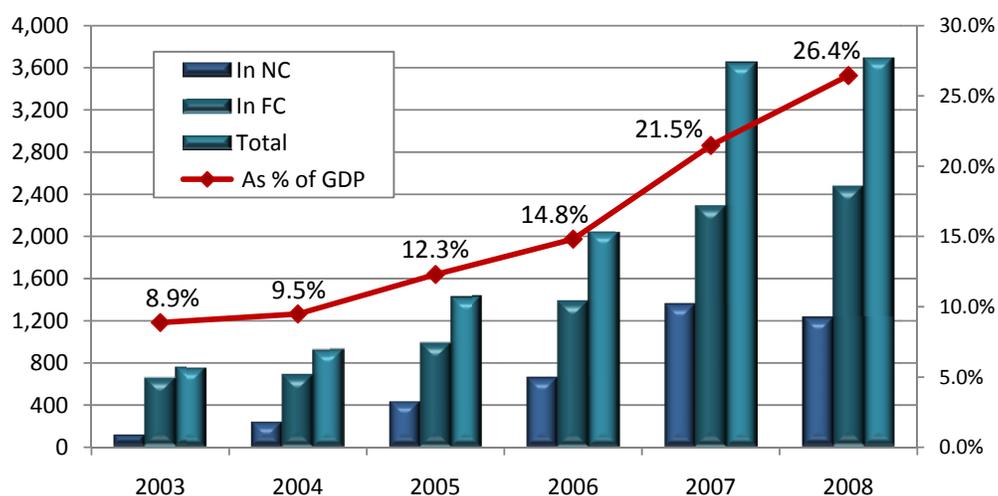
Commercial banks represent the main segment of the financial sector in Georgia (more than 95%). Liberal regulations implemented in the banking sector since 2003 have increased the interest of large foreign banks in the Georgian banking market. Alone in 2007, five new banks were opened in Georgia and in the last three quarters of the same year, the foreign direct investment in the banking sector amounted to USD 118 million. All these have contributed to the continuous expansion of the banking sector reflected in the growth of banking sector assets averaging 63% annual growth in the last three years. Profitability ratios have been high by international standards with ROA and ROE being 1.9% and 9.6% in 2007.



Source: National Bank of Georgia

In countries like Georgia where banking sector constitutes the major portion of the financial sector, financial stability of the whole economy significantly depends on the liquidity of the banking sector. For instance, commercial banks receive deposits from households and companies and then lend them to other households and companies; commercial banks perform all types of cashless payments both within the country and abroad. Therefore, unlike regular companies, problems in commercial banks are instantly reflected in the rest of the economy.

One of the main sources of banking liquidity is deposits. Growing trust towards the banking sector, which was due to liberalization period in relation to capital adequacy, profitability, assets quality and risk management as well as macroeconomic stabilization, stronger economic activity and positive economic outlook have driven rapid increase in deposits especially in recent years.



Source: National Bank of Georgia

This fact confirms that the decisions made by the households and enterprises on redistribution of available resources i.e. investments of the savings in the financial markets are significantly affected by the country's economic conditions. Depositors' behavior determined by these

decisions on its turn has a great influence on the liquidity condition of commercial banks and thus on the stability of financial sector.

All above mentioned proves that factors affecting deposits formation are important determinants of financial system stability and therefore analyzing them is essential and requires attention.

Despite that analyzing the effects of economic conditions on deposit formation is an important issue there is no research done in this direction in Georgia. The aim of this paper is to fill this gap and to analyze deposits formation in Georgian commercial banks.

Determining the macroeconomic indicators that affect depositors' behaviour and examining which of them are the most essential and influential determinants of deposits formation in Georgia are done in three step. In the first steps, cointegration technique is applied to verify the macroeconomic variables that have significant effect on the demand for real money balances and the presence of the long run equilibrium relationship among them is sought. In the second step using the same econometric tools, the model for currency deposit ratio is estimated. In the final step model for the real deposits are derived and using the results from previous steps, real deposits are estimated. The results suggest that the macroeconomic variables such as real GDP, interest rate on deposits, inflation, financial innovation, real effective exchange rate and the proxy variable measuring the spread of the "black economy" are essential in analyzing deposits formation in Georgia.

Result of this research is helpful for policy makers and especially for National Bank of Georgia (NBG). As one of the main functions of the NBG is to ensure the stability of the financial system and its transparency, conclusions of this study can be useful when designing monetary policy. Thus knowing how different macroeconomic indicators affect depositors' behaviour is very useful to predict what and how deep will be the effects of changes in economic conditions on the deposit formation and hence on the liquidity position of commercial banks in Georgia.

The paper is organized as follows: Section II is the main part of the paper that describes the model specifications, links to literature, estimation results. It consists of three sub-sections corresponding to each step in the three steps procedure. The first sub-section presents model for estimating money demand function and its relation to existing literature; provides the description of the data used in the estimation; presents the methodology and discusses the empirical results. The second sub-section does the same for the currency deposit ratio. The final sub-section by using results from previous sections constructs the final model for the real deposits and analysis deposits formation in Georgia. Section III concludes and gives suggestions for future research.

## II Methodology, Links to Literature, Data Description and Estimation Results

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In this paper, deposits are considered as the difference between real money balances and currency in circulation

$$\frac{D}{P} = \frac{M}{P} - \frac{C}{P}$$

where  $\frac{D}{P}$  is real deposits,  $\frac{M}{P}$  and  $\frac{C}{P}$  are real money balances and real currency in circulation respectively.

Following this definition deposits formation is analyzed using three-step procedure. First step includes estimation of money demand function. Second, gives the evaluation of currency-deposit ratio. By using the results from the previous steps, the final step verifies which factors are essential to explain deposit formation and how each of them affects depositors' behaviour in Georgia.

