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CURRENCY SUBSTITUTION IN AN OIL-RICH CIS COUNTRY: THE CASE OF AZERBAIJAN

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Abstract

Since independence, currency substitution has drawn considerable attention in the policy circles of the CIS countries, but recently its nature has changed notably. High inflation volatility and fragile economic stability in the early phase of transition induced dollarization as people attempted to avoid rapid devaluation in their assets. However, in the previous decade, the dollarization process reversed its direction in CIS countries, especially in oil rich ones. The de-dollarization observed in Russia and Kazakhstan, and documented by various researchers, was also taking place in another oil rich CIS country, namely, in Azerbaijan. In this paper, we empirically study the existence of currency substitution between Azeri manat and US dollar in the first decade of 2000s, and expose the reverse trend in dollarization observed after the oil boom years. The estimation results reveal the recently new phenomenon of de-dollarization and increasing confidence in national currency, manat, in the post oil boom years.

Keywords: *Currency substitution; Non-linear system GMM estimation; Oil-rich CIS country*

JEL classification: *E41, E52, F31*

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Introduction

Dollarization has been a widespread phenomenon in CIS countries since independence, but recently its nature has changed considerably, especially in oil exporting ones. In the early years of transition, the introduction of national currency in CIS countries led to severe confidence crisis which reflected the worsening of the economic and financial environments in almost all newly independent states. High inflation volatility and fragile economic stability in the early phase of transition induced dollarization as people attempted to avoid rapid devaluation in their assets.

Now, after more than twenty years passed over their independence, the institutional transformation in the organization and structure of the markets has completed and the situation seems to be stabilized in almost all countries. It is highly probable that in parallel to the improvements in the economy, people's confidence in their national currency has been restored and dollarization has reversed its direction. Though almost all previous studies document the prevalence of currency substitution in those countries, some recent studies reveal the reverse trend of currency substitution process, especially in the oil-exporting countries.

Studying the period during and after hyperinflation years of 1992-1996 in Russia, Tullio and Ivanova (1998) documented currency substitution between ruble and dollar assets by estimating demand functions for different monetary aggregates. In their model, the significant exchange rate depreciation was interpreted as an evidence for dollarization. Oomes (2003) developed a model to explain dollarization hysteresis observed in Russia during 1992-1998 when dollarization ratio exhibited persistence despite declining inflation and exchange rate stabilization. Ohnsorge and Oomes (2005) estimated money demand functions covering the period of 1996-2003 in Russia and demonstrated that the money demand was rather stable in the case of effective broad money which also included an estimate of cash dollars in the economy. They claimed that the reason for lower inflation (“missing inflation”) despite rapid money growth was in fact due to the de-dollarization took place in the country. Harrison and Vymyatnina (2007) addressed the issue of the currency substitution in Russia after the crisis period, 1999 -2005 and shed light on the phenomenon of the decline in currency substitution. That is, although currency substitution was rather prevalent phenomenon in the early years of transition in Russia, it has reversed its direction, more probably due to stabilization of the economy and windfall of petrodollars.

Similar to the Russian case, Yılmaz et.al (2009) found evidence on the reversal of the currency substitution in Kazakhstan during the years of 2000 - 2007 in contrary to the high dollarization years of 90s. Although they attribute the de-dollarization to

the implementation of stable monetary policy in the country, it seems that stable economic environment and significant accumulation of petrodollars contributed to the stable monetary policy and increase in the confidence to the national currency.

Though currency substitution has long history in Azerbaijan, there was little interest in the country to study the phenomenon at the empirical level. One known study conducted to determine the level of dollarization in the country is due to Fiege and Dean (2004) who reported the approximate volume of dollars in circulation.

However, any other studies providing empirical documentation of currency substitution in the country using econometric tools are rare, if exist.

