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On the Reliability of Black-Market Exchange Rate: Evidence from Algeria

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Abstract: The existence of a well-defined and stable money demand function is an essential condition for conducting of an effective monetary policy. In Algeria, as is the case for most of developing countries, excessive control on foreign exchange leads to the emergence of black-market exchange rate. As a consequence, two exchange rates (official and black) coexist and operate simultaneously. The gap between the two rates has widened since the adoption of the structural adjustment program in 1994. Despite its negative impact on Algerian economy, this market has not, so far, attracted attention of researchers. Using an autoregressive distributed lag technique for a set of quarterly data going from 1990Q1- 2021Q4, we aim to investigate the effect of black-market exchange rate on the demand for money. Our results provide further evidence for the inclusion of the black rather than the official rate when drawing a monetary policy.

Keywords: Demand for money, Black market exchange rate, ARDL Bounds testing approach, Algeria.

Introduction

The demand for money is one of the hot topics that have attracted the most attention in the literature both for developed and developing countries. According to Goldfeld (1994), a well-specified money demand function is very crucial for the conduct of a successful monetary policy. The idea of including the exchange rate in the demand for money function as another important determinant, though not tested empirically, was first introduced by Robert mundell (1963). Subsequently, many studies attempted to examine such link empirically, (see, for example, Boughton, 1979 ; Arrango & Nadiri, 1981 ; Domowitz & Elbadawi,1987 ; Arize, 1989 ; Bahmani-Oskooee & Pourheydrian, 1990 ; McNown & Wallace, 1992 ; Hassan, 1992 ; Arize & Shwiff, 1993 ; Chowdhury, 1997 ; Pozo &Wheeler, 2000).

The general consensus in the literature is that in developed countries, nominal exchange rate represents a suitable cost of holding money where as in developing countries, due to lack of well developed financial markets, the cost of holding money is often proxied by the expected rate of inflation. Therefore, the choices available for asset holders in developing countries are limited to mostly money and goods. Also, investors in these Countries, are constrained to invest in bank deposits and bank bonds, the interest on which are not market determined, they are fixed by the countries' monetary authorities for extended time period (Wong,1977; Hassan, 1992).

In addition, some of the above mentioned authors investigated the impact of foreign interest rates and expected domestic currency depreciation on the domestic demand for money in developing countries. They conclude that, since many of these countries are small, open economies, the most likely alternatives to holding domestic money for individuals are domestic goods and foreign currencies. Thus, the official exchange rates in small open economies are more of an exception than a rule. The inclusion of exchange rate in the demand for money equation issue in developing countries was not well supported by empirical evidence. Different studies yielded

mixed and country – specific results. Such differences in findings may thus be due to either a misspecification of the money demand equation; the improper use of a proxy for the foreign exchange rate, the estimation method, or both. Little attention has been paid to analyze the impact of the black market exchange rate on the long-run demand for money in developing countries that have black market activities for their currencies (for an exception, see Hassan et al., 1995; Bahmani-Oskooee, 1996; Arize & Shwiff, 1998a, 1998b; Tabesh, 2000, Hafez & Afzal (2003); Bahmani- Oskooee; Altin –Tanku, 2006).

A unique feature of the exchange rate regimes in any developing country with foreign exchange controls is the coexistence of a parallel or black market along with the official market for foreign exchange. The official exchange rate is fixed by the monetary authorities, whereas the black market exchange rate is a market determined rate. The two rates operate simultaneously, often with substantial discrepancies between them. Thus, individuals in these countries tend to alter their wealth portfolios by substituting foreign money for domestic money whenever they expect foreign exchange rate depreciation. This adjustment takes place mostly in the black market.

The main purpose of this work is to test empirically the effects of the black market exchange rate on the demand for money in Algeria thereby contributing to the existing literature on the role of black market exchange rate. The impact of the black market exchange rate on the demand for money in Algeria is worth investigating for several reasons: First, compared with other countries, literature on the demand for money in Algeria is rather scarce. Second, the area of the black market exchange rate in Algeria is unexplored. Though its negative impact on the Algerian economy, has not so far, attracted researchers' attention. Third, there is a growing need to a well-specified money demand equation in Algeria; particularly in its transition from a central-planning economy to a market- based one. The choice of the appropriate rate to fit the demand for money function is extremely important to avoid parameter estimates biasdness for the demand for money. As far as policy makers are concerned, a well defined money demand function will help in designing appropriate monetary policy actions and researchers in carrying out further research. Finally, Statistics about black market exchange rate in Algeria bring out an active black market for currencies. The gap between the official exchange rate of the Algerian dinar against the euro and that observed on the black market has widened. The difference amounts today to more than 60%. The foregoing discussion reveals the importance of black market exchange rate as an important determinant of the demand for money in Algeria. Given this introduction, the rest of this paper is structured as follows. Section 2 provides a profile of black market for foreign currencies in Algeria. Section 3 reviews the literature on black market exchange rate. Section 4 describes the data, methodology and presents the empirical results. Section 5 summarizes the main findings, provides an economic interpretation and some policy recommendations.

