THE DETERMINANTS OF LOAN DOLLARIZATION IN ARMENIA

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Abstract

This paper provides analysis of Loan Dollarization determinants in Armenia given the huge importance of this phenomenon and highly dollarized economy of the country. The OLS model is estimated using data of Armenia for the period of 2000-2018. The empirical result of the paper shows that the main determinant of Loan Dollarization in Armenia is banks' currency matching behavior. Some estimations were done to understand the determinants of Deposit Dollarization in Armenia, which as a main driving factor of Loan dollarization shown by the initial model.

Keywords: *Loan Dollarization, Deposit Dollarization, OLS, Currency matching behavior*

ACKNOWLEDGEMENTS

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All the remaining errors in this paper are mine.

Contents

Introduction

Financial dollarization is one of the widely studied topics in economics and a subject for many studies and research. In these researches, there are a lot of different findings and outcomes which sometimes contradict with each other and become the reason of debate among economists. Despite all these controversies, there is broad agreement among economists that financial dollarization accompanied by some economic shocks can lead to financial crises and become a threat to financial and macroeconomic stability of the country. Thus, it is important to understand better what it is? And why we need to worry about it?

Financial Dollarization is a term to describe the phenomenon of using foreign currency in addition to or instead of the domestic currency as a legal tender. There two types of dollarization official (de jure) and unofficial (de facto). Official dollarization as a word implies is the case when the foreign currency is given a legal tender status, while in case of unofficial dollarization the foreign currency is used alongside the national currency and is not a legal tender. This mainly occurs in developing economies and where is detected the unstable economic environment, in particular, countries that had severe inflationary experiences. (Levy, 2003). As a result, literature related to dollarization is mainly concentrated on Latin American countries and transition economies where we can meet this phenomenon largely. While looking at the researches done previously on this topic, and countries chosen for conducting the research, it becomes obvious that researchers mainly choose highly dollarized economies to analyze this phenomenon. Among these countries, we can often meet the inclusion of Armenia, as an example of a transition country that has highly dollarized economy.

To understand better why it worse to study dollarization and its determinants in dollarized economies, it is essential to understand its pros and cons. There is another part of literature devoted to finding out the advantages and disadvantages resulting from dollarization, and one of the advantages is lower interest rates as a result of reduced currency risk studied by Andrew Berg and Eduardo Borensztein. Another advantage that comes, in the long run, is stability, meaning fewer currency crises, and closer integration with the United States. (Salvatore, 2003) Thus, as Sebastian Edwards from the University of California states, dollarization is a way of emerging markets to achieve credibility, prosperity, and growth. It also can strengthen institutions and create positive sentiment toward investment. (Berg, 2000) However, it will also mean the loss of autonomous monetary and exchange rate policy, the reduced scope for lender-of-last-resort to the banking sector, and loss of vital national symbol. The countries that are fully dollarized lose seigniorage revenues, the right of issuing a currency brings to the government revenue, as currency and base money are non-interest bearing debt. (Berg, 2000) It also can make the financial system more fragile because dollarized financial systems are exposed to both solvency and liquidity risks. (Nicoló, 2005)

As financial dollarization can also be referred to as holding financial assets and liabilities broadly in foreign currency by country's residents, these two aspects can be analyzed separately, which this paper is trying to do. The paper will analyze the determinants of Loan Dollarization held by residents of the Republic of Armenia. It is important to analyze the determinants of dollarization in Armenia because as already mentioned above, Armenia is one of the transition economies that has very high dollarization. By taking into consideration the effects that dollarization can have on the economy, it is important to understand its determinants, in order to fight against or to control it. The dollarization effect on banks can strengthen solvency and

liquidity risks, which is needed to be checked by interbank analysis for Armenia. However, we can state that Armenia's financial system is relatively shallow and mainly dominated by banks, there are currently seventeen banks in Armenia (banking sector's assets equal about 78 percent of GDP). And it worth to mention that huge bank failure the effect will be substantial on overall Economy. (IMF, 2018)

Using the data of Armenia for the period 2000-2018 for one Loan Dollarization and Deposit Dollarization models and 2004-2017Q2 for the second Loan Dollarization model, this paper is mainly focused on finding the determinants of Loan Dollarization.

The remainder of this paper is organized as follows. Section 2 discussed the core literature for the paper. Section 3 discusses Data and methodology following by Empirical results in section 4. The conclusion is given in section 5

Literature Review

Over the last years, the vast amount of literature tried to explain the high levels of Financial Dollarization in different economies through examining different angels of this phenomenon. The majority of the papers were dedicated to the developing economies and focused mainly on the Latin American and transitional economies. And the main problem of the researches where the limited and incomplete data. There are several things that mainly caught the attention of researchers, and some of them are the reason for the debate even nowadays. Part of the literature is concentrated on currency substitution models that refer to using foreign currency as a medium of exchange and which is challenges the implementation of monetary policy.

Another part of literature is concentrated on balance sheet effect and mainly argues Financial Dollarization causes currency imbalance in the economy, which affect local banks. During the large exchange rate depreciation, the situation created when dollar debtors cannot return money to the bank. This kind of scenario can happen with the government too in case of having foreign currency sovereign debt. Thus real exchange rate changes and shocks can lead to massive bankruptcies in the country and financial collapse. (E. Levy, 2006).