In general, high dollarization level in a national economy poses several risks to policy makers. First of all, central banks lose the effective control of the domestic money supply and interest rate in the presence of high dollarization. Secondly, high dollarization makes domestic agents susceptible to exchange rate shocks and restricts the maneuvers of policy makers aiming to use exchange rate policy to stabilize the economy. That is, a sharp depreciation of the national currency in the case of high dollarization may lead to financial turmoil if a country is a net debtor from the external world. The case of Azerbaijan is a proper example showing restrictive characteristics of high dollarization in the country. Here, policy makers always pay special attention to the probable consequences of moving from the peg regime to a more flexible one. As the presence of currency substitution has serious implications for policy makers and the choice of nominal anchor, we empirically verify the existence and the degree of it in the economy.

In the literature, most of the empirical studies use one equation money demand function in the estimation of the currency substitution, which is subject to Lucas (1976) critique. Those models ignore the dynamics of decision making process of economic agents and their expectation formation mechanism. To avoid those problems we follow the dynamic money-in-the-utility-function approach (Imrohoroglu (1994)) to study the currency substitution in Azerbaijan.

Friedman and Verbetsky (2001) also follow the same methodology developed by Imrohoroglu (1994) to investigate the currency substitution in Russia during 1995-2000. The model incorporates the decision making process of economic agents, and the system equations for econometric estimation are derived from optimization problem of households. In the model, agents decide on the monetary and non-monetary asset mix and then allocate currencies in their currency portfolio.

In our estimations, we use foreign currency denominated deposits as a proxy for the cash dollars circulating in the economy. We divide the period (2001-2010) into pre-boom (2001-2005) and post-boom (2006-2010) years. We find empirical evidence on the elasticity of substitution between cash manats and cash dollars, and between manat and dollar denominated deposits. However, the econometric results underscore the declining role of dollar for transaction and saving purposes, and correspondingly increasing share of manats in the portfolio of domestic agents in the post-boom years. The estimation results show that the economic stabilization years of post oil boom period established confidence in national currency and in consequence, manat started to enjoy a new, strong status.

The structure of the paper is as follows: Section II provides the details of theoretical model, Section III gives data description and empirical findings and Section IV concludes.

Model and Estimation Methodology

The model employed for econometric estimation is borrowed from Imrohoroglu (1994). The model assumes that the economy is inhabited by infinitely lived identical households. The decisions of consumption and saving are taken at the beginning of each period. The household decides consumption level, c_t, saving level in the form of domestic real bonds, b_t, domestic and foreign real money balances, $\frac{m_t}{p_t}$ and $\frac{m_t^*}{p_t^*}$ respectively. Households produce money services, x_t, by combining domestic and real balances using CES function:

$$x_t = \gamma[\alpha\left(\frac{\mathrm{m_t}}{\mathrm{p_t}}\right)^{-\rho} + (1-\alpha)\left(\frac{\mathrm{m_t^*}}{\mathrm{p_t^*}}\right)^{-\rho}]^{-1/\rho}$$

The representative household maximizes lifetime utility function, **U**

$$E\sum_{t=0}^{\infty}\beta^t U\,(\mathrm{c_t}, \frac{\mathrm{m_t}}{\mathrm{p_t}}, \frac{\mathrm{m_t^*}}{\mathrm{p_t^*}})$$

subject to budget constraint

$$c_t + \frac{m_t}{p_t} + \frac{m_t^*}{p_t^*} + b_t \leq y_t - \tau_t + \frac{m_{t-1}}{p_{t-1}} + \frac{m_{t-1}^*}{p_{t-1}^*} + (1 + \mathrm{r_{t-1}})\mathrm{b_{t-1}}$$

where β is the discount factor and c_t per capita consumption. Holding the real bond b_t one period yields a real return of $\mathrm{r_t}$. At the beginning of each period an exogenous endowment y_t is received by each individual who pays lump-sum tax of τ_t.