### Step1. Demand for Broad Money

#### *Model Specification*

There exists a large and comprehensive literature on the theory of money demand and on its influential factors. In general, the demand for real money balances is considered to be decreasing in the opportunity cost of holding it, measured by nominal interest rate and increasing in some scale measure, such as income or wealth (Lucas, 1988; Hoffman and Rasche,

1991; Stock and Watson, 1993). Therefore, the standard functional form for money demand can be expressed in the following way:

$$\frac{M}{P} = F(Y, i) \quad , \quad F_Y > 0 \quad F_i < 0$$

where M is money stock, P is price level, Y - real income and i - nominal interest rate.

However, there are various discussions on the form of the money demand function and the selection of the variables entering in the equation. The choice of economic indicators varies in different country experience due to the distinction in different financial systems. For instance, Felmingham (2001) in his paper “The Long Run Demand for Broad Money in Australia Subject to regime Shifts” uses the spread between interest on broad money and on non-money assets, real GDP and rate of inflation to explain demand for money. Vega (1998) uses the similar specification for estimating money demand in Spain. The only difference in his formulation is that unlike to Felmingham, interest rates enter in the equation separately.

Alternatively, Komarek and Melecky (2004) extend traditional money demand consisting purely of domestic variables (such as the producer price index, the index of industrial production, the interest rates on sight and short term time deposits) to include certain foreign determinants (direct investment, effective exchange rate, the returns on foreign assets, etc.). According to them, these indicators are likely to have effect on the demand for money in small open transition economies like the Czech Republic.

The choice of an appropriate monetary aggregate for the estimation of a money demand function is also subject to discussion. Either a narrow or a broad definition of money can be used as the monetary variable depending on the aim of paper. Generally, narrow money (like monetary base or M1) is used to estimate the money demand as it tends to be more flexible and reactive to

changes in economic variables (see e.g., Lucas, 1978; Hetzel, 1984; Stock and Watson, 1993; Ball, 2001).

The main aim of this paper is to analyze total deposit formation and thus, estimation of money demand is done for this purpose. Considering this, a broad definition of money, such as M3 is used to evaluate money demand as it includes total deposits denominated both in national and foreign currency.

The first determinant of the money demand function is a scale variable measuring the level of economic activity. The holding of money is related to the volume of the transactions. Since the volume of transactions is greater when output is higher, the demand for real balances is expected to be proportional to the level of output. Either an income or a wealth variable is used as a scale variable. As data about wealth is not available for Georgia, for this purpose this paper uses income variable like Gross Domestic Product (GDP). Using this indicator as scale variable is general practice as well.

Another important determinant of money demand is market interest rates and yields on different financial assets. In general, it is believed that demand for money is inversely related to the interest rates. The explanation for this thinking is the following: generally, for estimating demand, only narrow definition of money (which pays no interest rate) is used and thus nominal interest rate can be interpret as an opportunity cost of holding it. According to these definitions, negative relationship between nominal interest rate and demand for real money balances is reasonable and empirically confirmed as well. However, as this paper considers broad definition of money, the interest rates on deposits becomes the nominal return of holding it. Hence, in money demand equation expected sign of the nominal interest rate is positive as it represents the own rate of return on broad money.

On the other hand, the rate of return on bond and securities can be considered as the opportunity costs of holding the broad money (see e.g., Mutluer and Barlas 2002). However, the markets for these kinds of financial assets are underdeveloped in Georgia. Thus, this hypothesis cannot be tested for Georgia.

In addition to above-mentioned variables, inflation can be considered as one of the determinants on money demand, which becomes more important if there are high fluctuations in prices. It approximates the effect of the opportunity cost of holding money with respect to real assets and is expected to have negative coefficient (see e.g., Sriram 1999b). Moreover, the coefficient is expected to be high for Georgia as in developing countries real assets represent a substantial part of public's portfolio since the range of financial instruments outside money is limited due to underdeveloped financial markets (see e.g., Nachegea, 2001).

The reason of including interest rate and inflation in the model separately is to distinguish effects of own rate of return on broad money and the opportunity cost of holding real money balances relative to real assets.

Foreign exchange rate can also be used as one of the determinants of money demand. Either bilateral exchange rates (Sriram, 1999; Komarek and Melecky, 2004; Van Aarle and Budina, 1996) or real effective exchange rate (REER) (Mutluer and Barlas 2002) can be used in the money demand equation to incorporate the implications of currency substitution theory. Moreover, REER should capture the consequence of the different financing requirement that imports and exports have on transaction money demand. The expected sign of this variable is negative meaning that when domestic currency appreciates the demand for broad money tends to decrease. However, after considerable experimentation it was not able to detect any significant effect of bilateral exchange rates on money demand. On the other hand, effective exchange rate (REER) seems to have significant effect on money demand.

Taking these together, in the first step the following model is estimated:

$$\left(\frac{M}{P}\right)_t = \beta_1 Y_t + \beta_2 i_t + \beta_3 \pi_t + \beta_4 ER_t + u_t$$