To analyze determinants of Loan Dollarization and Deposit Dollarization econometric analysis were conducted, and the model specifications, choice of variables are closely related to the literature that is described next.

One of the papers that is core literature for this research paper provides evidence that the main reason for credit dollarization is deposit dollarization and banks' desire for currency-matched portfolios beyond the regulatory requirements. (Luca, 2008). A. Luca, in his paper, used data from 21 transition economies from Central and Eastern Europe and Central Asia, including Armenia, for the period 1990-2003. The impact of firm and bank variables on credit dollarization is studied in an optimal portfolio allocation model similar to Ize and Levy-Yeyati (2003). The model in this paper separates credit dollarization determining variables in three different groups such as banks-specific factors such as asset and liability management indicators, firm-specific factors meaning natural hedges and macroeconomic determinants, for example, exchange rate volatility and the cost of foreign capital, the details of variables is provided in data section of the paper. In the end, empirical results of the paper provide evidence that banks' currency matching behavior determines credit dollarization in transition economies.

Another paper that became core literature for this research is empirical work dedicated to analyzing the drivers of financial dollarization in Russia. To understand the main drivers of loan

dollarization in Russia the author considers several problems that the county had, such as not well developed financial market, due to better conditions of borrowing and landing in foreign countries compared to Russia under the managed exchange rate, the lending by Russian banks and non-financial organizations increased drastically in foreign financial markets. Additionally, Russian banks were unable to satisfy the demand for loans from non-financial organization. (Ponomarenko, 2011). Thus, the paper states that increased degree of openness of the Russian economy, dependence on international capital, banks' currency matching behavior could be drivers of loan dollarization in the country. For the variable selection, the paper used strategies of different papers including A.Luca and Petrova (2008) "What Drives Credit Dollarization in Transition Economies?" paper mentioned above as one of the core literature for this research too. Thus it includes, as previous paper does, variables related to banks' currency matching behavior, construction of minimum variance portfolio. As this paper is for one country, it also includes some country-specific variables such as dummy variables and interaction terms including 2005 and 2008 years that were typical for Russia. 2005 is the year of inclusion EURO in the exchange rate target of the Bank of Russia, and 2008 dummy variable stands for the global financial crisis that can be included in the models analyzing the financial situation in other countries in the world.

Data and Methodology

The data that is used for the research includes time period starting from 2000-2018 for one model and 2004-2017Q2 for another, because of the scarcity of data in some variables. As the data is on a quarterly basis, overall, we have 76 observations for the first case and 52 for the second one. We estimated the effects using the ordinary-least-squares (OLS) method. The data is taken from Armenia's Central Bank (CBA) and IMF's databases. As a result, models were constructed using variables included in the following equations:

$$\mathbf{LD\_D1_t}=\beta_0 + \beta_1 LD\_D1_{t-1} + \beta_2 DD\_D1_t + \beta_3 DD\_D1_{t-1} + \beta_4 exVolat + \beta_5 ird + \beta_6 exCpi + \beta_7 expGDP\_D1 + \beta_8 moneybase\_D1 + \beta_9 nfa\_D1 + u_t$$

$$\mathbf{LD\_D1_t}=\beta_0 + \beta_1 LD\_D1_{t-1} + \beta_2 LD\_D1_{t-2} + \beta_2 DD\_D1_t + \beta_3 DD\_D1_{t-1} + \beta_4 exVolat + \beta_5 ird + \beta_6 exCpI + \beta_7 expGDP\_D1 + \beta_8 moneybase\_D1 + \beta_9 import\_D1 + \beta_{10} remittances\_D1 + \beta_{11} realGDP\_D1 + \beta_{12} crisis20082009 + \beta_{13} exDepr\_D1 + \beta_{14} nfa\_D1 + u_t$$

$$\mathbf{DD\_D_t}=\beta_0 + \beta_1 LD\_D_t + \beta_2 exVolat + \beta_3 ird + \beta_4 nfa\_D1 + \beta_6 crisis20082009 + \beta_7 exDepr\_D1 + u_t$$

However, before constructing the final models out of the data available, several more variables were included in the models to check their significance in determining Deposit and Loan Dollarization. The variables used and the information about the ways that they are constructed are the following:

LD (Loan Dollarization)-the ratio of foreign currency Loans to total Loans held by the residents in the domestic banks (Loan (FX)/Total Loan).

DD ((Deposit Dollarization)-the ratio of foreign currency deposits to total deposits held by the residents in the domestic banks (Deposits (FX)/Total Deposits). The reason for inclusion of this variable in the LD model is banks' currency matching behavior. When there is a higher supply of deposits in dollars by domestic residents, the banks' supply of dollar loan increases, ceteris paribus.

exVol (Exchange rate volatility)-Standard Deviation of USD-AMD for the quarter using daily exchange rate data-the inclusion of the variable implies changes in the borrower's and lender's behavior following the increase in the exchange rate volatility.

ird (interest rate differential) - loans interest rate differential for USD and AMD loans. The inclusion of this variable implies that interest rate changes can influence people behavior to change their loan or deposit preferences from one currency to another.

exCPI - Covariance between exchange rate and CPI. When there is high real openness of the economy, which is indicated by higher covariance between the exchange rate and domestic prices, the demand for loans with dollar increases.

expGDP (export-GDP ratio) - tradable in total domestic production (export as a percentage of GDP)-this variable captures firms' currency matching behavior. This variable describes firms' currency matching behavior, because when the exports increases, it is expected LD to increase, as people will tend more to take dollar loans.