We assume that the utility function of the household is linear in consumption and money services, which takes the following form:

$$U_t = c_t + x_t$$

Therefore, the equations from the optimization problem of the household can be used as moment conditions in the non-linear system GMM estimation:

$$\beta(1 + \mathrm{r_t}) - 1 = \mathrm{d_{1,t+1}}$$

$$\alpha\gamma\left[\alpha\left(\frac{\mathrm{h_t}}{\mathrm{h_t^*}}\right)^{-\rho} + (1-\alpha)\right]^{-1/\rho-1}\left(\frac{\mathrm{h_t}}{\mathrm{h_t^*}}\right)^{-\rho-1} + \beta\frac{p_t}{p_{t+1}} - 1 = \mathrm{d_{2,t+1}}$$

$$\alpha\left(1-\beta\frac{p_t}{p_{t+1}}\frac{e_{t+1}}{e_t}\right)\left(\frac{\mathrm{h_t}}{\mathrm{h_t^*}}\right)^{-\rho-1} - (1-\alpha)\left(1-\beta\frac{p_t}{p_{t+1}}\right) = \mathrm{d_{3,t+1}}$$

where $\mathrm{h_t} = \frac{m_t}{p_t}$ and $\mathrm{h_t^*} = \frac{m_t^*}{p_t^*}$. Purchasing power parity condition is imposed by the equation $e_t = \frac{p_t}{p_t^*}$.

The instrument set I_1 consists of one period lagged values of the variables entered the above equations[1]:

$$I_1 = \{1, \frac{\mathrm{h_{t-1}}}{\mathrm{h_{t-1}^*}}, \frac{p_{t-1}}{p_t}, \frac{e_t}{e_{t-1}}, 1 + \mathrm{r_{t-1}}\}$$

Data and Empirical Findings

We split the sample into *pre-boom (01.2001-12.2005)* and *post-boom (01.2006-12.2010)* years due to the structural change taken place in the economy during the years 2005-2006. After the inauguration of Baku-Tbilisi-Ceyhan (BTC) pipeline in the mid of 2005, oil export of the country started to increase dramatically. The pre-boom period covers the years before BTC pipeline inauguration date and post-boom period covers the boom and post-boom years[2].

In each case there are 60 observations on per capita domestic and foreign money holdings, domestic and US price level (CPI), bilateral AZN/USD exchange rate and domestic real interest rates. To calculate per capita values of respective variables, we use data on population, M0 (*cash manat in circulation*), M2 (*cash manat plus*

[1] We also test for including different lag lengths in the instrument set.
[2] Our split point of the sample is intended to characterize the structural change taken place in the country during the period under the study. However, our evidence on the currency substitution remains robust against small variations of the subsamples.

manat deposits) and dollar denominated deposits in the banking sector. All the data are taken from the Central Bank of Azerbaijan database except data on population which is collected from the State Statistical Committee database.

Since almost all variables incorporated into the model are in growth terms, they demonstrate stationarity which makes our estimations robust[1]. In addition, because the empirical model includes overidentifying restrictions we also test for the validity of those restrictions using J-test.

In the *Case 1,* we interchangeably use both foreign and domestic interest rates. The corresponding instrument set can be the p period lagged values of respective variables. We start with the one lag, but also check more than one period lagged values of respective values. In cases with more than one period lagged values, the overidentifying restrictions are rejected at 5% significance level. The empirical findings employing the national currency cash holdings (M0) and the banking sector foreign deposits as proxies for domestic and foreign money holdings respectively, are reported in the *Table 1* below

In all cases of the non-linear GMM estimation, the objective function collapses to almost zero after a few iterations and the results are not sensitive to initial conditions. It is clear from the table below that all four estimated parameter values are statistically significant at 5% significance level.

[INSERT TABLE 1 HERE]

The estimated discount factor β for the period pre-boom years is approximately 0.998 (or 0.995 on quarterly basis) whereas it is around 0.997 (or 0.99 on quarterly basis) in the post-boom years. The domestic and foreign currencies enjoy approximately equal weights in the production of liquidity services in both pre and post boom years. Though small, the estimate of the share of money services γ in the utility function is strongly significant.