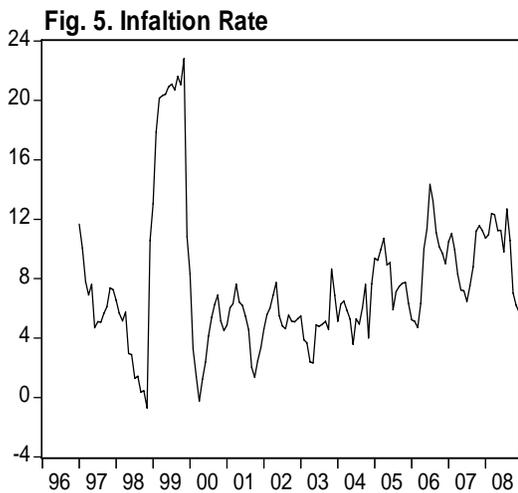
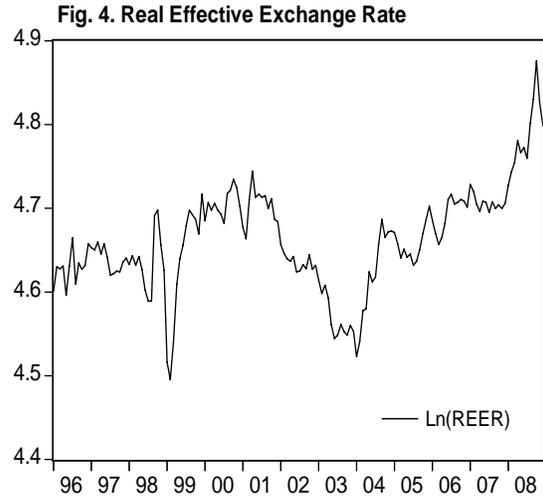
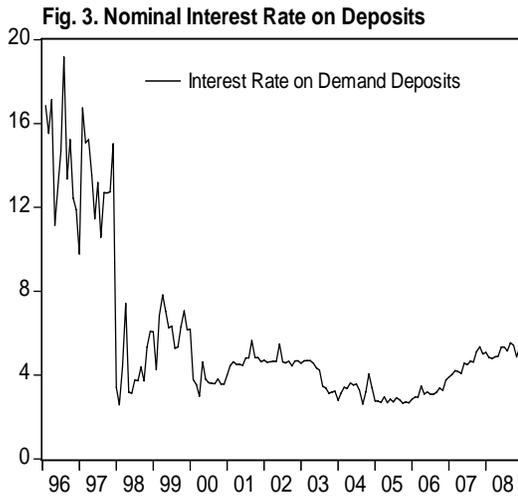
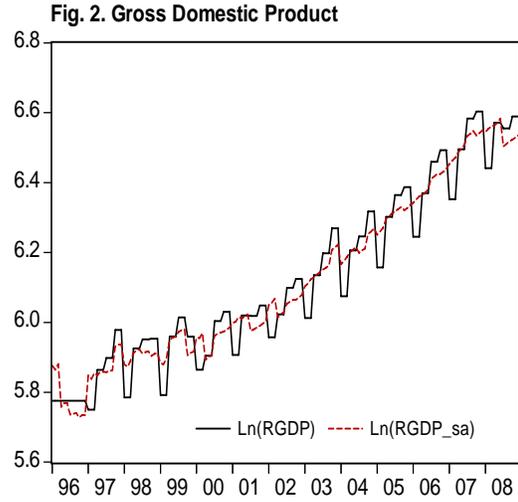
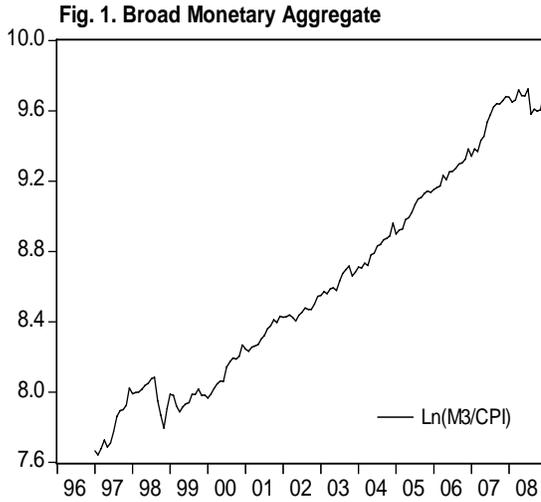
where  $\left(\frac{M}{P}\right)_t$  is real broad money,  $Y_t$  is the scale variable approximation,  $i_t$  represents the own rate of return on broad money,  $\pi_t$  approximates the cost of holding money relative to real assets,  $ER_t$  is an approximation to describe the effect of price elasticity of foreign trade and  $u_t$  is the error term. All variables are in logarithms except interest rate and inflation, thus coefficients of  $Y_t$  and  $ER_t$  represent the long run elasticities while the coefficients of other variables ( $i_t$  and  $\pi_t$ ) specify the semi-elasticities.

### *Data Description*

The study is based on monthly data extending over the period 1996 (Feb) to 2008 (Dec). Main variables are presented in chart II.1. All data are obtained from National Bank of Georgia, Statistics Department of Georgia and Ministry of Finance.

The money aggregate used in the estimation is a broad money (M3) defined as a sum of money outside banks and deposits denominated both in national and foreign currency. It is deflated using consumer price index (CPI) as it enters into the equation in real terms. Figure1 in Chart II.1 shows the logarithm of this real money balances  $\left(\ln\left(\frac{M}{P}\right)\right)$  where it can be seen that there is an upward trend especially from 1999 until August 2008. This is partially related to increase in levels of deposits during this period (Chart I.3). The decline of the real money balances in the third quarter of 2008 was one of the consequences of the conflict with Russia and the international financial crises as well.

## Chart II.1 Variables in Money demand Equation, 1996-2008



The income variable used in the analysis is the real GDP at constant 1996 prices. Moreover, due to high seasonality it is seasonally adjusted. The seasonally unadjusted and adjusted real GDP series in logarithm ( $Ln(RGDP)$ ) are illustrated in Figure 2 in Chart II.1. As it can be seen there is an upward trend reflecting increasing economic growth of the country in the recent years followed by a sharp decline in 2008 due to political and economic conditions that prevailed in Georgia in that year.

The own return on broad money is measured using the nominal interest rate ( $i$ ) on total demand deposits ( $DD$ ). It is calculated as a weighted average of nominal interest rates on demand deposits in national ( $DD_{NC}$ ) and foreign currency ( $DD_{FC}$ )

$$i = w_{NC}i_{NC} + w_{FC}i_{FC} \quad w_{NC} = \frac{DD_{NC}}{DD} \quad w_{FC} = \frac{DD_{FC}}{DD}$$

where weights,  $w_{NC}$  and  $w_{FC}$  represent the shares of national and foreign currency deposits in total deposits respectively. This interest rate is illustrated in Figure 3 in Chart II.1. It can be seen that it was very volatile in 1990s and experienced a sharp decline in January 1998.