Moneybase - the Monetary base is composed of currency and checkable deposits composed of local-currency, the inclusion of this variable in the model can show the relationship between monetary expansion and AMD loan supply.

Nfa (net foreign assets)-inclusion of this variable indicates banks' currency matching behavior. An increase in the bank's foreign liabilities or decrease of foreign assets increases the bank's supply of dollar loans. And the more the banks' liabilities are dollarized more its credit dollarization increases.

exDepr_D (exchange rate depreciation) - Using the first-differenced data of exchange rate that shows in period whether the dram is appreciated or depreciated. The inclusion of this variable enables us to capture the effects of possible shifts between the foreign and domestic currency in case of depreciation or appreciation of the local currency.

Import - as the imports are conducting using foreign currency, an increase or decrease in import can change the dollarization level in the country, as people may borrow more in dollars to finance the imports.

Remittances - high level of remittances in foreign currency can both influence LD, and DD as people will be more eager to make loans or save in foreign currency when having an income in that currency.

realGDP - whenever there is economic growth, which leads to the investment growth, loans in dollars may increase as a result in the country.

Crisis20082009- 2008 global financial crisis that has its influence on Armenian economy also in 2009, thus dummy variable for these two years is included.

Results

To understand what the determinants of Loan and Deposit Dollarization are, we use the ordinary-least-squares (OLS) method. The specifications of the model will be analyzed with

Stata software. We begin our investigation and creation of models by making the data appropriate for conducting time series analysis, and for this purpose, we did some tests and adjustments in the data. Before making our model, we first need to check whether there is seasonality in our data or not, after making some of the variables seasonally adjusted than we checked the stationarity of our variables.

To check it, we will apply to the Dickey-Fuller test. (Appendix1) As a result of the tests, it becomes obvious that several variables such as DD, LD, expGDP, money base, nfa, import, exDepr, remittances, realGDP are non-stationary. As the P-values of those variables are higher than 5%, consequently we will fail to reject the null hypothesis (H_0: variable is non-stationary), and they will be considered non-stationary. To solve this problem, the variables were transformed into the first differences and checked again for stationarity with the same test, and all of them become stationary after it. That is why, in the models, the variables are written with _D1 notation.

The next step implies creating the OLS model and finding the best fitted model using AIC criteria. The first model includes mixed variables from the papers mentioned in the literature review part. The table below shows several models with the same variables. The variables included are the following DD_D, exVolat, ird, exCPI, exGDP_D, moneybase_D, nfa_D, and LD_D. The "Model 1" includes all mentioned variables without lagged values and. The second model is the same included one lag of dependent variable, the third one includes two lags o dependent variable, and finally, the last one model includes one lag of Loan dollarization and one lag of Deposit Dollarization. And By looking to AIC criteria for all these models, it becomes obvious that the best one is a the4th model (AIC=-439.0449). **(Table1)**

Table 1

Dependent Variable: Loan Dollarization				
VARIABLES	(1)	(2)	(3)	**(4)**
exVolat	0.00104***	0.000480	0.000476	**-0.000216**
	(0.000380)	(0.000322)	(0.000323)	**(0.000327)**
ird	0.00181**	0.000584	0.000785	**0.000731**
	(0.000795)	(0.000696)	(0.000754)	**(0.000617)**
exCPI	-0.000457	-0.000309	-0.000316	**-0.000178**
	(0.000300)	(0.000244)	(0.000244)	**(0.000218)**
expGDP_D1	0.000477	-0.000907	-0.000855	**-0.000421**
	(0.000966)	(0.000822)	(0.000822)	**(0.000736)**
moneybase_D1	-4.96e-08	-3.30e-08	-3.18e-08	**-2.45e-08**
	(4.95e-08)	(4.02e-08)	(4.02e-08)	**(3.56e-08)**
nfa_D1	3.46e-08	-1.46e-08	-1.76e-08	**-3.45e-08**
	(3.61e-08)	(3.04e-08)	(3.06e-08)	**(2.73e-08)**
DD_D1	0.313***	0.177***	0.183***	**0.101***
	(0.0612)	(0.0545)	(0.0548)	**(0.0513)**
LD_D1(t-1)		0.571***	0.662***	**0.401*****
		(0.0948)	(0.119)	**(0.0927)**
LD_D1(t-2)			-0.152	
			(0.109)	
DD_D1(t-1)				**0.258*****
				(0.0597)
Constant	-0.0121***	-0.00393	-0.00477	**-0.00137**
	(0.00369)	(0.00336)	(0.00359)	**(0.00303)**
Observations	74	73	72	**73**
R-squared	0.379	0.604	0.617	**0.694**
aic	-397.84267	422.12448	415.61738	**-439.0449**
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

It is also necessary to conduct the autocorrelation and heteroskedasticity tests to be sure that the model is a good one. By looking to the graphs representing the autocorrelation of residuals, we can notice how it improves while including lags and reaching to the final model