A Profile of Black Market for Currencies in Algeria

In less developed countries, government regulation and controls, particularly on the external sector, lead to black markets for currencies. After its independence, Algeria opted for a planned economy system that lasted almost for three decades. National currency (Algerian dinar) was subjected to a set of policies that had reflected the prevailing economic system characterized by a strict government control on foreign exchange. This control policy is seen as the major cause for the emergence of the black market for foreign currencies in the early seventies. Exchange controls in Algeria, though substantially reduced through the adoption of the structural adjustment program (S.A.P), still have its effects. This can be seen clearly from the volume of transactions carried out through the black market.

Supply of funds in this market generally comes from emigrants in France, retirement pensions and other pensions paid in foreign currency and tourist industry while demand originates mainly from individuals wishing to open bank accounts in foreign currency for visas purposes. As a result, a large part of foreign currency liquidity flowing through the black market is regularly held with banks in foreign currency accounts form. This is a positive aspect because it gives the banking system the opportunity to channel some Algerian foreign currency resources available from emigrants, who for obvious reasons prefer the informal market channel rather than the formal sector. Another significant portion of the currency however, flows on the parallel market, and is difficult to assess, goes to the benefit of importers of goods and services. These are a fringe engaged in importing prohibited goods or counterfeit, which generally strengthens the informal sector.

Finally, the last part of the foreign exchange resources available to the informal sector, takes the form of capital flight. Indeed, many Algerians invest heavily in activities such as restaurants, hotels, services, or property outright in some countries such as France, Spain and Tunisia. Two main phases can be distinguished in the

history of black market for foreign currency in Algeria. The first one dates back to the seventies and a large part of the eighties, characterized by a strict exchange controls, shortages of all kinds and a total absence of effective and efficient banking system. The second and most crucial stage began with the adoption of the structural adjustment program in Algeria in 1994. The new procedures such as the liberalization of the national economy, the significant change in the liberalization of the convertibility of the dinar that Algeria has undertaken since then were justified as essential for economic development, trade facilitation and foreign investment encouragement. Given the above realities, the black market for currencies in Algeria has taken new dimensions, and therefore, deserves more attention.

Review of Literature

This section reviews the pertinent literature that have dealt with the black market exchange rate and the demand for money in developing countries. Most of this literature reveals the importance of black market exchange rate as an essential determinant for the demand for money. Blejer (1978) examined the effects of the black market exchange rate and its expectations on the domestic demand for money in three Latin- American countries namely Brazil, Chile, and Colombia in which foreign- exchange control where in force during the 1950- 1973 period. His research suggested that a depreciation in the black market exchange rate led to a decrease in the domestic money demand. He attributed these results to portfolio rebalancing by individuals. According to Blejer's results, an omission of the proxy for expected currency depreciation from the demand for money, leads to overestimation of the variations in the demand for money because of changes in the expected rate of domestic inflation. He concluded that in nations where a substantial discrepancy develops between the official and the black market exchange rate, the expected black market rate could be the major determinant of domestic demand for money.

Hassan (1992) examined the role of the credit constraint, foreign interest rates, currency depreciation, the domestic inflation rate, and domestic income in the demand for money in Bangladesh. Using quarterly data from 1974:1 to 1989:4, he found, as is the case in many countries, that real income and expected rate of inflation are significant determinants of the demand for money in Bangladesh. As concerns foreign interest rates and currency depreciation, they did not play any major role in explaining the demand for money in Bangladesh. The complete absence of any relationship between money demand and currency depreciation may be attributed to the way exchange rate depreciation was measured (calculation of currency depreciation would rather be made from black market currency rates instead of official exchange rate). Hassan and Suryadi (1993) investigated empirically the impact of foreign interest rates, domestic rate of depreciation, and the credit constraint on the demand for money in Indonesia. Significance was found only for expected currency depreciation. Following Blejer (1978), Hassan (1995) studied the demand for money in Nigeria using quarterly data for the period 1976-1988. Using conventional regression analysis like Blejer, Hassan's findings confirmed Blejer's results that an expected black market exchange rate depreciation has a significant negative effect on domestic demand for money (a depreciation in the in the black market exchange rate leads to a decrease in demand for money). He suggested that the black market exchange rate must be taken into account as an important element by monetary policy.

Bahmani- Oskooee (1996) investigated the determinants of the demand for money in Iran using annual data over the period 1959-1990. He estimated demand for broad money (M2) by applying the Johansen and Juselius technique of cointegration and exclusion tests. According to him, the long-run demand for money (M2) in Iran includes real income, the inflation rate, and the black market exchange rate. Two versions of (M2) were estimated in Bahmani- Oskooee (1996), one with official exchange rate and another with black market exchange rate. His results showed better performance with the black than the official rate. Bahmani- Oskooee's conclusion was that "in the countries where there is a black market for currencies, it is the black market exchange rate and not the official exchange rate that should enter into the money demand equation".