The estimate of ρ implies that the elasticity of currency substitution $\epsilon = \frac{1}{1+\rho}$ is around 2.93 and 2.88 for the pre and post boom years respectively. Hence the estimation suggests that there exists at least empirical evidence on the substitution between Azeri manat and US dollar. Though the elasticity of substitution is larger in the first half of the period, the difference in their magnitude is not statistically significant. The post boom period did not lead individuals to review their decisions and substantially reduce their holdings of cash manats. Surprisingly, the elasticity of

[1] All the variables demonstrate stationarity at 10% significance level using both ADF and KPSS tests. In case of a conflict between test results, we prefer KPSS test.

substitution even decreased slightly in the second half. It seems that the heart of the problem lied in the confidence in the national currency.

The empirical findings employing domestic interest rate as an opportunity cost variable of money holdings are presented in the *Table 1* above. The estimated parameters are not significantly different from the previous case except the coefficient of substitution. The elasticity of substitution in the first half of the period now falls to 0.62, but the substitution effect becomes statistically insignificant in the second half. That is, although there is a strong empirical support for the currency substitution effect in the pre-boom years, its importance even turns out to be statistically insignificant in the second half. Also, the discount factor is *(statistically)* significantly higher than one which runs contrary to the intuition. However, as Eichenbaum, *et al* (1998) indicates that a large value of the discount factor is a common problem in empirical studies.

We also check for the robustness of our results by using different instrument sets. We calculate money holdings ratio as the ratio of M2 to foreign deposits in the second instrument set, I_2. The empirical findings are provided in the *Table 2* below. For the whole period, the estimated coefficients are similar but become less precise except ρ which is insignificant in the first half.

It is possible that the effect of manat deposits in M2 dominate the overall results. To test this hypothesis we run the estimation of the empirical model using manat and foreign currency denominated deposits as inputs in the production of money services, and short-term interest rate on foreign currency deposits as the opportunity cost variable. We include manat to foreign currency deposits ratio as a new instrument in the $\boldsymbol{I_3}$.

[INSERT TABLE 2 HERE]

The findings reveal that for the pre-boom years manat deposits have statistically insignificant share in the production of money services ($\boldsymbol{I_3}$) and elasticity of substitution is relatively smaller. However, for the period of post-boom years the elasticity of substitution is statistically larger and significant, and manat deposits enjoy almost half of production of money services.

Empirical evidence show that manat and dollar deposits in both periods are substitutes though the elasticity of substitution is relatively smaller and the share of manat deposits is statistically insignificant in the first half. However, as we stated previously, the magnitude of the elasticity of substitution between cash dollar and cash manat was very similar in both periods. It seems that an average cash holder

was different from an average manat deposit holder in the pre-boom years. But the situation reversed in the post boom years and individuals started to treat manat deposits as an alternative to dollar deposits. That is, the substantial rise in the volume of strategic currency reserves, increasing confidence in the economy and the credible fixed exchange regime lead individuals to treat national currency as a safe haven as well.

[INSERT TABLE 3 HERE]

Moreover, the imposition of the purchasing power parity condition might seem a strong assumption for the model in the short run. Hence, we also check for the robustness of our results by replacing exchange rate with foreign price. The estimation results are presented in the *Table 3* above. The empirical findings show that all parameters except the elasticity of substitution remain almost the same and their standard errors have not changed significantly in both periods. In the case of the elasticity of substitution, its value declines to 0.47 in the first half, but it becomes statistically insignificant in the second half. Though its values differ from our previous estimation results, this finding is also in line with our previous findings. That is, although there exist empirical evidence on the currency substitution between manat and dollar in the first half, its magnitude decreased or became insignificant in the second half.

Conclusion

In this paper, we empirically document the existence of currency substitution between Azeri manat and US dollar. The estimation results suggest that in the pre and post oil boom years those currencies were treated by households as substitutes. Currency substitution affected the portfolio allocation decisions of cash and deposit holders, but in the latter case, it was more pronounced in the post boom years.