(Model 4). **(Appendix 2).** We also used the Breusch-Godfrey LM test for autocorrelation, to be sure that there is no autocorrelation in this model, as the P value is higher than 5 %. Consequently, we fail to reject the null hypothesis; thus, there is no serial correlation. (Table 2)

Table2

```
. estat bgodfrey, lags(1/5)

Breusch-Godfrey LM test for autocorrelation
```

lags(p)	chi2	df	Prob > chi2
1	0.219	1	0.6401
2	0.249	2	0.8829
3	0.281	3	0.9637
4	0.722	4	0.9486
5	0.781	5	0.9782

H0: no serial correlation

For the heteroskedasticity, we conducted Breusch-Pagan test, and as a result, we observe that P value is higher from 5% and as we fail to reject null hypothesis H_0=Constant Variance we conclude that the model is homoscedastic.

Table 3

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of LD_D1

         chi2(1)      =     3.41
         Prob > chi2  =   0.0650
```

By considering so far model 4 as the best one, we decided to add more variables, part of which are country-specific variables, to understand whether there is any effect on Loan dollarization. Added variables are the following: import_D, remittances_D, realGDP_D, crisis20082009 and exDepr_D. **Table 4** shows the result of the new model. As it becomes obvious none of the added variables are significant for loan dollarization after improving the model and getting rid of autocorrelation.

Table 4

Dependent Variable: Loan Dollarization				
VARIABLES	(1)	(2)	(3)	(4)
exVolat	0.000578	0.000252	0.000158	-0.000468
	(0.000542)	(0.000478)	(0.000437)	(0.000415)
ird	0.00159	0.000361	7.97e-05	-0.000395
	(0.00138)	(0.00124)	(0.00120)	(0.00105)
exCPI	0.000680**	-0.000440	-0.000369	-0.000159
	(0.000315)	(0.000281)	(0.000257)	(0.000230)
expGDP_D1	0.000668	-0.000322	0.000338	0.000720
	(0.00143)	(0.00127)	(0.00118)	(0.00103)
moneybase_D1	-3.46e-08	-2.26e-08	-3.55e-08	-2.84e-08
	(5.45e-08)	(4.74e-08)	(4.35e-08)	(3.77e-08)
nfa_D1	0	-2.82e-08	-2.75e-08	-4.73e-08
	(3.94e-08)	(3.50e-08)	(3.21e-08)	(2.83e-08)
import_D1	-5.37e-05	-4.35e-05	-4.02e-05	8.25e-06
	(3.80e-05)	(3.30e-05)	(3.02e-05)	(2.94e-05)
remittances_D1	5.33e-05	5.10e-05	5.22e-05	1.87e-05
	(0.000109)	(9.47e-05)	(8.67e-05)	(7.56e-05)
realGDP_D1	-1.12e-08	-1.51e-08	7.95e-08	5.43e-08
	(1.47e-07)	(1.27e-07)	(1.21e-07)	(1.05e-07)
crisis20082009	0.00578	-0.000870	-0.00253	-0.0109
	(0.00890)	(0.00791)	(0.00783)	(0.00715)
exDepr_D1	0.000442*	0.000237	0.000137	-3.62e-05
	(0.000234)	(0.000210)	(0.000195)	(0.000175)
LD_D1 (t-1)		0.472***	0.726***	0.687***
		(0.125)	(0.145)	(0.126)
LD_D1(t-2)			-0.309**	-0.317***
			(0.125)	(0.108)
DD_D1	0.182*	0.144	0.227**	0.183**
	(0.105)	(0.0915)	(0.0904)	(0.0793)
DD_D1 (t-1)				0.285***
				(0.0779)
Constant	-0.00697	-0.000227	0.000435	0.00669
	(0.00785)	(0.00704)	(0.00673)	(0.00607)
Observations	53	53	52	52
R-squared	0.599	0.706	0.766	0.829
aic	-284.89598	-299.35	-302.361	-316.7825
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Thus we can conclude that the best model is the 4th model presented in Table 1. The result shows that the Loan Dollarization in Armenia is mainly determined by Deposit

Dollarization, and lagged values of Loan and Deposit Dollarization. We can state by looking to the model that one percentage point increase in Deposit Dollarization rate is predicted to increase loan dollarization by 0.1 percentage point. And the effect of one-quarter previous value change in Deposit Dollarization rate is predicted to increase loan dollarization by 0.25 percentage point. The Loan Dollarization lagged value, which is one quarter previous Dollarization level of loans, effects to it present Dollarization level too. One percentage point increase in Loan Dollarization rate is predicted to increase loan dollarization of the next quarter by 0.4 percentage point. Thus we can state that the Loan dollarization in Armenia is a result of banks' currency matching behavior which is similar to the finding of the A.Luca and Petrova (2008) "What Drives Credit Dollarization in Transition Economies?" paper results. It is very interesting that the lagged value of Deposit Dollarization ratio influence to the Loan Dollarization more than the Deposit Dollarization itself, the reason behind can be, that the interest rates of loans in Armenia respond to the Deposit market shocks and overall atmosphere changes on overage after one quarter. (Grigoryan, 2011)

After finding out that the main determinants of Loan Dollarization are Deposit Dollarization, it is also important to understand what drives Deposit Dollarization in Armenia. Using the same data set and adding the Dird variable, which is interest rate differential of Deposits interest rates, and also separating the effect of 2008 and 2009 crises, we tried to analyze this phenomenon too. The reason of taking crisis2008 and crisis2009 dummy variables separately is the fact that we have observed changes in Deposit and Loan Dollarization during this two years, which had decreasing pattern till 2008 and started to increase from 2009(Appendix 3). In Appendix 4, you can see the results of OLS models. After checking the

heteroskedasticity assumption for the first model and finding out that there is heteroskedasticity (Appendix 5), the next model is constructed by the inclusion of robust errors. As a result, we observe that crisis2008, exchange rate depreciation (exDepr_D1), and exchange rate CPI covariance (exCPI) influences to the Deposit Dollarization. Even though the model needs further improvement, we can state that Deposit Dollarization is a result of minimum variance portfolio allocation of residents and firms to minimize their risks, by changing their preferences based on some shocks on the economic environment.

Conclusion

Financial dollarization is one of the important features of the Armenian economy and analyzing the determinants of this phenomenon has huge importance. The paper tried to find what are the main driving factors of Loan Dollarization in Armenia using OLS model and data for the period from 2000-2018. From the literature reviewed we constructed model similar to the studies done in that Loan dollarization is the outcome of domestic agent's minimum variance portfolio allocation choices, and assuming that banks are risk averse and their currency matching is an important phenomenon for Loan Dollarization. And the empirical findings of the paper revealed that the bank's currency matching behavior is the main determinant of Loan Dollarization. However, the coefficients were very low.

These empirical findings can be a starting point for further study the determinants of credit dollarization. A worthwhile extension could be analyzing the bank's risks associated with dollarization, trying to analyze the loan dollarization using bank-specific data and at the end to offer some policy changes and suggestions to fight against or control Loan Dollarization.

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Appendix1

