AN ECONOMETRIC INVESTIGATION OF DOLLARIZATION IN EGYPT

Tarik Alami

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Abstract

Egypt has experienced large increases in the share of foreign currency deposits in broad money. What could explain this rise? Engle-Granger cointegration and error-correction modeling along with Johansen-Juselius cointegration technique are used to establish the long-run relation between the ratio of foreign currency deposits to total liquidity (dollarization ratio) and different measures of the opportunity cost of holding these deposits. Empirical results imply that Egyptians hold foreign currency deposits as a store of value rather than as a medium of exchange, i.e. Egypt is subject to dollarization but not to currency substitution as previously thought.

استقصاء اقتصادي قياسي للدولرة في مصر

طارق علمي

ملخص

شهدت مصر زيادة كبيرة في حصة الودائع بالقطع الأجنبي من مجموع الكتلة النقدية. ولكن، ما الذي يفسر هذا الارتفاع؟ إستخدمت عدة طرق مثل تكامل انجل – جرانجر ونمذجة تصحيح الخطأ بالإضافة إلى تكامل جوهانسن جوسيليوس، لبناء علاقة طويلة الأمد بين نسبة الودائع بالعملات الأجنبية إلى مجموع السيولة (نسبة الدولرة) وبين الحدود المختلفة لتكلفة الفرصة البديلة لحمل هذه الودائع. إن النتائج التجريبية التي تضمنتها هذه الورقة تدل ضمنا على أن المصريين يحملون ودائع بالعملات الأجنبية كمخزون للقيمة أكثر من كونها كوسيلة تبادل. هذا يعني أن مصر قيد الدولرة وليس إحلال العملات كما كان يعتقد في السابق.

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Introduction

In the light of severely limited capital markets and exchange controls in developing countries, large increases in the share of foreign currency deposits in broad money may not constitute currency substitution. Rather, it may be a systematic tendency of money holders to substitute different monies in their portfolios in response to their respective opportunity costs to protect the value of their wealth. This portfolio shift takes place, especially in an inflationary environment that is coupled with interest rate regulations.

These considerations are extremely relevant to the Egyptian case. The Egyptian economic performance during 1980-1991 was characterized by high rates of inflation, interest rate restrictions, underdeveloped money and capital markets and limited range of financial assets. As a result, the value of available interest-bearing, as well as, non-interest-bearing domestic assets is diminished, encouraging domestic residents to shift out of domestic money into foreign money.[(1)]

Previous empirical studies on currency substitution ignore the institutional details of financial sectors of the countries where they claim to find evidence of currency substitution, thereby failing to distinguish between currency substitution, the use of different currencies as a medium of exchange, dollarization and the use of different currencies as a store-of-value.

This paper attempts to distinguish empirically between portfolio diversification (dollarization) and transaction motivations (currency substitution) behind holding foreign money. This constitutes a first step in examining the process of dollarization and its implication on the effectiveness of monetary policy in Egypt.

To date, only two papers have addressed so far the issue of currency substitution in Egypt, El-Erian (1988) and Elkhafif and Kubursi (1991). Nevertheless, these studies have not addressed the issue of data stationarity. Failure to test for stationarity implies that these estimates might be inconsistent, and may result in false policy implications. Another limitation of the two above mentioned studies on Egypt, as well as other studies on the subject, point to the fact that the degree of currency substitution is usually estimated without exploiting data collected and published by the International Monetary Fund on foreign currency deposits held abroad by country of origin of residents. Moreover, researchers in this area have ignored data on the black market exchange rate, published by the International Currency Analysis Inc. which reflects the unregulated supply and demand forces.