In the pre-boom years, low interest rate differentials between manat and USD deposits, and the absence of long-term investment/loan instruments rendered both borrowers and lenders to store their assets and lend/borrow in a more credible US dollar. İt seems that the fragile performance of the economy damaged the reputation of national currency in the early years of transition period.

In contrast, empirical estimation results underscore the rising share of manat holdings in the money portfolio holdings and comparatively small values of currency substitution ratios in the post boom years. It is more likely indicating the strengthening status of the national currency. The windfall of petro dollars to the country and the respective accumulation in dollar reserves not only restored

confidence in national currency but also strengthened it. The credible fixed exchange rate policy of the Central Bank affected the attitude of economic agents and encouraged de-dollarization in the country. This can be one of the underlying factors behind the lower inflation of the post oil boom years despite the significant expansion in the money supply. These processes are in the same spirit with the facts mentioned in the beginning - that increasing stability and inflow of petrodollars raised the confidence in the national currencies and induced de-dollarization in Russia and Kazakhstan, two oil rich CIS countries.

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APPENDIX

Figure 1. Cash manat in circulation, M0, 2000-2010

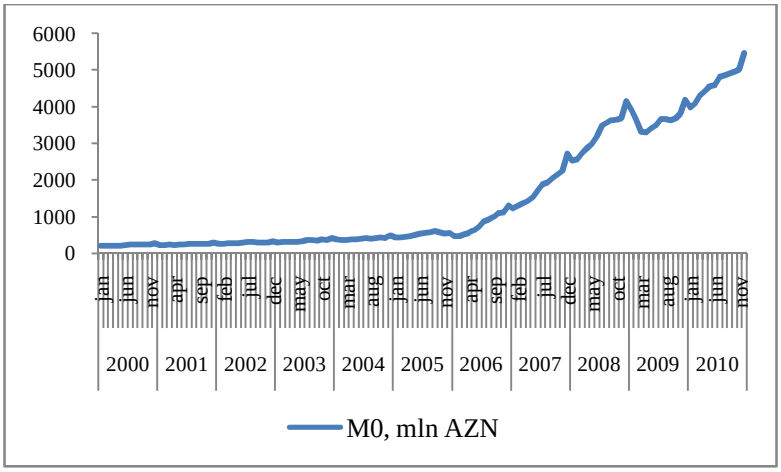

Figure 2. USD/AZN exchange rate, 2000-2010

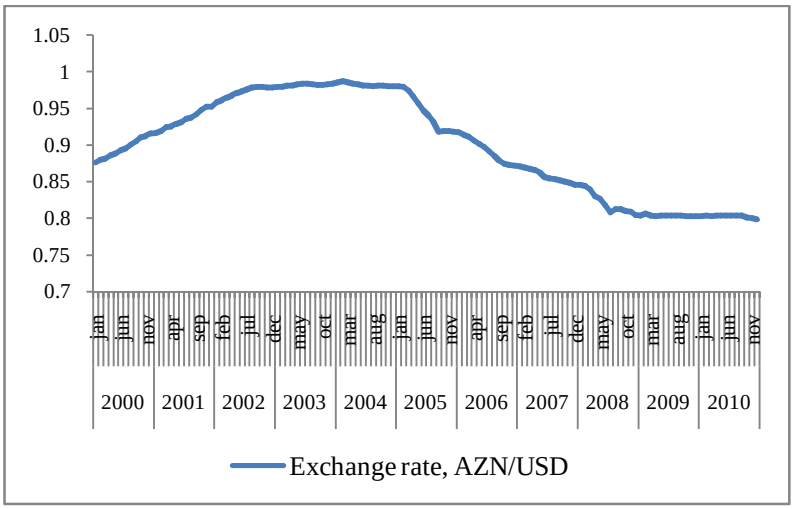

Figure 3. Dollar deposits in the banking sector, 2000-2010

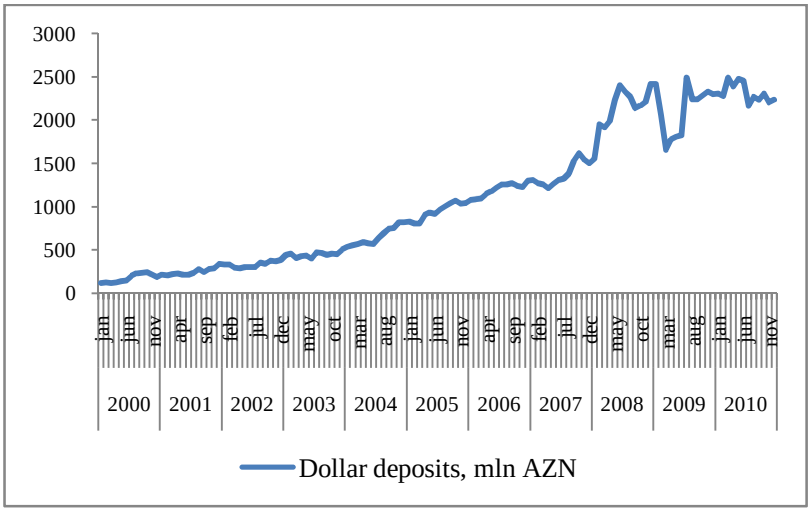

Table A1. Descriptive Statistics