```
. dfuller DD, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        74

                     ------------ Interpolated Dickey-Fuller ------------
             Test         1% Critical       5% Critical      10% Critical
          Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)       -1.497            -3.546            -2.911           -2.590
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.5351

------------------------------------------------------------------------------
        D.DD |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          DD |
         L1. |  -.0524215   .0350224    -1.50   0.139    -.1222373    .0173944
             |
       _cons |   .0299997   .0226747     1.32   0.190    -.0152015    .0752008
------------------------------------------------------------------------------

. dfuller DD_D1, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        73

                     ------------ Interpolated Dickey-Fuller ------------
             Test         1% Critical       5% Critical      10% Critical
          Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)       -5.517            -3.548            -2.912           -2.591
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
     D.DD_D1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       DD_D1 |
         L1. |  -.5978305   .1083664    -5.52   0.000    -.8139071    -.381754
             |
       _cons |  -.0023344   .0035371    -0.66   0.511    -.0093872    .0047184
------------------------------------------------------------------------------

. dfuller DD_D1, trend regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        73

                     ------------ Interpolated Dickey-Fuller ------------
             Test         1% Critical       5% Critical      10% Critical
          Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)       -5.489            -4.099            -3.477           -3.166
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
     D.DD_D1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       DD_D1 |
         L1. |  -.5989753   .1091277    -5.49   0.000    -.8166236   -.3813269
      _trend |   .0000517   .0001681     0.31   0.759    -.0002836    .0003869
       _cons |  -.0042503   .0071772    -0.59   0.556    -.0185648    .0100643
------------------------------------------------------------------------------
```

```
. dfuller LD, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        74

                     ------------ Interpolated Dickey-Fuller ------------
             Test         1% Critical       5% Critical      10% Critical
           Statistic           Value             Value            Value
--------------------------------------------------------------------------
 Z(t)       -1.806            -3.546            -2.911           -2.590
--------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.3774

------------------------------------------------------------------------------
        D.LD |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          LD |
         L1. |  -.0334207   .0185038    -1.81   0.075    -.0703074    .003466
             |
       _cons |   .0170271   .0117797     1.45   0.153    -.0064553    .0405095
------------------------------------------------------------------------------

. dfuller LD_D1, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        73

                     ------------ Interpolated Dickey-Fuller ------------
             Test         1% Critical       5% Critical      10% Critical
           Statistic           Value             Value            Value
--------------------------------------------------------------------------
 Z(t)       -3.663            -3.548            -2.912           -2.591
--------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0047

------------------------------------------------------------------------------
     D.LD_D1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       LD_D1 |
         L1. |  -.3213312   .0877291    -3.66   0.000    -.4962581   -.1464043
             |
       _cons |  -.0014387   .0016805    -0.86   0.395    -.0047894    .0019121
------------------------------------------------------------------------------

. dfuller LD_D1, trend regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        73

                     ------------ Interpolated Dickey-Fuller ------------
             Test         1% Critical       5% Critical      10% Critical
           Statistic           Value             Value            Value
--------------------------------------------------------------------------
 Z(t)       -3.694            -4.099            -3.477           -3.166
--------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0227