Inflation rate that is used to approximate the opportunity cost of holding money compare to real assets is an annual inflation and is calculated as a percentage change of CPI over corresponding month of previous year. Calculated in that way excludes any change in inflation due to seasonality. Figure 5 in Chart II.1 shows the annual inflation rate. The high inflation in 1999 was the consequences of Financial Crises in Russia in 1998-1999, which eventually stabilized in 2001. Since then some price fluctuations in the country were caused by several fiscal and seasonal patterns. Due to stable domestic currency, the price dynamics in Georgia during 2002-2007 years were determined mostly by the changes in nominal wages and seasonal price fluctuations.

Finally, Figure 4 in Chart II.1 shows the logarithm of the real effective exchange rate  $Ln(REER)$  of the Georgian Lari. The increase of this variable means appreciation of lari. It shows that, there is a sharp appreciation of REER in the third quarter of 2008. This sharp increase in REER index is related to Lari's appreciation against all its partner countries' currencies during August. It is also the result of movements in price levels both in Georgia and in its main partner countries. These facts in turn are also related to the unstable situation in Georgia after the conflict with Russia.

### *Estimation*

In general most of the macroeconomic variable are not stationary thus, to find out which method is the most appropriate to estimate the model firstly a unit root test is applied. In order to determine the order of integration of the variables used in the model the Augmented Dickey Fuller Test is used and the tests results are presented in Table II.1. According to the results all these series appear to be non-stationary and integrated of order I(1).

**Table II.1 Unit Root Test Results for Money Demand Model**

Variable	Augmented Dickey-Fuller Test		
	Level		First Difference
	Constant	Constant and Trend	Constant
$Ln(M/P)$	0.146	-2.171	-3.425*
$Ln(RGDP)$	0.086	-2.250	-10.137*
$i$	-2.487	-1.917	-7.564*
$Ln(REER)$	-2.157	-2.655	-8.607*
$\pi$	-0.561	-2.177	-7.129*
Critical Values			
0.05	-2.881	-3.44	-2.881

The superscript \* denotes the rejection of hypothesis of a unit root at 5% significance level

As variables are  $I(1)$ , various econometrical methods for non-stationary time series data can be applied to estimate demand for broad money. Specifically, in this study the Johansen procedure is used for testing the presence of cointegration and thus for determining the long run equilibrium relationship among variables of interest.

In the beginning of the estimation procedure, first Akaike Information Criterion (AIC), Final prediction error (FPE) and Schwartz Information criterion (SC) are used to select the lag order of the model. As the data used in this study is monthly, the maximum number of lags testing using these criteria is twelve. All these methods suggest including maximum 12 lags in the model. Next, the lag Exclusion Wald Test is used to determine among them which lags are significant. According to the tests results only sixth lag are excluded from the final model as all other lags tend to be jointly significant.

In addition, to improve the results of the estimation some dummies concerning some shocks are including in the model as exogenous variables. One of them corresponds to the war with Russia occurred in August 2008, as it has substantial negative shock for the Georgian economy Georgia and especially for the financial system. The second one reflects the Rose Revolution in Georgia in 2003. There was a sharp increase in the international wheat price in the same year, which makes the inclusion of this dummy on the model more important.

The third dummy is used to capture effect and the consequences of the Russian Financial Crises in 1998-1999. In 1998, economic situation in Georgia deteriorated again due to civil conflicts, fiscal imbalances and currency crises, in its turn, caused by the Financial Crises in Russia – one of the major trading partners of Georgia. Therefore, insertion of this dummy in the model is essential, as the effect of this shock in the Georgian economy was considerable.

As the results show all these dummies are statistically significant for estimating demand for broad money.

The results of the Johansen technique are given in the Table II.2. The first part of the table shows the results of cointegration rank test. Trace test indicates three cointegrating equations at the 0.05 level while Max-eigenvalue test indicates the existence only one cointegrating vector.

**Table II.2 Cointegration Analysis for Georgian Broad Money**

<b>Cointegration Rank Test</b>					
Hypothesized	No. of CE(s)	None	At most 1	At most 2	At most 3
<b>Trace</b>	Eigenvalue	0.371	0.159	0.134	0.091
	Statistic	123.371*	62.435*	39.638*	20.662*
	5% Critical Value	69.818	47.856	29.797	15.494
	Prob.**	0.000	0.001	0.003	0.008
<b>Max-Eigen</b>	Eigenvalue	0.371	0.159	0.134	0.091
	Statistic	60.935*	22.797	18.975	12.597
	5% Critical Value	33.876	27.584	21.131	14.264
	Prob.**	0.000	0.182	0.097	0.090

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Cointegrating Coefficients (normalized by  $b^*S_{11}^{-1}b=I$ ):

Ln(M/P)	Ln(RGDP)	i	$\pi$	Ln(REER)
15.85231	-39.09480	-1.055136	0.181348	19.66819
15.75121	-37.24651	0.132080	0.700686	-18.31534
-13.43692	32.70688	0.109485	-0.105211	28.22305
23.24813	-67.38610	-0.572063	0.635855	-4.502188
-29.84151	75.56581	-1.376764	-0.258377	10.46056

Adjustment Coefficients (alpha):

D[Ln(M/P)]	0.001750	-0.002467	-0.001368	0.000675	0.002073
D[Ln(RGDP)]	0.002488	0.001049	-0.002721	0.001113	-0.001458
D[i]	0.140278	0.034714	0.031047	-0.017995	0.008720
D[ $\pi$ ]	0.010585	0.051564	-0.133307	-0.301554	-0.040082
D[Ln(REER)]	-0.002094	0.004121	-0.001203	-0.000392	0.001494

**Cointegrating Equation:                      Log likelihood                      1011.388**

Normalized cointegrating coefficients (standard error in ( ) & t-statistics in [ ] )

Ln(M/P)	Ln(RGDP)	i	$\pi$	Ln(REER)
1.000000	-2.466189	-0.066560	0.011440	1.240714
	(0.08820)	(0.01847)	(0.00583)	(0.37572)
	[-27.9599]	[-3.60330]	[1.96326]	[3.30226]

The diagnostic tests show no autocorrelation (SC LM Test) and no heteroscedasticity (White Heteroscedasticity Test) concerning residuals. Therefore, model results can be considered to be valid.