	***pre-boom years** (2001m1-2005m12)*		***post-boom years** (2006m1-2010m12)*	
	Mean	*Std. deviation*	*Mean*	*Std. deviation*
M0 per capita	44	11	321	157
USD deposit per capita	63	31	209	53
AZN deposit per capita	15	8	161	67
Interest rate on AZN deposits	6.7	1.6	7.5	1.7
Interest rate on USD deposits	5.6	2.2	6.2	1.4

A2. Econometric Estimation Results

Table 1. Estimation results *(standard errors are in parentheses)*

Parameters	***2001-2005***	***2006-2010***	***2001-2005***	***2006-2010***
	foreign interest rate		***domestic interest rate***	
β	0.9981	0.9967	0.9988	1.0034
	(0.0002)	*(0.0002)*	*(0.0003)*	*(0.0007)*
α	0.4733	0.4684	0.4337	0.4002
	(0.0444)	*(0.0132)*	*(0.0321)*	*(0.0273)*
γ	0.0115	0.0278	0.0116	0.0129
	(0.0012)	*(0.0036)*	*(0.0008)*	*(0.0020)*
ρ	-0.6585	-0.6523	-0.3849	-0.2235
	(0.2288)	*(0.1316)*	*(0.1885)*	*(0.2712)*
J-statistics	9.76	11.32	11.03	9.85
Chi-sq (.025,11)	21.92			

Table 2. Estimation results with different Instrument sets *(standard errors are in parentheses)*

Parameters	***2001-2005***	***2006-2010***	***2001-2005***	***2006-2010***
	I_2		I_3	
β	0.9982	0.9967	0.9982	0.9967
	(0.0002)	*(0.0002)*	*(0.0002)*	*(0.0002)*

α	0.4565 *(0.0339)*	0.4848 *(0.0213)*	0.0093 *(0.0105)*	0.4262 *(0.0129)*
γ	0.0126 *(0.0013)*	0.0271 *(0.0037)*	0.0066 *(0.0009)*	0.0273 *(0.0037)*
ρ	0.3304 *(0. 4126)*	-0.8155 *(0.1043)*	2.1453 *(0.7750)*	-0.6828 *(0.1327)*
J-statistics	10.38	11.82	8.55	11.41
Chi-sq (.025,11)	21.92			

Table 3. Estimation results *(standard errors are in parentheses)*

Parameters	***2001-2005***	***2006-2010***
	foreign interest rate	
β	0.9981 *(0.0002)*	0.9967 *(0.0002)*
α	0.3861 *(0.0488)*	0.7188 *(0.0254)*
γ	0.0104 *(0.0008)*	0.0171 *(0.0023)*
ρ	1.1388 *(0.2288)*	-0.2964 *(0.2964)*
J-statistics	9.55	11.71
Chi-sq (.025,11)	21.92	