------------------------------------------------------------------------------
     D.LD_D1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       LD_D1 |
         L1. |  -.3323987   .0899802    -3.69   0.000    -.5118584   -.1529389
      _trend |   .0000488   .0000803     0.61   0.545    -.0001113    .0002089
       _cons |  -.0032857   .0034745    -0.95   0.348    -.0102154    .0036439
------------------------------------------------------------------------------

. dfuller exVolat, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        75

                     ------------ Interpolated Dickey-Fuller ------------
             Test         1% Critical       5% Critical      10% Critical
           Statistic           Value             Value            Value
--------------------------------------------------------------------------
 Z(t)       -8.358            -3.545            -2.910           -2.590
--------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
  D.exVolat |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     exVolat |
         L1. |  -.9785644   .1170875    -8.36   0.000    -1.211919   -.7452094
             |
       _cons |   4.67778    .8130153     5.75   0.000     3.057443    6.298117
------------------------------------------------------------------------------
```

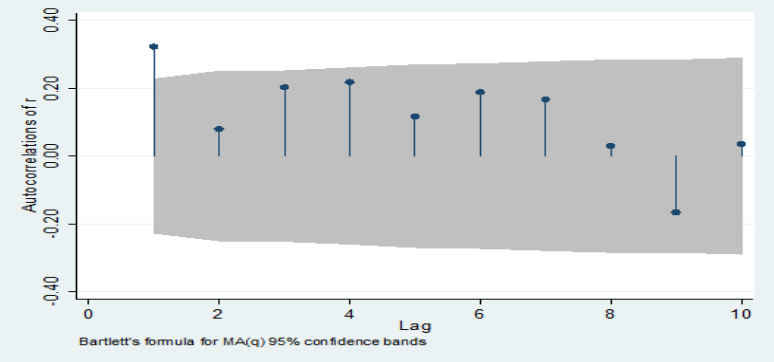
```
. dfuller ird, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        75

                     ------------ Interpolated Dickey-Fuller ------------
             Test    1% Critical    5% Critical    10% Critical
          Statistic       Value          Value          Value
------------------------------------------------------------------------------
 Z(t)       -3.641         -3.545         -2.910         -2.590
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0050

------------------------------------------------------------------------------
       D.ird |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ird |
         L1. |  -.2696612   .0740704    -3.64   0.001    -.4172834   -.1220391
             |
       _cons |   .7693877   .2949653     2.61   0.011     .1815226    1.357253
------------------------------------------------------------------------------

. dfuller expGDP, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        75

                     ------------ Interpolated Dickey-Fuller ------------
             Test    1% Critical    5% Critical    10% Critical
          Statistic       Value          Value          Value
------------------------------------------------------------------------------
 Z(t)       -1.170         -3.545         -2.910         -2.590
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.6864

------------------------------------------------------------------------------
    D.expGDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      expGDP |
         L1. |  -.0440448    .037651    -1.17   0.246    -.1190832    .0309935
             |
       _cons |   1.511713   1.127342     1.34   0.184    -.7350769    3.758502
------------------------------------------------------------------------------

. dfuller expGDP_D1, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        74

                     ------------ Interpolated Dickey-Fuller ------------
             Test    1% Critical    5% Critical    10% Critical
          Statistic       Value          Value          Value
------------------------------------------------------------------------------
 Z(t)      -10.401         -3.546         -2.911         -2.590
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
  D.expGDP_D1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+----------------------------------------------------------------
    expGDP_D1 |
          L1. |  -1.195149   .1149081   -10.40   0.000    -1.424214   -.9660839
              |
        _cons |   .2356669   .2230478     1.06   0.294    -.2089708    .6803045
------------------------------------------------------------------------------

. dfuller moneybase, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        75

                     ------------ Interpolated Dickey-Fuller ------------
             Test    1% Critical    5% Critical    10% Critical
          Statistic       Value          Value          Value
------------------------------------------------------------------------------
 Z(t)        0.596         -3.545         -2.910         -2.590
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9875

------------------------------------------------------------------------------
  D.moneybase |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+----------------------------------------------------------------
    moneybase |
          L1. |   .0086412   .0144904     0.60   0.553    -.020238    .0375205
              |
        _cons |   10196.86   8111.045     1.26   0.213    -5968.424    26362.15
------------------------------------------------------------------------------
```

```
. dfuller moneybase_D1, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        74

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                 Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -11.797            -3.546            -2.911           -2.590
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D.           |
moneybase_D1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
moneybase_D1 |
         L1. |  -1.318655   .1117742   -11.80   0.000    -1.541472   -1.095837
             |
       _cons |   18882.51   4752.327     3.97   0.000     9408.924    28356.1
------------------------------------------------------------------------------

. dfuller moneybase_D1, trend regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        74

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                 Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -12.058            -4.097            -3.476           -3.166
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D.moneybas~1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
moneybase_D1 |
         L1. |  -1.346551   .1116741   -12.06   0.000    -1.569223   -1.123879
      _trend |     349.025   209.2085     1.67   0.100    -68.12495     766.175
       _cons |    6194.921   8937.312     0.69   0.490    -11625.57    24015.42
------------------------------------------------------------------------------

. dfuller nfa, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        75

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                 Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -1.416            -3.545            -2.910           -2.590
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.5745

