Is the Gresham's Law Still Valid? Evidence from South American Dollarized Economies

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Abstract
Gresham's Law postulates a well-known causality in the economy with two circulating currencies "the bad currency drives out the good one", relating to the market with metal coins with different content of precious metal. The "bad currency" is supposed to be spent, and the "good currency" to be stored. The value of money nowadays, however, is not determined by the content of silver, or other precious metal, but by the exchange rate. This paper studies the impact of nominal exchange rate volatility on banking deposits in two currencies in two parallel currency markets in South America, Chile and Argentina, where the national currency operates along with the US dollar. Using GARCH model we find that increasing volatility of nominal exchange rate affects negatively deposits in national currency and positively deposits in the US dollar, in both countries in the sample. This may be accepted as the "bad currency drives out the good one" application of Gresham's Law to current economic conditions.

Keywords: dollarization, currency substitution, exchange rate volatility, parallel currency
JEL codes: F310, C580, E420, E440

1. Introduction

The presence of a sizeable share of foreign currency in African, Asian, South American or Post – Soviet countries has recently attracted a keen interest of both economic policy and research. US Treasury department (2003) and Feige and Dean (2004) estimate the currency in circulation outside the Federal Reserve and the Treasury was about $620 billion by the end of 2002. Residents in developing economies can save and borrow in foreign currencies. A comparable share of developing economies' domestic banks loans and virtually all their external obligations are also denominated in foreign currencies. This phenomenon is known in the literature as financial dollarization (Yeyati, 2005). A foreign currency is used in developing countries because it is perceived as trustful, compared to a possibly risky national currency. Numerous authors focus on dollarization in Latin America (e.g. Freitas and Veiga, 2006), and in Africa (Yinusa, 2009; Yinusa and Okinlo; 2008). Recent research for the Eurozone provides Heimonen (2008) evaluating the dynamics between the dollar and euro balances in the Estonian economy, concluding on a substitution effect between the US dollar and the Euro to be asymmetric in the short run. One of the first theoretical attempts of explaining the behaviour of two currencies in one economy is the 16th century's Gresham's Law. The theoretical concept reflects the conditions of circulating metallic coins with different contents of precious metal and describes the behaviour of consumers with the regard to money circulation and savings. The "bad

currency drives out the good one" should be interpreted as that a consumer will rather hold a currency with higher content of precious metal and the currency with the lower content will be used for transactions. The value of currency is here an important factor. Currently banknotes and metallic coins make a minority in the money in circulation worldwide.

The value of a currency to another currency or a group of currencies is determined by the exchange rate. In this paper we are therefore focusing on selected dollarized economies where two currencies are circulating and are studying the effect of nominal bilateral exchange rate volatility on deposits in two currencies in the economy. The aim of the current study is to identify the influence of exchange rate volatility on development of deposits in selected dollarized countries. From the perspective of the Gresham's Law a currency with decreasing value, in the case of this paper depreciating or increasing volatility of exchange rate, is supposed to experience a decline of bank deposits and the currency with increasing value is expected to have the opposite effect.

2. Literature review

During the 16th century, Sir Thomas Gresham observed that bad money drives out good money. In a broader sense, Gresham's Law suggests that a high quality currency is driven out of circulation by a cheaper currency. The literature on Gresham's Law application is relatively narrow. Alejandra Irigoin (2009) studies the political economic consequences of the disappearance of the Spanish silver peso standard in Spanish America. Since in Latin America different currencies co-existed within a formerly highly integrated economic space, a widespread Gresham's Law effect exacerbated the conflict among local and regional elites issuing the diverse currencies. There are doubts on the correct specification of the Gresham's Law theory. Rolnick and Weber (1986) studying a part of U.S. and English coinage history argue that the popular version of the Gresham's Law does not deserve its status as a law because it has too many unexplained exceptions. Velde et al. (1999) study the conditions under which Gresham's Law holds and develop a model of commodity money with light and heavy coins under imperfect information. Li (2002) develops a model to study how legal restrictions may account for the fact that Gresham's Law sometimes holds but other times fails. In his words, a government policy sufficiently favorable to light coins can induce the existence of an equilibrium where both coins circulate and light coins are even accepted at a premium. Mundell (1998) even argues that the phrase, "bad money drives out good," is not a correct statement of Gresham's Law nor is it a correct empirical assertion. In his words, the opposite has been the case throughout the history because the laws of competition and efficiency ensure that "good money drives out bad". In this paper, however, we are studying the application of the standard formulation of Gresham's Law.