Based on this model, the cointegrating equation representing the long run demand for real broad money can be expressed in the following way:

$$\ln\left(\frac{M}{P}\right)_t = 2.47 \ln(RGDP)_t + 0.07 i_t - 0.02 \pi_t - 1.24 \ln(REER)_t$$

All variables in the above equation are statistically significant and have the expected signs. The income elasticity found is 2.47, which is higher than what other studies show. Many papers find this coefficient to be close to one suggesting unit income elasticity. However, in all cases that were tried in this study it was higher than 2, indicating a higher income elasticity in Georgia compare to other countries (The Czech republic, Austria, Turkey). Possible explanation of this high income elasticity can be the following: as the real money balances used in this model includes deposits both in national and foreign currency and the stocks and bonds markets are underdeveloped in Georgia and thus there are not good alternatives compare to deposits. According these when income increases one of the best possibilities is to put it on deposits resulting in high income elasticity.

The interest rate on deposits has a positive sign as it represents the own rate of return, while inflation has a negative effect on the money demand as it represents the return on real assets. The REER also negatively influences the money demand as the increase in the real exchange rate means the appreciation on lari, when domestic currency appreciates the demand for broad money tends to decrease. It is difficult to compare the values of coefficients with the results of other studies as they vary according to the model specification and country of interest. However,

the signs of the coefficients are consistent with the findings of other papers and with the theory as well.

The final equation estimated in this section is used in the Step3 to estimate the real deposits.

## Step2. Currency-Deposit Ratio

### *Model Specification*

The literature on the investigation the behaviour of the currency-deposit ratio ( $C/D$ ) is quite extensive. There are some general determinants of this ratio, such as income growth and opportunity cost of holding currency (see e.g., Ahmed and Ali, 1994; Dadkhah and Mookerjee, 1988; Khatkhate et al., 1980). Additionally, different authors suggest testing different hypothesis about the determination of the currency-deposit ratio, concerning the country specific factors and the aims of the studies.

One of the important determinants of the currency-deposit ratio is income. (see e.g., Hasan, 2001; Boughton and Wicker, 1979). Income growth reduces the ratio while during recessions the  $C/D$  tends to rise as confidence toward banks may decrease and people may start to view banks deposits risky. Thus, the expected sign of the income growth in the  $C/D$  ratio equation is negative.

The relative cost of holding currency rather than deposit is another factor that has effect on the currency-deposit ratio. An increase in the opportunity cost of holding currency as measured by the interest rate paid on deposits diminishes the attractiveness of currency compare to deposits and thus, reduces the  $C/D$  ratio. Real interest rate on total deposits is used to test this hypothesis for Georgia.

Another factor motivating shifts in the C/D is inflationary expectations. Expectations about high inflation reduce attractiveness of deposits and hence induce depositors to shift to consumer durables and physical assets. According to this hypothesis, expected inflation is likely to have a positive influence on the currency-deposit ratio. However, as analysis shows that the effect of the inflation on currency deposit ratio is not statistically significant in Georgia and has a negative sign. Therefore, it is not included in the C/D equation.

Together with the determinants described above, it has been suggested by, for example, Cagan (1965) that the currency-deposit ratio is likely to be influenced by increased financial sophistication. According to this hypothesis, as a richer range of liquid financial assets becomes available, the demand for currency falls disproportionately. However, this hypothesis was rejected by the U.K. data (Beenstock, 1989) as at a time when financial innovation was quite rapid, the currency ratio rose rather than declined. Conversely, it seems that it will not be rejected by the Georgia data since during the rapid development of financial sector in Georgia there was a decreasing trend in the C/D ratio (Figure 1 in Chart II.2). However, there is a problem related to measurement financial sophistication. One option is to use the number of branches of the commercial banks as proxy measure for financial development. Another way, suggested for example, by Paroush and Ruthenberg (1986) is to use the number of ATMs as a proxy variable.

Data on the number of bank plastic cards in circulation as well on the number of transactions made and their total values are available only from 2007. Thus, these variables cannot be used as proxy variables to study the effect of financial innovations on currency deposit ratio in Georgia. Instead, various ratios, C/M1, M0/M3, M1/M2, M0/M2 etc as proxy variables are used in the model capture the effect of financial sophistication on C/D ratio but only M0/M2 turned out to be statistically significant.

Another institutional change that seems to have an effect on the C/D ratio is the increased use of banks for the payment of wages and salaries in recent years. Since 2006, payments of pensions in Georgia are made using banking account. The consequence of this kind of changes is the increased number of people holding bank accounts as it forced people who might not otherwise have done so to open accounts. This in turn would have reduced the currency ratio. Certainly, there is a tendency for transactions to become less cash intensive in Georgia. However, as it is already mentioned above data about the fraction of transactions made in cash in Georgia exists only from 2007, which is not sufficient for econometric analysis.

Another hypothesis about the determination of the currency ratio has been suggested by Matthews (1982). He argues that the relative demand for currency varies directly with the spread of the “black economy”. Transactions in the black economy tend to be in the form of cash since bank records might lead to detection by tax authorities. According to this view, the demand for cash will vary directly with the marginal rate of tax, since it is that stimulates the black economy. This may be true for Georgia also. Here number of reforms, including reducing number and amount of taxes has been implemented to decrease the size of the “black economy”. Therefore, it will be interesting to test whether these reforms have effect on currency-deposit ratio as well.