------------------------------------------------------------------------------
       D.nfa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         nfa |
         L1. |  -.0523123   .0369375    -1.42   0.161    -.1259285    .021304
             |
       _cons |   25979.27   14363.75     1.81   0.075    -2647.644    54606.19
------------------------------------------------------------------------------

. dfuller nfa_D1, trend regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        74

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                 Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -9.697            -4.097            -3.476           -3.166
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D.nfa_D1     |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      nfa_D1 |
         L1. |  -1.140277   .1175902    -9.70   0.000    -1.374745   -.9058087
      _trend |  -22.44392   314.9469    -0.07   0.943    -650.4303    605.5424
       _cons |   9894.004   13630.55     0.73   0.470    -17284.53    37072.54
------------------------------------------------------------------------------
```

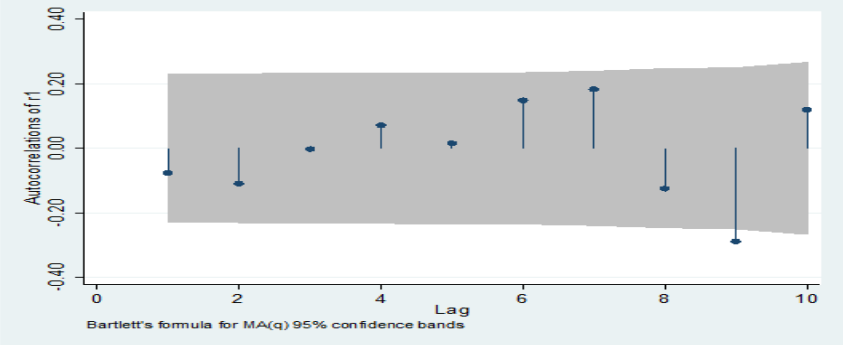
```
. dfuller exCPI, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        75

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic             Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -6.177            -3.545            -2.910            -2.590
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
      D.exCPI |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
        exCPI |
          L1. |  -.6963131    .112723    -6.18   0.000    -.9209698   -.4716564
              |
        _cons |   1.484756   .7460619     1.99   0.050    -.0021428    2.971656
------------------------------------------------------------------------------

. dfuller exCPI, trend regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        75