A number of papers focus on the effect of exchange rate volatility on banking deposit in dollarised economies. Honohan (2007) performs an analysis of short-run response of dollarization to exchange rate changes which he shows shown to be too small to warrant "fear of floating" by dollarized economies. Elkhafif (2003) employs Granger causality test to study the relationships of exchange rate volatility and banking deposits, indicating unidirectional relationship from the exchange rate to currency substitution in Egypt and South Africa. Yinusa (2008) applies the same methodology to study the bi-directional relationship of nominal exchange rate volatility and dollarization in Nigeria. In his words, the causality from dollarization to exchange rate volatility appears stronger and dominates. The relationship of dollarization leading to exchange rate volatility using a form of GARCH model is covered by Korap (2007) and Mengesha and Holmes (2013). Using quarterly data for Turkey since 1987, Korap (2007) performs estimations employing contemporaneous exponential GARCH methodology indicating that dollarization leads to the exchange rate uncertainty. Mengesha and Holmes (2013) see the relationship of dollarization and exchange rate volatility both theoretically and empirically unresolved. They contribute to the research on African economies by investigating the consequences of dollarization on Eritrean exchange rate volatility. Using quarterly official and black market exchange rate data for the period 1996-2008 they employ E-GARCH model. The results suggest that dollarization has a positive impact on real exchange rate volatility, both on official and black market.

3. Model and Data

In this paper we make several assumptions on the application of the Gresham's Law to current economic conditions. (1) The value of currency is determined by its nominal bilateral exchange rate, (2) "bad currency drives out the good currency" formulation is applied to current conditions in a sense that exchange rate volatility of national currency reflects in the volume of banking deposits in both the national and foreign currency. For simplicity, highly volatile currency should circulate and foreign stable currency should be stored in bank accounts. We only test the connection of volatility of national currency and deposit development in both currencies. Following the standards used in literature, monthly returns are calculated as first difference in natural logarithms and then multiplied by 100 to approximate percentage changes by:

$$R_t = \ln(x_t - x_{t-1}).100 \qquad\qquad (1)$$

where X_t and R_t refer to the exchange rates as well as deposits values and the monthly returns on month t, respectively. Figure 1 shows the development of selected variables for Argentina.

Figure 1: Development of variables in Argentina
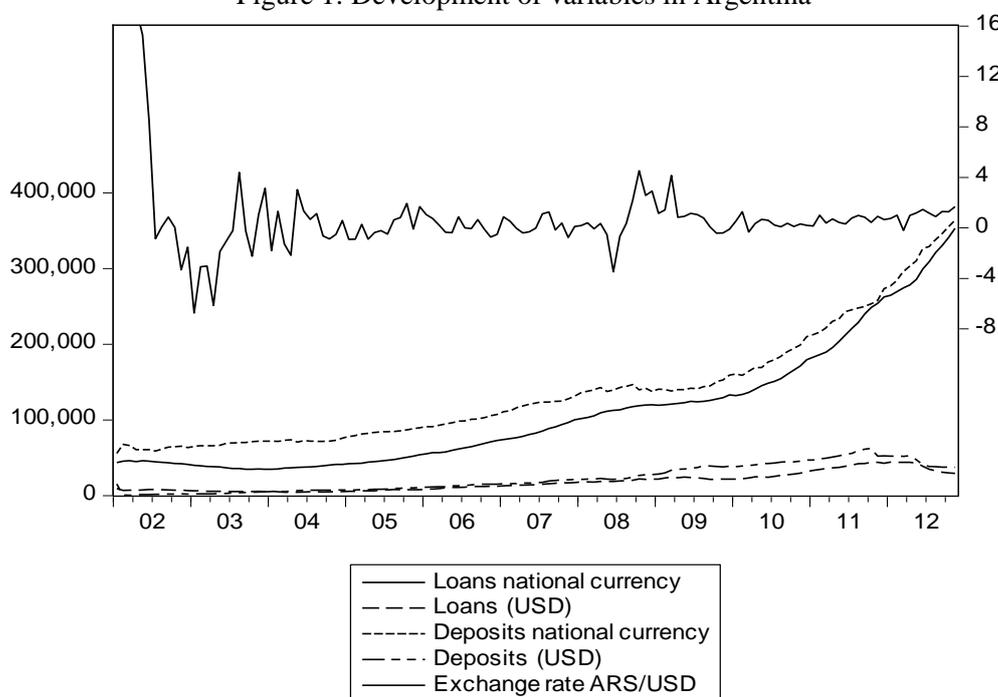
Source: authors' work