The relevance of the black market exchange rate in the money demand function in developing countries has also been stressed by the study of Arize and Shwiff (1998 b). Undertaking a similar analysis to that of Bahmani-Oskooee (1996), they used annual data for the period 1951-1990 to estimate a money demand function for 25 developing countries namely India, Korea, Malaysia, Myanmar, Pakistan, the Philippines, Taiwan, Thailand, Egypt, Ghana, Morocco, Tunisia, Argentina, Brazil, Bolivia, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Mexico, Paraguay, Peru, Uruguay, and Ven- ezuela. Their results provide evidence that the elasticities for real income and the official rate in the second function are generally larger than those of the first function (which includes black market exchange rate). They interpreted this result as evidence against the use of the

official exchange rate variable as the relevant exchange rate variable in the money demand function of these countries.

Tabesh (2000) explored the impact of the black market exchange rate expectations on the demand for money in Iran using annual data for the period 1959-1994. In the post-revolution era, Iran has imposed a great deal of restriction on the exchange market. The restrictions were so severe that in the period 1979-89, the nation was basically a closed economy. However, as the exchange market restrictions intensified, an active underground exchange market emerged in which key currencies in general and the U.S. dollar in particular, were exchanged several-fold higher than the official rate. The findings suggested that in the sample period 1959-94, demand for real cash balances had been significantly affected by the expected black market exchange rate. Further, the results of a cointegration test provided ample evidence that the expected appreciation/depreciation in the black market exchange rate, real income, and the rate of inflation jointly determine the demand for real (M2) money in Iran.

Following Bahmani- Oskooee (1996), Hafez and Afzal (2003) examined empirically the impact of black market exchange rate on the demand for money in Pakistan. Using quarterly data over the period 1972-2000, the same money demand equation proposed by Bahmani- Oskooee (1996) was estimated. Hafez and Afzal (2003) however, employed an ARDL approach combined with CUSUM and CUSUMQ tests. Their results showed that M2 was cointegrated with income, inflation rate and the black market exchange rate, moreover, the estimation relation was also stable.

Bahmani- Oskooee and Altin -Tanku (2006) estimated a money demand equation similar to Bahmani- Oskooee (1996) for 25 LDC, namely, Algeria, Argentina, Brazil, Chile, Costa Rica, Egypt, Ethiopia, India, Indonesia, Jordan, Kenya, Malaysia, Malawi, Mexico, Morocco, Nigeria, Pakistan, Paraguay, Philippine, S-Africa, Sri Lanka, Suriname, Syria, Thailand and Turkey. Using an ARDL approach, they were unable to generalize the conclusion that the black market exchange rate and not the official rate belongs to the demand for money. By the same way, Bouteldja et al (2013) found evidence of black market exchange rate effect on the demand for money in Algeria. Using quarterly data for the period 1974Q1- 2003Q4. Using an autoregressive distributed lag technique, they argued that the monetary agregate M1 should taken into account in drawing monetary policy.

Data, Methodology and Results

According to the literature on the demand for money, a money demand equation should contain a scale variable to the level of transactions in the economy and a variable representing the opportunity cost of holding money. Furthermore, to account for economic openness, another variable reflecting the relative returns of foreign money vis-à-vis domestic money should be included in the demand for money equation. Since Algeria is a developing country which lacks well developed financial market, the inflation rate is used as a proxy for the opportunity cost of holding money. Following Bahmani-Oskooee (1996) and Bahmani-Oskooee and Rehman (2005) we adopt the following specification:

$$LnM_t = a + LnY_t + cLnP_t + dLnEX_t + \varepsilon_t \quad (1)$$

Where;

M_t is the desired holdings of real money balances (M_1 or M_2); M_1 consists of currency in circulation and demand deposits in scheduled banks. M_2 consists of M_1 plus quasi money. Y_t is the real GDP; P_t is the consumer price index; EX_t is the exchange rate defined as the number of Algerian dinars per U.S dollar; ε_t is the stochastic disturbance term.

According to macroeconomic theory, the money demand is assumed to be an increasing function of real income (i.e., real GDP), thus, an estimate of b is expected to be positive. Theoretically, estimate of the inflation rate c is expected to be negative. However, what should be emphasized in this regard is that high inflation rates erode the value of domestic currency and would tend to decrease the demand for domestic currency and thus a negative sign of c. Nevertheless, higher inflation rates may also mean higher demand for domestic currency in order to meet required transaction needs yielding a positive sign of c. The impact of inflation on the demand for money is therefore, dependent on the net effect of the two influences.

As regards the estimate of d, it could be positive or negative depending on the prevailing effects; the wealth effect or the substitution effect. According to Arango and Nadiri (1981), a depreciation of domestic currency or

an increase of foreign currency leads to an increase in value of foreign assets held by domestic residents. If this increase is perceived as an increase in wealth (a wealth effect), then, the demand for money increases yielding a positive estimate of d. Domestic currency depreciation on the other hand, could also result in a decrease of money demand (substitution effect). The so mentioned effect was pointed out in Bahmani-Oskooee and Pourheydarian (1990). They argued that when a currency depreciates, individuals could expect further depreciation and may hold less of domestic currency. In this case, the estimate of d is expected to be negative. The Two monetary aggregates M_1 and M_2 in equation (1) above are subject to empirical tests, each in three alternatives namely; official exchange rate, black market exchange rate and exchange rate premium. Table 1 below provides an identification of the various alternatives that will be subject to estimation:

Table 1. Model identification

Model	Identification
Model 1	LnM1, LnGDP, LnCPI, LnOEX
Model 2	LnM1, LnGDP, LnCPI, LnBOX
Model 3	LnM1, LnGDP, LnCPI, LnPR
Model 4	LnM2, LnGDP, LnCPI, LnOEX
Model 5	LnM2, LnGDP, LnCPI, LnBOX
Model 6	LnM2, LnGDP, LnCPI, LnPR

The Data

Quarterly data over the period 1990Q1 – 2021Q4 are collected from the international Financial Statistics (IFS) by the IMF. Data on black market exchange rate for the period 1990Q1- 2003Q4 are collected from http://www.puaf.umd.edu/ faculty /reinhart/OFFICIAL_PARALLEL_DATABASE1.xls. Those for the period 2004Q1- 2021Q4 however, are collected from dealers in black market for currencies in Algeria.

The ARDL Estimation Technique

The six models identified in table1 above, will be estimated using a cointegration ARDL bounds testing approach developed by Pesaran (1997), Pesaran and Shin (1999) and Pesaran et al. (2001). This method has several advantages over conventional methods such as cointegration of Engle and Granger (1997), Johansen (1988) and Johansen and Juselius (1990). First, the ARDL procedure does not require that the series should be integrated of the same order[2] (it can be used for stationary variables and / or integrated of order 1 and / or fractional integration). We note in this context that this procedure cannot be applied to variables with order of integration superior or equal two. Secondly, this procedure has good small sample properties as compared to alternative approaches. In this context, we note that Narayan (2005) has provided critical values for sample sizes ranging from 30 to 80 observations. Third, this procedure allows variables to have different numbers of delay, and provide unbiased long- run estimates with a valid t-statistic even in the case of endogeneity of regressors (Harris and Sollis, 2003). Fourth, unlike conventional methods of cointegration that use a system of equations for estimating long-term relationships, this procedure uses a single equation in the reduced form.

The aim of this study is two folds as it first estimates the long-run income, inflation, and exchange rates (official, black, premium) elasticities of M1 and M2 monetary aggregates and examines their stability and second to test for the existence of currency substitution. However, this will not be sufficient. Laidler (1993) as well as many other authors, point out the importance of the short-run adjustment process. According to them, the short-run modeling of money demand could be a potential source of instability. Thus, incorporating the short –run dynamics into equation (1) leads to an error correction model of the ARDL form following Pesaran et al. (2001):

$$\Delta LnM_t = a_0 + \sum_{i=1}^{n} a_{1i}\,\Delta LnM_{t-i} + \sum_{i=0}^{n} a_{2i}\,\Delta LnY_{t-i} + \sum_{i=0}^{n} a_{3i}\,\Delta LnP_{t-i} + \sum_{i=0}^{n} a_{4i}\,\Delta LnEX_{t-i} + \delta_1\,LnM_{t-1} + \delta_2 LnY_{t-1} + \delta_3 LnP_{t-1} + \delta_4 LnEX_{t-1} +$$

The operator Δ represents the first difference and εt is a white noise representing the error term. The cointegration bounds testing approach is based on the F statistic or Wald statistic. According to Pesaran et al. (2001), the asymptotic distribution of F is non-standard under the null hypothesis of the absence of long-term relationships between variables, and this regardless of their order of integration if it is (I (0) or I (1)). Based on

equation (2), the null hypothesis is $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$, while the alternative hypothesis (existence of cointegration relations) is $H_1: \delta_1 \neq 0, \delta_2 \neq 0, \delta_3 \neq 0, \delta_4 \neq 0$. To perform the test, Pesaran et al. (2001) provide two sets of critical values, upper and lower. The first (upper) when all variables are integrated of order one (I (1)) and second (lower) when all variables are stationary (I (0)). These two sets of critical values provide a band covering all possible classifications of variables, whether purely I (0), purely I (1) or mutually cointegrated. If the F statistic exceeds the upper band, then the null hypothesis is rejected, then there are cointegration relationships between variables. In case the F-statistic lies between the two bands, while the cointegration test is conclusive (in this case it is necessary to know the order of integration of each variable). And in the case when the F statistic is less than the lower band, the null hypothesis cannot be rejected, therefore there is no cointegration relationship.

Results and Discussion

The cointegration ARDL bounds testing approach requires that the series should have an integration order less than two. Therefore, it is essential to ensure that the order of integration of the variables in the work in hand is less than two. The results of the Augmented Dickey-Fuller (ADF) and Philips Perron (PP) tests of stationarity are presented in Table 2.