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic             Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -6.198            -4.095            -3.475            -3.165
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
      D.exCPI |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
        exCPI |
          L1. |  -.7036376   .1135253    -6.20   0.000    -.9299461   -.4773291
        _trend |   .0242916   .0331912     0.73   0.467    -.0418737    .090457
        _cons |   .5758461   1.449996     0.40   0.692    -2.314668    3.46636
------------------------------------------------------------------------------
```

Appendix2

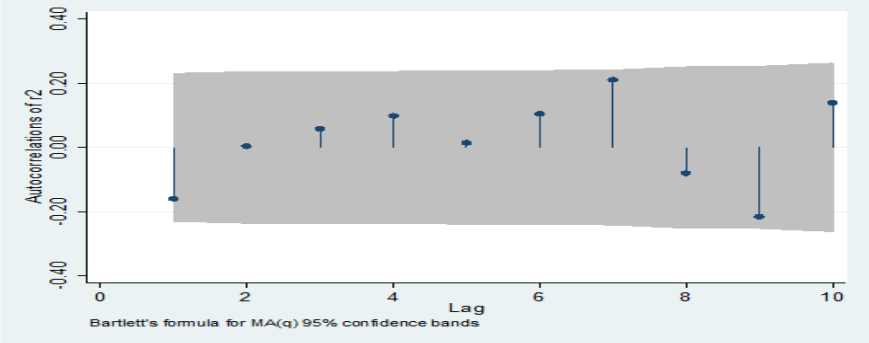
Model1



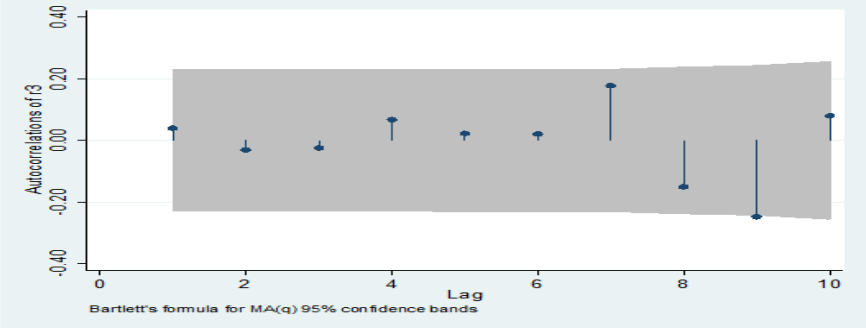
Model 2



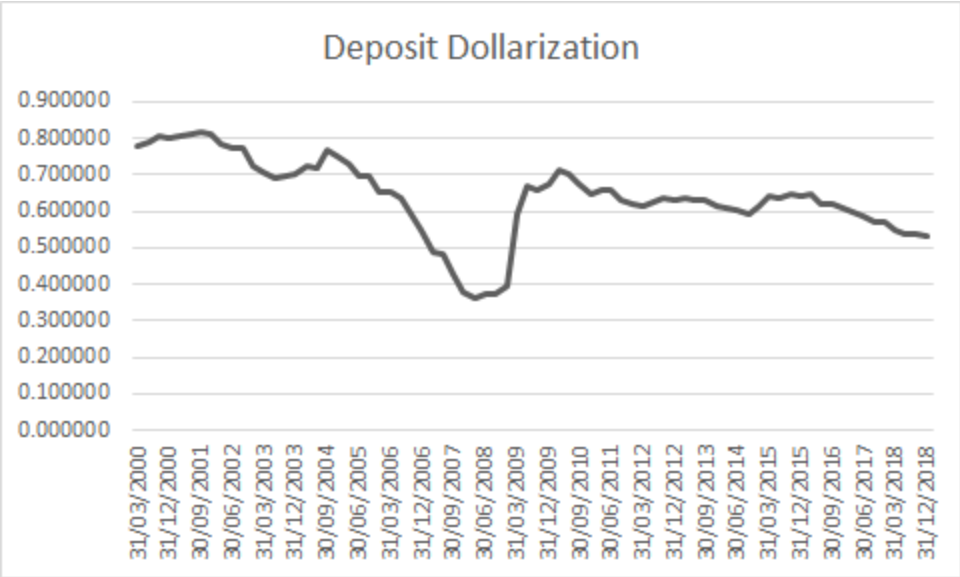
Model 3

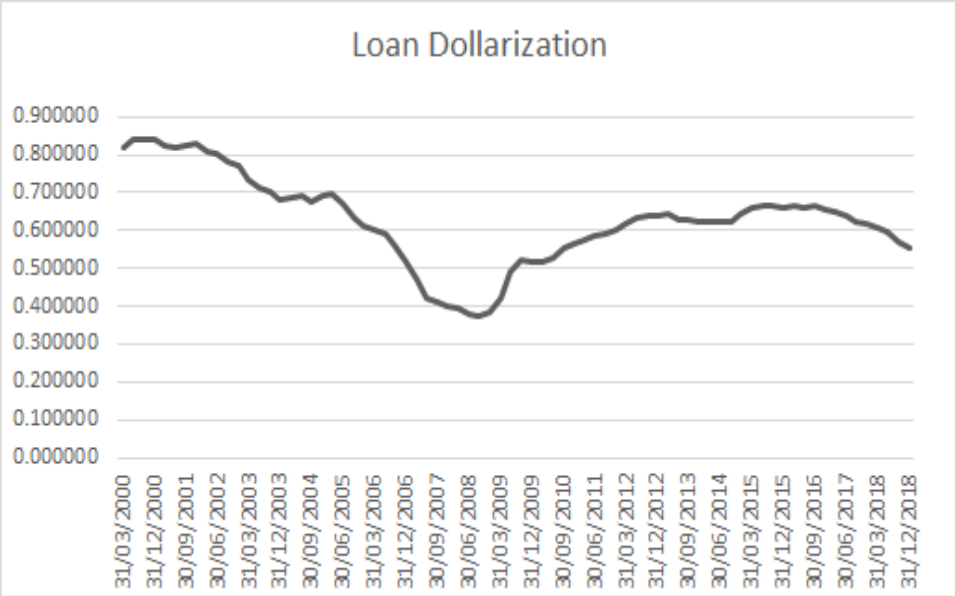


Model 4



Appendix3


Deposit Dollarization
0.900000
0.800000
0.700000
0.600000
0.500000
0.400000
0.300000
0.200000
0.100000
0.000000
31/03/2000
31/12/2000
30/09/2001
30/06/2002
31/03/2003
31/12/2003
30/09/2004
30/06/2005
31/03/2006
31/12/2006
30/09/2007
30/06/2008
31/03/2009
31/12/2009
30/09/2010
30/06/2011
31/03/2012
31/12/2012
30/09/2013
30/06/2014
31/03/2015
31/12/2015
30/09/2016
30/06/2017
31/03/2018
31/12/2018


Loan Dollarization
0.900000
0.800000
0.700000
0.600000
0.500000
0.400000
0.300000
0.200000
0.100000
0.000000
31/03/2000
31/12/2000
30/09/2001
30/06/2002
31/03/2003
31/12/2003
30/09/2004
30/06/2005
31/03/2006
31/12/2006
30/09/2007
30/06/2008
31/03/2009
31/12/2009
30/09/2010
30/06/2011
31/03/2012
31/12/2012
30/09/2013
30/06/2014
31/03/2015
31/12/2015
30/09/2016
30/06/2017
31/03/2018
31/12/2018

Appendix4

Dependent variable: Deposit Dollarization		
VARIABLES	(1)	(2)
exCPI	-0.000762	-0.000762*
	(0.000511)	(0.000457)
crisis2008	0.0702***	0.0702*
	(0.0142)	(0.0399)
crisis2009	0.0263*	0.0263
	(0.0155)	(0.0169)
exDepr_D1	0.000548**	0.000548**
	(0.000257)	(0.000238)
Dird	0.000905	0.000905
	(0.00126)	(0.000704)
Constant	-0.00943*	-0.00943***
	(0.00534)	(0.00350)
Observations	74	74
R-squared	0.354	0.354

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix5

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of DD_D1

        chi2(1)      =    99.97
        Prob > chi2  =   0.0000
```

I give my consent to post my study on the library database for an open access to the AUA community.