Deposits and loans in national currency are higher than loans and deposits in USD. Banks in Argentina provided lower amount of loans in national currency than the amount of national currency deposits in our estimated period. Variables in national currency are increasing on the contrary to variables in USD. It could be explained by the exchange rate development (right axe), where we see that the national currency strongly depreciated against USD at the beginning and then depreciated again in the second half of our period. Therefore we split our estimated period into two sub-periods due to the positive or negative spread against the geometric mean of exchange rates. The first sub-period in Argentina is from January 2002 to November 2008, the second from December 2008 to November 2012. Figure 2 presents the development of the same variables for Chile. We can see higher exchange rate volatility in percentages on the right axe than in the case of Argentina. In Chile the first sub-period is from January 2004 to August 2008, the second from September 2008 to December 2012. We make dummy variables from these sub-periods based on spread against geometrical mean to differ times of stronger or less strong currencies.

Figure 2: Development of variables in Chile
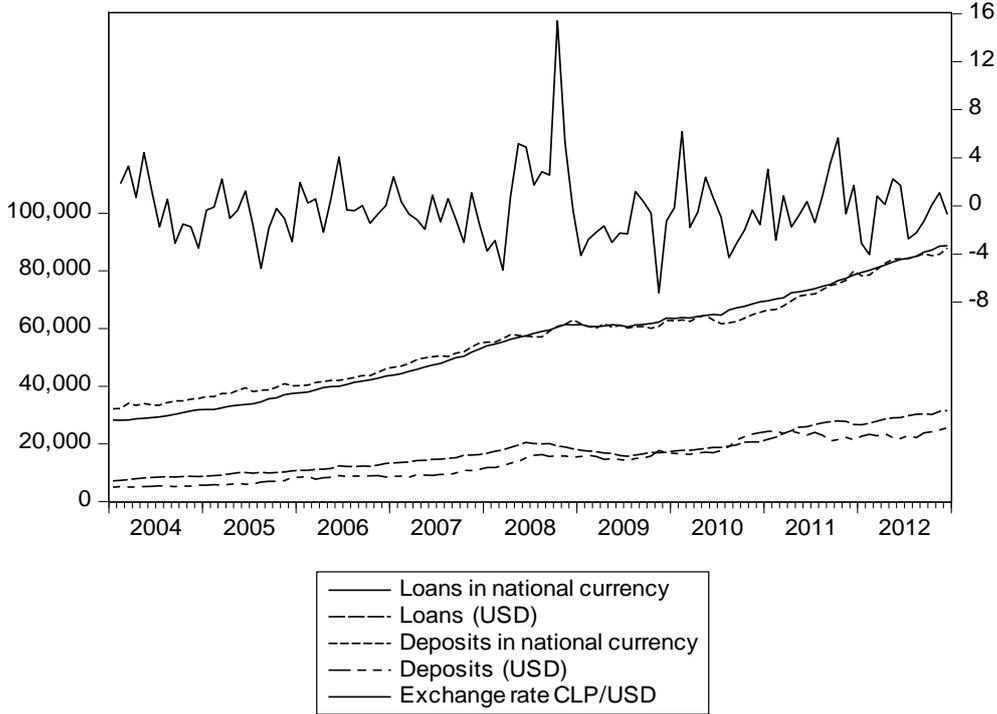
Source: authors' work

Due to the existing residual heteroskedasticity in our data sample we use Autoregressive Conditional Heteroskedasticity model to examine, if there is relationship between volatility development of exchange rate ARS/USD and volatility developments of deposit in both currencies. Stavárek and Heryán (2012) used GARCH method to estimate day of the week effect in stock markets of Visegrad countries. According to them we estimate GARCH-M (1,1) model by equations (2) and (3):

$$R_t = \alpha_0 + \alpha_{EX}.EX + \lambda h_t + \varepsilon \qquad (2)$$

$$h_t^2 = \alpha + \beta \varepsilon_{t-1}^2 + \gamma h_{t-1}^2 \qquad (3)$$

where R_t denotes volatility or monthly returns of deposits in both currencies separately, EX is dummy variable for exchange rate, h_t is conditional variance, ε is residual term and λ is a measure of the risk premium within GED parameter to show how the volatility of exchange rate affects development of deposits.

4. Results

Table 1 presents results of empirical analysis for Argentina. The Ex rate PESSO parameter suggests that increasing exchange rate volatility reflects in increasing volume of deposits in USD in both sub-periods. In the case of deposits in national currency, only the coefficient for pre-crisis sub-period is significant, and is negative. We may therefore argue that, in accordance with the theory, increasing volatility inhibits precautionary motive of holding money in the USD. Our suggestion suffers due to insignificant equation of variance in our models. Nevertheless, exchange rate coefficients were detected as significant in three cases.