Table2. Stationarity test results

	Augmented Dickey-Fuller (ADF)		Philips Perron (PP)		Decision
Series	Level	1st difference	Level	1st difference	I(d)
LnM1	- 1.6008	- 6.5204*	- 1.7142	-11.6796*	I(1)
	[0.4793]	[0.0000]	[0.4218]	[0.0000]	
LnM2	- 3.2359**	- 5.7111	-2.8617***	- 9.4208	I(0)
	[0.0201]	[0.0000]	[0.0527]	[0.0000]	
LnGDP	- 1.7373	- 1.8515***	- 0.5180	- 5.3230*	I(1)
	[0.4100]	[0.0613]	[0.8829]	[0.0000]	
LnCPI	- 5.5392*	-2.0408	-5.0355*	- 7.2474	I(0)
	[0.0000]	[0.0400]	[0.0000]	[0.0000]	
LnOEX	-4.8169*	-8.1831	-5.3409*	-8.2845	I(0)
	[0.0001]	[0.0000]	[0.0000]	[0.0000]	
LnBEX	-2.2125	- 8.9756*	-2.2944	-8.9865*	I(1)
	[0.2029]	[0.0000]	[0.1753]	[0.0000]	
LnPR	-1.3825	-10.7403*	- 1.6690	-10.7824*	I(1)
	[0.8618]	[0.0000]	[0.7595]	[0.0000]	

***, **, * are the MacKinnon critical values for the rejection of the null hypothesis of a unit root at the 1%,5% and 10% levels respectively. Values between brackets are probabilities**.**

According to the results in table2, variables are a mixture of I(0) and I(1). These results represent a suitable rationale for using ARDL approach. the next step in ARDL approach is to test for the existence of a long-run causal relationship between the variables using the bounds test approach developed by Peasran et al. (2001). Since the test is sensitive to the lag length, this latter is determined according to Akaike Information Criterion (AIC). The results of cointegration test are reported in Table 3:

Table 3. ARDL bounds test for cointegration

Null Hypothesis: No Level Relationship					
	F-Statistic	Significance	I(0)	I(1)	Decision
Model 1	11.22956	10%	2.37	3.2	
Model 2	15.05788	5%	2.79	3.67	
Model 3	14.90562	2.5%	3.15	4.08	
Model 4	14.64838	1%	3.65	4.66	Cointegration
Model 5	4.935526				
Model 6	23.68478				

Results of bound tests in table 3 show that the calculated F-statistics are statistically significant (i.e. higher than the upper bound) at 1% level of significance indicating a long run-relationship between variables in the various models. Having the existence of a cointegration relationship between the variables in our models, the next step is to check the long-run coefficients. Table 4 below reports these estimates.

Table 4. Estimated Long-Run Coefficients

Models	Optimum lags	Variables C	LnGDP	LnCPI	LnOEX	LnBEX	LnPR
Model 1	(2,4,4,0)	- 50.84990*	7.885916*	- 0.870238	0.006868	-	-
Model 2	(2,0,4,0)	- 44.66506*	6.085952*	0.949934**	-	- 0.005220*	-
Model 3	(1,0,3,0)	- 44.27246*	6.129775*	0.672352***	-	-	- 0.004793
Model 4	(8,2,1,3)	- 83.74591	9.083529	3.390313	- 0.018757	-	-
Model 5	(1,8,0,3)	- 69.07732*	8.366140***	1.037108	-	0.015482	-
Model 6	(1,4,1,3)	58.31740	- 6.709433	2.344735	-	-	- 0.055674