The paper introduces a general model to be estimated and discusses how it differs from those estimated in previous studies. In this study, quarterly data for Egypt covering the period 1981 to 1994 are used to analyze the current episode of dollarization. This time period is important since it allows the assessment of the effect of the adopted structural adjustment program on the financial sector. In addition, because of the lack of reliable data prior to 1981 and after 1994, the years 1981-1994 represent an ideal period to be analyzed. Since the

[(1)] For more on the Egyptian financial system, see Alami (1998).

model is estimated using time series data, results of stationarity tests, as well as cointegration tests, are presented. An error correction model is then estimated for the demand for foreign money in Egypt.

Specification Issues

Alami (forthcoming) modifies Cuddington's portfolio balance model and provides a formal framework that could distinguish the store of value substitutability (portfolio shifts or dollarization) and the medium of exchange substitutability (currency substitution). Alami's model demonstrates that foreign currency denominated deposits earn interest in Egypt and therefore, these interest-bearing foreign currency denominated deposits are considered as part of Cuddington's foreign assets and not part of foreign money that is dominated by other interest-bearing assets.

The general model offered in this paper resembles that of Bordo and Choudhri (1982),[2] El-Erian's (1988),[3] and Clements and Schwartz (1992). In this modified version, a negative response of domestic money to expected depreciation, represents currency substitution. In addition, a positive response of foreign currency dominated deposits to interest reates differential in favor of foreign currency, represents portfolio shifts, i.e. dollarization. The general model is specified as follows:

$$F = \gamma_0 + \gamma_1 x^e + \gamma_2 \left(i^* - i\right) \qquad \text{(Equation 1)}$$

where:

F = is the ratio of foreign currency denominated deposits to total liquidity

x^e = a measure of expected rate of change of the exchange rate

(i^*-i) = a measure of interest rate differential where i and i^* are the yield on domestic and foreign currency deposits

In this model, γ_1 measures the degree of currency substitution. The currency substitution hypothesis predicts a positive/negative short-run effect on the ratio of foreign to domestic money due to increases/decreases in the currency substitution variable, expected depreciation. Therefore, currency substitution exists if γ_1 is expected to be positive. The sign of the coefficient on the interest rate differential (i^*-i) is expected to be positive. This means that an increase in the yield on foreign currency deposits relative to that on domestic currency deposits, induces an increase in the demand for foreign currency deposits. This would result in an increase in the ratio (F). Thus, γ_2 is supposed to capture portfolio shifts.

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[2] Bordo and Choudhri propose a variation of Miles's theory in which a pure transaction demand for money resides along the substitution effect. The final equation is:

$$\log\left(M^d / EM^f\right) = \beta_0 + \beta_1 \log y + \beta_2 i + \beta_3 \left(i - i^*\right)$$

Assuming uncovered interest parity, they identify the interest differential as the expected rate of depreciation.

[3] In his study of currency substitution in Egypt, El-Erian estimated the following equation

$$\log\left(\frac{EM^f}{EM^f + M^d}\right) = \beta_0 + \beta_1 x^e + \beta_2 \log\left(\frac{1+i}{1+i^*}\right) i + \beta_3 \left(\frac{EM^f}{EM^f + M^d}\right)_{t-1}$$

Approximation of the interest rate differential by expected depreciation has been a common practice in the econometric literature on currency substitution by assuming uncovered interest parity. However, this approximation is questionable since it is not clear how these uncovered rates capture the opportunity cost of holding money. This is especially true for countries with underdeveloped financial markets and where there are restrictions on capital mobility.

In this study, statistical analysis is extended to include foreign currency deposits held abroad as well as in domestic banks. The ratio (*F*) is defined as follows:

$$F = \frac{FCD + FCDA}{FCD + FCDA + DM2}$$

where:
FCD = total holdings of foreign currency denominated deposits held in local banks
FCDA = foreign currency denominated deposits held in banks abroad
DM2 = domestic *M2* (total liquidity includes: currency, checking, savings and time deposits)

Previous studies on Egypt employ the following specifications as proxies for the expected rate of depreciation (x^e).
LE = log of the Tertiary Exchange Rate (Elkhafif and Kubursi, 1991)
LESPT = log of the Tertiary Exchange Rate relative to official exchange rate (El-Erian, 1988).