Table 1: GARCH models output for Argentina

Argentina	Deposits before crisis		Deposits after crisis	
	Pesso	USD	Pesso	USD
C	1,3242 ***	2,0244 ***	2,7524 ***	1,5985 ***
Ex rate PESSO	**-0,1812** ***	**1,2005** ***	-0,9318	**0,9635** ***
GED PARAMETER	1,0020 ***	0,6917 ***	5,3301	0,6281 ***
C	0,7000 ***	5,1756	0,4861	0,7659
RESID(-1)^2	-0,0253	0,5081	-0,2767 ***	0,2370
GARCH(-1)	0,6915 ***	0,2707	1,0455 ***	0,7974

Note: *** denotes statistically significant coefficient at 1 % level

In Table 2 we present results for Chile. At 1% significance level only deposits in USD before crisis and in national currency after the crisis are significant. Relationship is opposite, whereas deposits in national currency is increasing in more safety times with less volatility of exchange rate (minus sign), deposits in USD is increasing in times of higher volatility. Then both values also confirm the theory that increasing riskiness of national currency stimulates the store of value function of USD in the economy. Even variance equation is significant in both models.

Table 2: GARCH models output for Chile

Chile	Deposits before crisis		Deposits after crisis	
	Pesso	USD	Pesso	USD
C	0,9982 ***	0,9484 ***	1,5035 ***	1,4668 ***
Ex rate PESSO	0,0298	**0,1864** ***	**-0,8495** ***	-0,1846
GED PARAMETER	1,9142 ***	2,5333 ***	1,8554 ***	2,3321 ***
C	0,5914	0,2019 ***	21,8004 ***	1,0789 ***
RESID(-1)^2	0,1276	-0,1573 ***	0,2726 **	-0,1022 ***
GARCH(-1)	0,5993 **	1,0494 ***	-0,4411 ***	1,0541 ***

Note: ***, ** denote statistically significant coefficient at 1 %, 5 % level.

5. Discussion

The present research has several limitations which should be taken into consideration. Firstly, the application is difficult because the standard Gresham's Law deals with the content of silver or precious metal. The lower value a coin has the more it should circulate. Even if the exchange rate as the measure of currency value nowadays is proper, it would be convenient to select economies where the currency was gradually depreciating. In the present research we are rather focusing on exchange rate volatility. Selection of such countries with data available for both currencies is demanding. Secondly, we abstracted from other determinants of banking deposits apart from the exchange rate

volatility. Neanidis and Savva (2009) show that banking deposits in a dollarized economy are affected by interest rate differential. Yinusa (2009) argues that inflation, expectations about exchange rate changes coupled with interaction between capital account restrictions and domestic inflation plays dominant role in determination of deposit dollarization. Finger and Hesse (2009) identify the determinants of banking deposits at macro level to be domestic factors, i.e. economic activity, prices, and the interest differential between the national and foreign currency. At the micro level, bank-specific variables, i.e. perceived riskiness of individual banks, their liquidity buffers, loan exposure, and interest margins banking deposits.

The results of our paper suffer from the above-mentioned limitations. We cannot therefore strictly define and prove a new version of Gresham's Law for exchange rates and banking deposits. There are many more economic factors in nowadays global world, than in 16th century. Nevertheless, we can definitely identify the impact of exchange rate volatility on selected variables. For broader suggestions and policy implications we need to analyse the reasons of exchange rate volatility.

6. Conclusion

The aim of the study was to identify the influence of exchange rate´s volatility on development of deposits in selected countries. We tested the applicability of the classical version of Gresham's Law, which postulates that the "bad currency drives out the good one", in other words, the currency with higher value is stored and the currency with lower value circulates in the economy, on two South-American dollarized economies. The value of money nowadays is nevertheless not determined by the content of precious metal, but by the exchange rate. We therefore test the connection of exchange rate volatility and the development of deposits in national and foreign currency in the economy. Using GARCH-M (1,1) model we find that increasing volatility of nominal exchange rate affects negatively deposits in national currency and positively deposits in the US dollar, in both countries in the sample. Since we tried to transform the classical version of the Gresham's Law into current economic conditions of countries where two currencies circulate alongside, the results of our paper suffer from several limitations. We cannot strictly define a new version of Gresham's Law for exchange rates and banking deposits since many more determinants affect the value of currency nowadays than in 16th century. For broader suggestions and policy implications there is a need to analyse the reasons of exchange rate volatility and extend the model to capture all determinants of exchange rate.

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