***, **, * indicate significance at the 1%,5% and 10% levels respectively.

Table 5. Estimated short-run coefficients

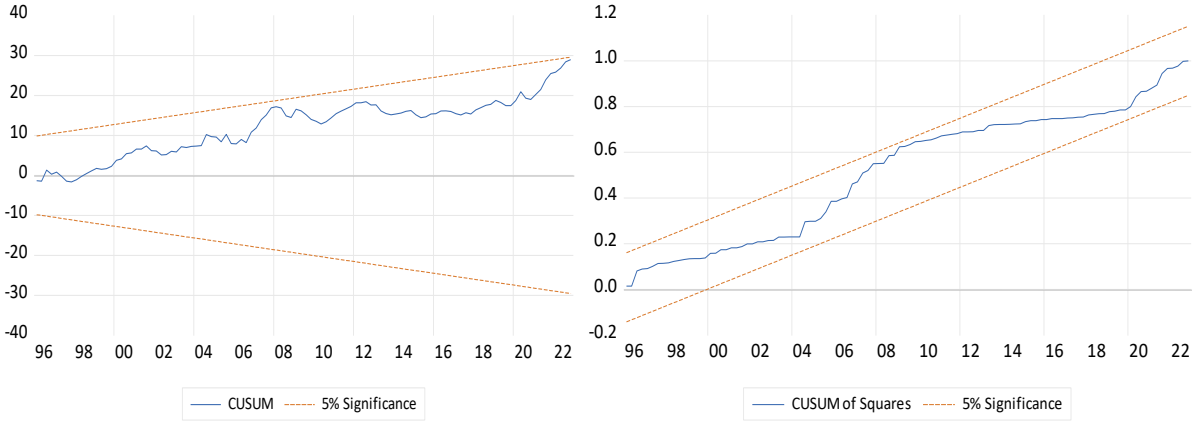
	Models Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
C	- 0.963386	- 1.755169	- 1.841403	0.731735	1.089937	0.503035
LnM1(-1)	- 0.018946	- 0.039296	- 0.041593	-	-	-
ΔLnM1(-1)	- 0.166646	- 0.142275	- 0.134325	-	-	-
LnGDP(-1)	0.149404	0.239155	0.254953	- 0.079368	- 0.132005	
ΔLnGDP	1.444677	1.132744	1.142319	0.934770	0.423876	- 0.057874
ΔLnGDP(-1)	0.666928	0.456004	0.455912	-	-	-
ΔLnGDP(-2)	- 0.633545	- 0.935181	- 0.931598	-	-	-
ΔLnGDP(-3)	- 1.231050	- 0.853009	- 0.815584	-	-	-
LnCPI	-	0.037329	0.027965	-	-	-
LnCPI(-1)	0.016487	-	-	- 0.029623	- 0.016364	0.020225
ΔLnCPI	- 0.207039	-	-	0.048534	0.001619	0.188079
ΔLnCPI(-1)	0.211803	-	-	0.172591	0.280490	0.225661
ΔLnCPI(-2)	- 0.371639	-	-	- 0.029623	- 0.372283	- 0.199129
ΔLnCPI(-3)	- 0.167970	-	-	-	-	-
ΔLnCPI(-4)	0.288477	-	-	-	-	-
ΔOEX	- 6.87E-05	-	-	0.000220	-	-
OEX(-1)	0.000130	-	-	0.000164	-	-
ΔOEX(-1)	- 0.000537	-	-	- 0.001974	-	-
ΔOEX(-2)	- 0.000796	-	-	- 7.08E-05	-	-
ΔOEX(-3)	- 0.004944	-	-	- 0.002058	-	-
ΔLnOEX	-	-	-	-	-	-
ΔLnOEX(-1)	-	-	-	-	-	-
ΔLnOEX(-2)	-	-	-	-	-	-
ΔLnOEX(-3)		-	-	-	-	-
BEX	-	- 0.070205	-	-	- 0.000244	-
PR	-	-	- 0.000199	-	-	-
LnM2(-1)	-	-	-	0.008738	0.015779	- 0.008626
ΔLnM2(-1)	-	-	-	-	0.069482	-
ΔLnM2(-2)	-	-	-	-	0.158129	-
ΔLnM2(-3)	-	-	-	-	- 0.069585	-
ΔLnM2(-4)	-	-	-	-	- 0.158587	-
ΔLnM2(-5)	-	-	-	-	0.107245	-
ΔLnM2(-6)	-	-	-	-	- 0.068496	-
ΔLnM2(-7)	-	-	-	-	- 0.195745	-
PR(-1)	-	-	-	-	-	- 0.000480
Δ PR	-	-	-	-	-	0.000354
Δ PR (-1)	-	-	-	-	-	0.000747
ECM(-1)	- 0.035229*	- 0.041572*	- 0.0034768*	0.023452	0.011415	0.002045

As can be seen, all variables carry their expected signs and significance at 1% level of significance when the black-market exchange rate (BEX) is included in the demand for money equation M1(model 2). Such high significance diminishes with the inclusion of the official exchange rate and disappears totally when the money demand equation M2 is used. The aforementioned results are extremely important as they point out more stability in monetary aggregate M1 by including black-market exchange rate. As mentioned previously, the short-run modeling of money demand could be a potential source of instability. Thus, short-run coefficients estimates should be considered. To this end, the long-run coefficient estimates are used to form error-correction term ECM by substituting the lagged level variables in (2) by lagged error-

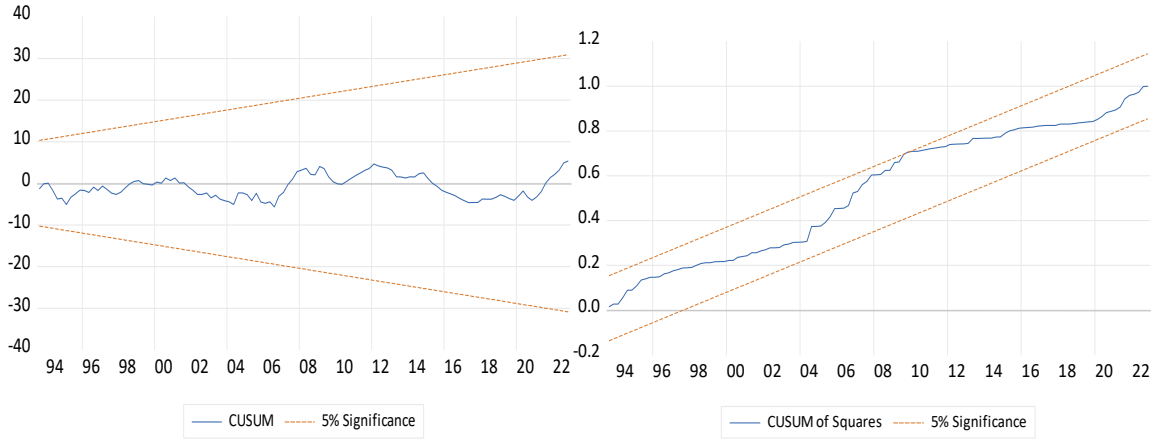
correction term ECM and estimate the model again by imposing the optimum number of lags determined before. A negative and significant coefficient obtained for ECM is a more efficient way of establishing cointegration. As can be seen from Table 5, indeed ECM carries its expected negative and significant coefficient in M1 models, supporting cointegration among all variables. Finally, we perform the CUSUM and CUSUMSQ tests to the residuals. As it is clear the CUSUM and CUSUMSQ tests in figure 1 support stability of M1.