Since the Tertiary Exchange Rate[4] was abolished in May 1991, the black market exchange rate is substituted for the tertiary exchange rate. However, in addition to these two measures, the percentage change in the black market exchange rate (*DEP*) is used as a proxy for expected depreciation, log (E_t/E_{t-1}), as suggested by Rojas-Suarez (1992).

El-Erian (1988) specifies the interest rate differential (*Z*) as the log of $(1+i^*)/(1+i)$, where i and i^* are interest rates on domestic and foreign currency denominated deposits, respectively. In addition to this measure, the following measure of interest rate differential $[\frac{1+i^*+x^e}{1+i} - 1]$ is employed. This specification differs from that employed by El-Erian (1988) in the sense that it expresses the rate of return on foreign money in terms of domestic currency (i^*+x^e). Therefore, (i^*+x^e) is the expected nominal rate of return on foreign currency deposits.

[4] The Tertiary Exchange Rate relates to transactions effected outside banks and can only be considered as indicative of the exchange rate at which transactions take place. It is published by the IMF as line (yg).

Econometric Issues

Firstly, stationarity of the all variables in Equation 1 is tested. Secondly, cointegration among the different variables in Equation 1 utilizing the Engle-Granger methodology is likewise tested. Finally, an error correction model for cointegrated variables is estimated.

Unit Root Tests

Utilizing the Augmented Dickey-Fuller tests raises a problem relating to the fact that it is not known whether the true data-generating process contains an intercept and/or time trend. To determine whether the data contain an intercept and/or a time trend, Dickey and Fuller F-statistics called ϕ_1, ϕ_2, and ϕ_3 (1981).

There are three different models that the data may generate: (a) a model with no constant and no trend; (b) a model with a constant and a trend; and (c) a model with only a constant. The unit roots results of the "true" models, in terms of the model out of the three different models are presented in Table 1. As shown in Table 1, nonstationarity of *F, LE, LDIF* and *LESPT* could not be rejected at the 5 percent significance level, indicating that these variables are *I(1)* processes. In addition, the rate of change of the exchange rate (*DEP*), and the interest rate differential, (*PBV=[((1+i*+DEP)/(1+1)) - 1]*), are found to be stationary processes, *I(0)*.

Plots of the series (not shown here for space considerations) indicate that the adoption of the economic reform and structural adjustment program in May 1991 **(????)** may have resulted in permanent shifts. To assess the robustness of these findings on the order of integration of the series previously discussed, this policy change is incorporated explicitly in the unit roots tests. Tests for known structural breaks have been proposed by Perron (1989).

Table 1. Dickey-Fuller ϕ_1, ϕ_2, and ϕ_3 Tests and Unit Root Tests

	ϕ_2	ϕ_3	ϕ_1	True Model	Stationary I(0)	I(1)
F	**0.91**	**0.80**	**0.59**	**no constant no trend**	**-0.56**	**-2.42****
LE	**3.06**	**-4.36**	**1.52**	**no constant no trend**	**-1.58**	**-4.96*****
DEP	**6.75****	**1.29**	**----**	**constant and trend**	**-4.24*****	**------**
LESPT	**0.98**	**1.21**	**2.46**	**constant and trend**	**-2.15**	**-5.45*****
PBV	**2.49**	**0.53**	**3.20**	**only constant**	**-5.50*****	**------**
LDIF	**0.61**	**54.21****	**22.40****	**only constant**	**-0.99**	**-4.49*****

F = dollarization ratio, defined as follows (*FCD+FCDA*)/(*FCD+FCDA+DM2*) where:
FCD = total holdings of real foreign currency denominated deposits (demand and savings deposits) held in Egyptian banks
FCDA = holdings of foreign currency denominated deposits held in banks abroad
LE = log of the black market exchange rate
DEP = expected depreciation of the black market exchange rate, $\log(E_t/E_{t-1})$,