Taking these together, the final model that is estimated in the second step is the following:

$$\left(\frac{C}{D}\right)_t = \alpha_1 Y_t + \alpha_2 r_t + \alpha_3 TaxRate_t + \alpha_4 FI_t + \varepsilon_t$$

where  $\left(\frac{C}{D}\right)_t$  is currency deposit ratio,  $Y_t$  is the income variable,  $r_t$  represents the opportunity cost of holding currency relative to deposits,  $TaxRate_t$  approximates the effect of “black economy”,  $FI_t$  is a proxy variable that describes the effect of innovations in the financial system and  $\varepsilon_t$  is the residual term. Again all variables are in logarithms except interest rate, thus

the coefficient of interest rate specifies the semi-elasticity while other coefficients represent the long run elasticities.

### *Data Description*

The data that is used to estimate currency-deposit ratio is monthly, extending over the period 1996 (February) to 2008 (December). The variables are presented in chart II.2. The sources for these data are the same as in previous case.

The variable, which is estimated in this part of study, the currency-deposit ratio is constructed in the following way: it is logarithm of the ratio of the money outside banks over total deposits.

Figure1 in Chart II.2 shows this variable  $\left( \ln \left( \frac{C}{D} \right) \right)$  where it can be seen that there is a declining tendency in this ratio in Georgia during the estimation period. Development of banking sector and increased trust toward banks have increased number of banking accounts and thus caused decrease in C/D ratio. However, situation that came up in Georgia during last year has its implication on currency-deposit ratio as well, revealed as a sharp increase of this variable in August-September 2008.

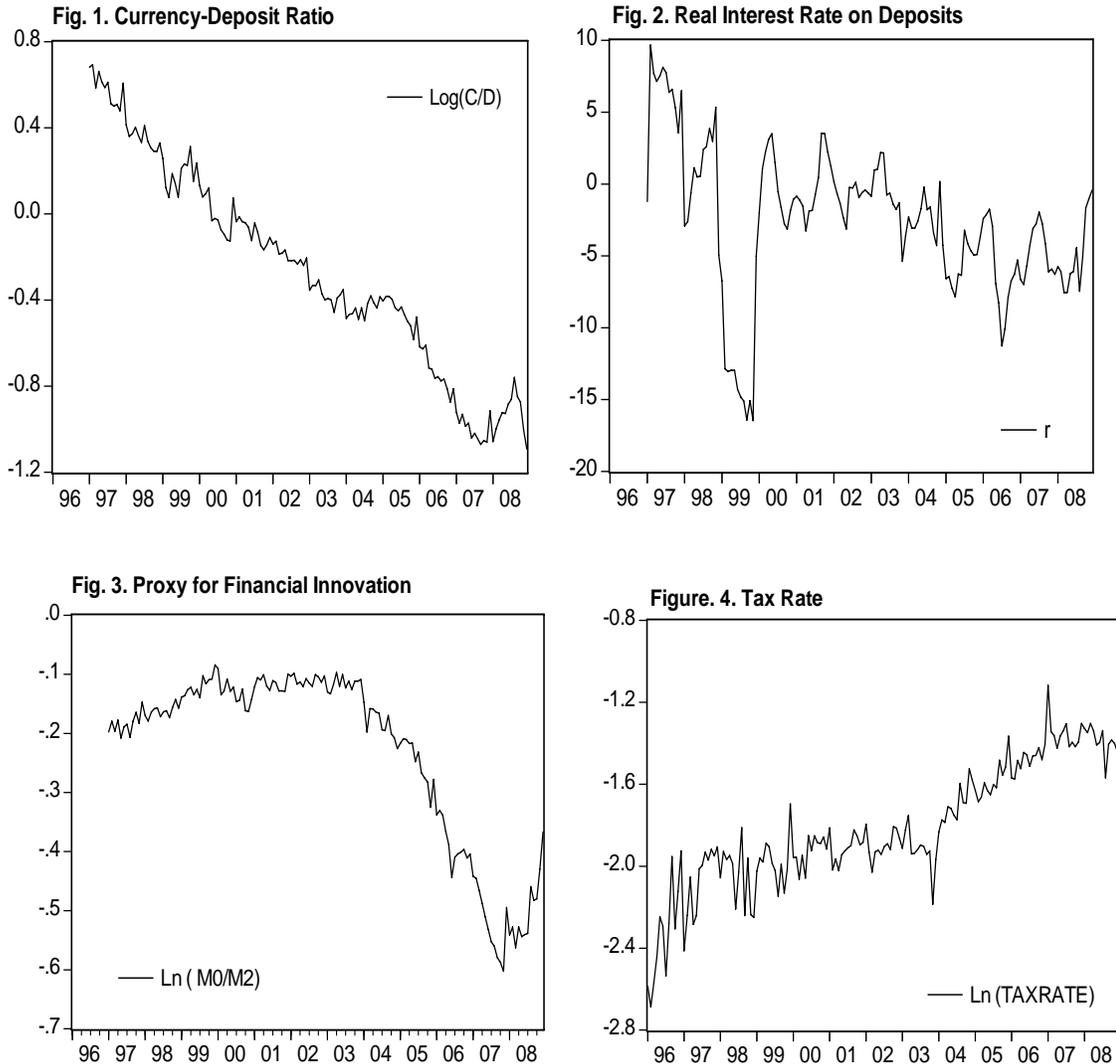
The income variable used in the section is the same as in the previous step – logarithm of the real GDP at constant 1996 prices. ( Figure 2 in Chart II.1)

To measure the opportunity cost of holding currency relative to deposits the real interest rate on deposits is calculated using Fisher equation:

$$r_t \approx i_t - \pi_t$$

where  $i_t$  and  $\pi_t$  are nominal interest rate on deposits and inflation respectively as defined in the Step1. It is shown in the Figure2 in Chart II.2.