Concluding Remarks

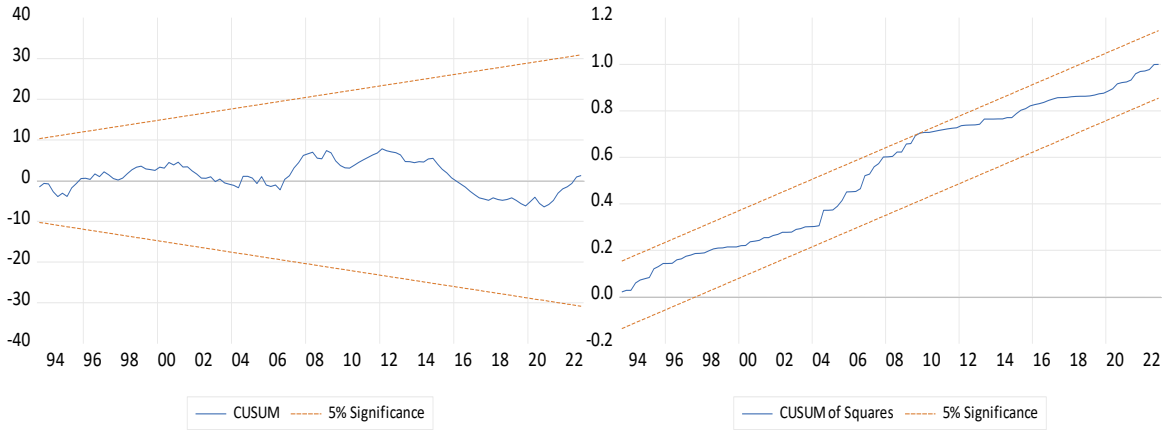
Model 1.LnM1,LnOEX,LnGDP ,LnCPI



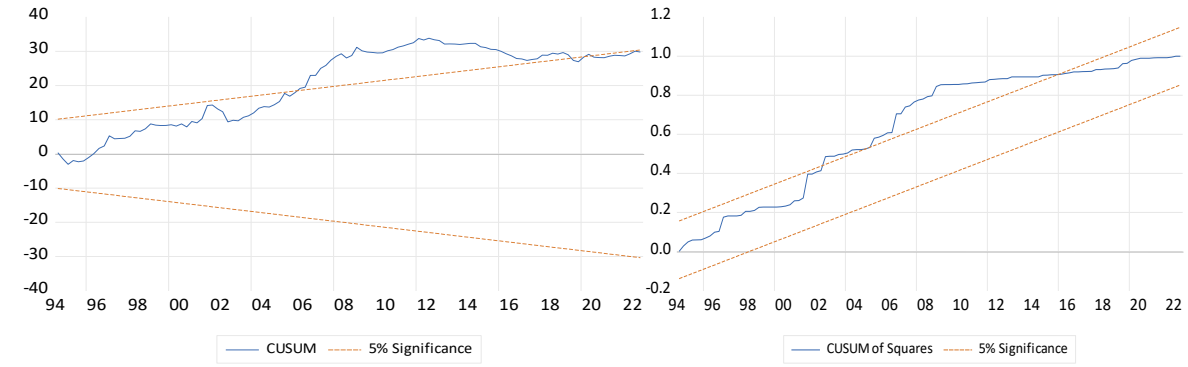
Model 2. LnM1,LnBEX,LnGDP ,LnCPI



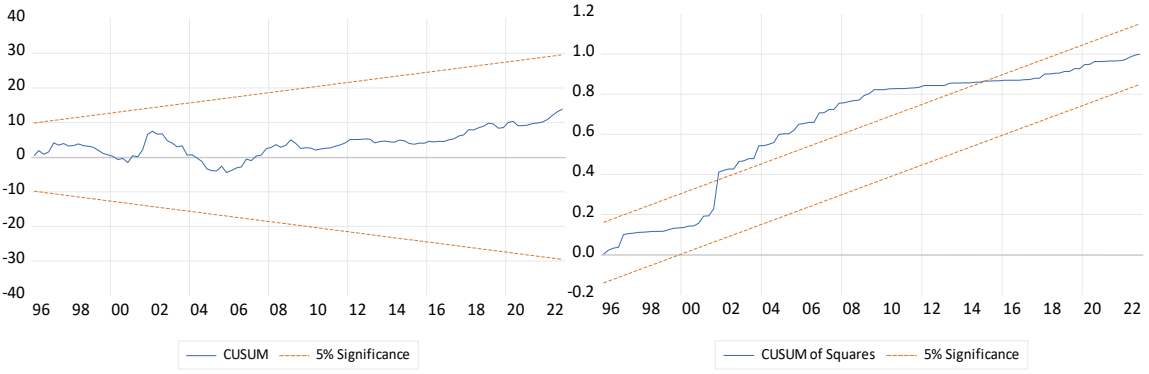
Model 3. LnM1,LnPR,LnGDP ,LnCPI



Model 4. LnM2, LnOEX,LnGDP ,LnCPI



Model 5.LnM2, LnBEX ,LnGDP ,LnCPI



Model 6.LnM2,LnPR,LnGDP ,LnCPI

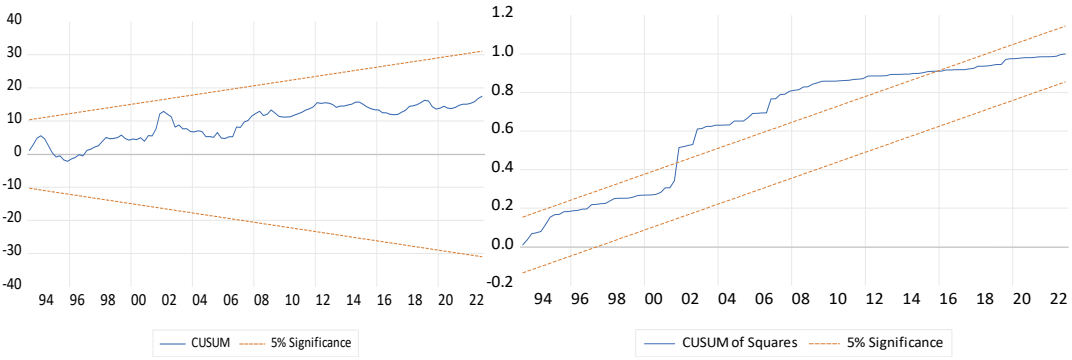


Figure 1. CUSUM and CUSUMSQ

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS Journal belongs to the authors.

Acknowledgements or Notes

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References

Ajibola, I. O., Udoette, S. U., Muhammad, R. A., & Anigwe, J. O. (2020). Currency substitution and exchange rate volatility in Nigeria: An autoregressive distributed lag approach. *CBN Journal of Applied Statistics*, *11*(2), 1-28.

Akcay, O. C., Alper, C. E., & Karasulu, M. (1997). Currency substitution and exchange rate instability: The Turkish case. *European Economic Review*, *41*(3-5), 827-835.

Arango, S., & Nadiri, M. I. (1981). Demand for money in open economies. *Journal of Monetary Economics*, *7*(1), 69–83.

Bahmani, O. M., & Pourheydarian, M. (1990). Exchange rate sensitivity of demand for money and effectiveness of fiscal and monetary policy. *Applied Economics*, *22*(7), 917-925.

Bahmani-Oskooee, M. (1996). The black market exchange rate and demand for money in Iran. *Journal of Macroeconomics*, *18*(1), 171-176.

Bahmani-Oskooee, M., & Karacal, M. (2006). The demand for money in Turkey and currency substitution. *Applied Economics Letters*, *13*(10), 635-642.

Bahmani-Oskooee, M., & Tanku, A. (2006). Black market exchange rate, currency substitution and the demand for money in LDCs. *Economic Systems*, *30*(3), 249-263.

Bahmani-Oskooee, M., & Tanku, A. (2006). Black market exchange rate, currency substitution and the demand for money in LDCs. *Economic Systems*, *30*(3), 249-263.

Bahmani-Oskooee, M., & Techaratanachai, A. (2001). Currency substitution in Thailand. *Journal of Policy Modelling*, *23*(2), 141–145.

Boamah, D., Guy, K., Grosvenor, T., & Lescott, A. (2012). Currency substitution: Evidence from the Caribbean. *Journal Of Business, Finance & Economics in Emerging Economies*, *7*(1).

Bouteldja, A., Benamar, A., & Maliki, S. (2013). The black market exchange rate and demand for money in Algeria. *International Journal of Arts and Commerce*, *2*(10), 71-82.

Chowdhury, A. R. (1997). The financial structure and the demand for money in Thailand. *Applied Economics*, *29*(3), 401-409.

Doguwa, S. I. (2014). Currency substitution: Evidence from Nigeria. *CBN Journal of Applied Statistics*, *5*(2), 1-23.

Elkhafif, M. A. (2003). Exchange rate policy and currency substitution : The case of Africa's emerging economies. *African Development Review*, *15*(1), 1-11.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, *12*(2-3), 231-254.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with appucations to the demand for money. *Oxford Bulletin of Economics and Statistics*, *52*(2), 169-210.

Laidler, D. E. (1993). *The demand of money : theories, evidence and the problems*. Newyork, NY : Harper Collins.

McNown, R., & Wallace, M. S. (1992). Cointegration tests of a long-run relation between money demand and the effective exchange rate. *Journal of International Money and Finance*, *11*(1), 107-114.

Mundell, R. A. (1963). Capital mobility and stabilization policy under fixed and flexible exchange rates. *Canadian Journal of Economics and Political Science/Revue Canadienne de Economiques et Science Politique*, *29*(4), 475-485

Odedokun, M. O. (1996). Black market exchange rate behaviour in African countries: Evidence from an eclectic model. *African Development Review*, *8*(2), 1-19.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289-326.

Ramcharran, H. (1990). The black-market exchange rate and currency substitution in a small open economy: An empirical analysis of Barbados. *North American Review of Economics and Finance*, *1*(1), 135-143.

Rehman, H. U., & Afzal, M. (2003). The black market exchange rate and stability of demand for money in Pakistan : A cointegration analysis. *Pakistan Economic And Social Review*, *41*(1-2), 13-28

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