## Chart II.2 Variables in Currency-Deposit Ratio Equation, 1996-2008



The variable that is used as an approximation of financial sophistication is constructed in the following way: it is the logarithm of currency in circulation (M0) over money aggregate (M2, which includes money outside banks and deposits in national currency)  $\left( \ln \left( \frac{M0}{M2} \right) \right)$ . As it can be seen from Figure 3 in Chart II.2, there is a declining trend until 2008, meaning an increasing level of innovations in the financial system. However, an unstable situation in Georgia during 2008 that has negatively affected the financial system is also confirmed by the behaviour of this ratio.

In order to test the effect of the spread of the “black economy” on the currency-deposit ratio the total tax revenues over the nominal GDP is used as a proxy for tax rate ( $\ln(TaxRate)$ ). It enters in the equation in logarithm. Figure 4 in Chart II.2 represents this variable.

### Estimation

As in the previous step, firstly a unit root test is applied to determine the order of integration of the variables used in the model. The Augmented Dickey Fuller Test results are presented in Table II.3. According to the results all these series appear to be non-stationary and integrated of order I(1).

**Table II.3 Unit Root Test Results for Currency Deposit Ratio Model**

Variable	Augmented Dickey-Fuller Test		
	Level		First Difference
	Constant	Constant and Trend	Constant
Ln(C/D)	-0.831	-3.362	-10.147*
Ln(RGDP)	0.086	-2.250	-10.137*
r	-2.590	-2.961	-12.157*
Ln(TaxRate)	-1.766	-2.493	-8.290*
Ln(M0/M2)	-0.419	-1.607	-15.292*
Critical Values			
0.05	-2.881	-3.44	-2.881

As variables are I(1), again the Johansen procedure is used for testing the presence of cointegration and thus for determining the long run equilibrium relationship among variables of interest.

Again, Akaike Information Criterion (AIC), Final prediction error (FPE) and Schwartz Information criterion (SC) are used to select the lag order of the model. In this case, these

methods suggest different order of lags to be included in the model. Next, the lag Exclusion Wald Test are used to determine which lags are significant. According to the tests results the first, second, tenth and twelfth lags are included in the final model.

In addition, as in the previous case in order to improve the results the same dummies are including in the model as exogenous variables. According to the results, all the dummies are statistically significant for this model as well.

The results of the Johansen technique for this model are given in the Table II.4. The first part of the table shows the results of cointegration rank test. In this case, both Trace test and Max-eigenvalue test indicate one cointegrating vector at the 0.05 level.

**Table II.4 Cointegration Analysis for Currency Deposit Ratio**

Cointegration Rank Test					
Hypothesized	No. of CE(s)	None	At most 1	At most 2	At most 3
<b>Trace</b>	Eigenvalue	0.253	0.154	0.077	0.030
	Statistic	74.917*	36.648	14.707	4.139
	5% Critical Value	69.818	47.856	29.797	15.494
	Prob.**	0.018	0.364	0.798	0.892
<b>Max-Eigen</b>	Eigenvalue	0.253	0.154	0.077	0.031
	Statistic	38.269*	21.940	10.568	4.114
	5% Critical Value	33.876	27.584	21.131	14.264
	Prob.**	0.014	0.223	0.690	0.847

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Cointegrating Coefficients (normalized by  $b^*S_{11}^*b=l$ ):

Ln(C/D)	Ln(RGDP)	r	Ln(TAXRATE)	Ln(M0/M2)
-4.716477	-16.36255	-0.150812	12.62136	8.147093
-0.542689	-9.861711	0.221546	6.733719	-2.649935
9.538461	20.71800	0.103831	6.454690	10.90685
6.230422	1.323416	-0.045466	3.979269	-4.282410
-1.941496	-6.055404	-0.004531	-3.761294	-15.64377

Adjustment Coefficients (alpha):

D[Ln(C/D)]	0.008591	-0.003911	-0.004550	-0.003118	-0.000164
D[Ln(RGDP)]	0.005584	0.003250	-0.001284	-0.000737	0.000113
D[r]	0.467572	-0.401266	0.051345	0.115272	0.002275
D[(Ln(TAXRATE))]	-0.014646	-0.015366	-0.006692	-0.000327	0.000645
D[Ln(M0/M2)]	0.000566	0.001003	-0.003396	0.001952	-4.71E-05

**Cointegrating Equation:**                      **Log likelihood**                      **898.9917**

Normalized cointegrating coefficients (standard error in ( ) & t-statistics in [ ] )

Ln(C/D)	Ln(RGDP)	r	Ln(TAXRATE)	Ln(M0/M2)
1.000000	3.469232	0.031976	-2.676015	-1.727368
	(0.58484)	(0.00994)	(0.60150)	(0.75274)
	[5.93196]	[3.21843]	[-4.44889]	[-2.29478]

As in the previous model, the diagnostic tests show no autocorrelation (SC LM Test) and no heteroscedasticity (White Heteroscedasticity Test) concerning residuals. Therefore, model results are applicable.

Using the estimation results, the cointegrating equation for the currency deposit ratio can be written in the following way:

$$\ln\left(\frac{C}{D}\right) = -3.47 \ln(RGDP) - 0.03 r + 2.68 \ln(TaxRate) + 1.73 \ln\left(\frac{M0}{M2}\right)$$

All variables in the above equation are statistically significant and have the expected signs. This model shows that RGDP has a significant influence on the currency deposit ratio. The coefficient of the real interest rate has a negative sign as it represents the opportunity cost of holding currency thus when interest rate rises the public raises its preferences for deposits relative to cash.

This model confirms the positive relationship between the relative demand for currency and the spread of the “black economy” in Georgia. When the tax rate increases demand for cash will increase meaning higher spread of the “black economy”. In addition, there can be another

explanation for this relationship. When tax rates are higher people need more cash to pay it thus this can also explain the significant positive relationship between tax rate and currency-deposit ratio.

The analysis made in this section made it possible to detect the effect of financial sophistication here approximated by  $Ln\left(\frac{M0}{M2}\right)$  on the currency deposit ratio. The positive sign on this variable indicates that increase in financial innovation (decrease of the M0/M2 ratio) has a negative effect on the currency deposit ratio, as innovations in the financial system gives people opportunity to hold less cash relative to deposits.

The result of this step together with the result from Step1 is used in the next section to explain depositors' behaviour in Georgia.

### Step3. Estimating Real Deposits

In this section, first, the model for real deposits are constructed and then using estimation results from previous steps deposits formation is analyzed.

As mentioned above deposits are defined in the following way:

$$\frac{D}{P} = \frac{M}{P} - \frac{C}{P} \quad (1)$$

Where D is the total deposits denominated both in national and foreign currency, P is the price level measured by CPI. Thus,  $\frac{D}{P}$  represent the real total deposits. M and C are M3 monetary aggregate and money outside banks respectively.

The estimations of the right hand side terms are obtained from Step1 and Step2 respectively.

Specifically, from Step1:

$$\text{Ln}\left(\frac{\hat{M}}{P}\right) = F(X) \quad \rightarrow \quad \frac{M}{P} = e^{F(X)}$$

where X is a vector of right hand side variables in the money demand equation.

And from Step2:

$$\text{Ln}\left(\frac{\hat{C}}{D}\right) = \Phi(Z) \quad \rightarrow \quad \frac{C}{D} = e^{\Phi(Z)} \quad \rightarrow \quad \frac{C}{P} = \frac{D}{P} e^{\Phi(Z)}$$

where Z is a vector of right hand side variables in the currency deposit model.

Substituting these expressions in the equation (1), the following expression is obtained

$$\frac{D}{P} = e^{F(X)} - \frac{D}{P} e^{\Phi(Z)} \quad \rightarrow \quad \frac{D}{P} = \frac{e^{F(X)}}{1 + e^{\Phi(Z)}}$$

After taking the logarithm from both sides of the last equation it will become

$$\text{Ln}\left(\frac{D}{P}\right) = F(X) - \text{Ln}(1 + e^{\Phi(Z)})$$

In addition, using the following linear approximation  $\text{Ln}(1 + X) \approx X$ , next expression is obtained

$$\text{Ln}\left(\frac{D}{P}\right) = F(X) - e^{\Phi(Z)}$$

After using another approximation  $e^X \approx 1 + X$ , the final model for the real deposits can be expressed in the following way

$$\text{Ln}\left(\frac{\hat{D}}{P}\right) = F(X) - \Phi(Z) - 1 = \text{Ln}\left(\frac{\hat{M}}{P}\right) - \text{Ln}\left(\frac{\hat{C}}{D}\right) - 1 \quad (2)$$

From the Step1:  $Ln\left(\frac{M}{P}\right)_t = 2.47 Ln(RGDP)_t + 0.07 i_t - 0.02 \pi_t - 1.24 Ln(REER)_t$

From Step2:  $Ln\left(\frac{C}{D}\right) = -3.47 Ln(RGDP) - 0.03 r + 2.68 Ln(TaxRate) + 1.73Ln\left(\frac{M0}{M2}\right)$

Plugging these result in the equation (2) equation for real deposits becomes

$$Ln\left(\frac{\hat{D}}{P}\right) = 5.94Ln(RGDP) + 0.07 i + 0.03 r - 0.02\pi - 1.24 Ln(REER) \\ - 2.68 Ln(TaxRate) - 1.73\left(\frac{M0}{M2}\right) - 1$$

Finally, after using Fisher equation ( $r = i - \pi$ ) the final equation for real total deposits has the following form:

$$Ln\left(\frac{\hat{D}}{P}\right) = 5.94Ln(RGDP) + 0.1 i - 0.05\pi - 1.24 Ln(REER) - 2.68 Ln(TaxRate) \\ - 1.73\left(\frac{M0}{M2}\right) - 1$$

This equation shows that the elasticity of income is high and has a positive sign indicating that people tend to increase their deposits when their income measured by real GDP increases. Thus, in the booms, high economic growth tends to rise as confidence toward banks and encourages people to increase their deposits.

The interest rate on deposits has a positive sign as it represent the own rate of return and therefore increase in interest rate induces people to rise their deposits. On the other hand, the real deposits id negatively affected by the annual inflation rate as it approximates the opportunity cost of holding deposits relative to real assets. Moreover, inflation can be considered as an approximation of uncertainty meaning that attractiveness of deposits decreases and people tend to shift to consumer durables and physical assets when they expect high inflation.

The effect of financial sophistication on deposits is positive as expected. The increase in the financial innovations makes it possible transactions to become less cash intensive and tend to increase attractiveness of deposits relative to cash.

Moreover, the spread of the “black economy” has a negative effect on deposits, as transactions in the black economy are likely to be more cash intensive. The effect of REER is also negative, meaning that appreciation of lari has a negative influence on real deposits.

### III Conclusions

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This paper has analyzed deposits formation in Georgia from 1996 to 2008 using monthly data. Deposits are defined as the difference between real money balances and currency in circulation and following this definition the study is done in three steps.

The first step deals with the modelling of broad money demand by using Johansen technique. The result shows the long run relationship between demand the real money balances and the macroeconomic indicators such as real GDP, nominal interest rate on deposits, inflation and REER. All these variables are statistically significant and have correct signs.

The second step estimates the model for the currency deposit ratio using the same technique. According to the results real GDP, real interest rate on deposits, and the proxy variables for financial innovations and “black economy” are important variables in currency deposit ratio model.

The final step construct the model for real deposits and using the result from previous steps verifies which factors are essential to explain deposit formation and how each of them affects depositors’ behaviour in Georgia. The final model shows that real GDP, nominal interest rate on deposits and the financial sophistication have a positive effect on deposits formation, while inflation and “shadow economy” negatively affects it. All these variables are statistically significant and the sign are consistent with other studies and the theory as well.

This paper looks at the long run relationship between the variables of interest. However, it is possible to examine the short run dynamics using for example error correction model.

Furthermore, this analysis can be done separately for deposits denominated in national and foreign currency.

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