LESPT = deviation of the black market exchange rate from the official, fixed, exchange rate, (i^*): interest rate on foreign currency denominated deposits proxied by the 3-month London Inter Bank Offer Rate (LIBOR)
LDIF = the log of the interest differential, as proposed by El-Erian (1988), defined as follows $(1+i^*)/(1+i)$
PBV = interest rate differential, [((1+i*+DEP)/(1+i)) - 1]

All variables in this study appear to have a change in the level that occurred after 1991:II as well as, a change in the slope of the trend function after this date. The following regression as suggested by Perron (1989), is used to find out whether structural changes has occurred due to the 1991 economic reform.

$$y_t = a_0 + \mu_1 D_P + \mu_2 D_L + \mu_3 D_T + a_2 t + \alpha y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \varepsilon_t \qquad \text{(Equation 2)}$$

where D_P represents a pulse dummy variable such that $D_P = 1$ at 1991:II and zero otherwise; D_L represents a level dummy variable such that $D_L = 1$ for all t > 1991:II and zero otherwise; D_T represents a slope dummy such that D_T = 1, 2,...,9 (since the number of post break observations is 9) for all t beginning 1991:II and zero otherwise; if there is an increase in the slope of the trend, or D_T would take a decreasing number beginning at the break, (D_T = 9, 8,...,1) if there is a decrease in the slope of the trend.

The regression equation is estimated for each time series included in Equation 1. Each regression is estimated first by using twelve lags. Results are reported in Table 2 which presents the estimated coefficients of the regressions of each series along with their t-statistics, and the number of the significant lags in column (P). The value of (P) chosen is determined by a test on the significance of the estimated coefficient β_i at 1% level.

Of the six series, the unit root hypothesis is rejected for *LESPT* and *LDIF*, implying that these series are stationary around a deterministic trend with a change in the slope after 1991:II. However, since the plots of these series suggest a change in level and in the slope of the trend, it is expected that both the intercept dummy D_L and the slope dummy D_T are significant. However, no evidence of any structural break is found, since none of the dummy variables is significant. Therefore, this hypothesis is rejected and these series are considered as nonstationary.

As for the dollarization ratio (*F*) and expected depreciation (*LE*), the null hypothesis of a unit root could not be rejected. The post-break slope dummy μ_3, and the intercept dummy μ_2 are significant, suggesting that these variables are nonstationary around a deterministic trend function with a change in the slope. For the variable *DEP,* there is no evidence of a structural break, since none of the dummy variables appears significant in their estimated equation. Therefore, the results of the Augmented Dickey-Fuller obtained for this variable is valid. The interest rate differential (*PBV*) is found to be nonstationary with a one-time jump in the intercept, where the break dummy μ_2 is only significant. This finding of the stationarity of the *PBV* is rejected based on the significance of the constant term, a_0, and the break dummy, μ_1, coefficients. As indicated by Perron (1989), acceptance of the null hypothesis of a unit root implies that $a_0 \neq 0$, and $\mu_1 \neq 0$.

Table 2. Perron's Tests for Unit Roots in the Presence of Structural Breaks

	a_0	μ_1	μ_2	μ_3	a_2	α	p
F	-0.77	-0.02	-0.34	0.03	0.04	0.41	7
	(-2.35)[b]	(-0.41)	(-2.91)[a]	(2.39)[b]	(2.39)[b]	(1.68)	
LE	-0.06	-0.04	-0.21	0.02	0.10	0.25	4
	(-1.35)	(-0.47)	(-2.99)[a]	(1.88)[c]	(3.32)[a]	(1.12)	
DEP	0.08	-0.02	-0.08	0.009	-0.002	-1.16	4
	(1.86)[c]	(-0.18)	(-1.23)	(0.80)	(-0.23)	(-2.03)	
LESPT	0.02	-0.06	-0.01	0.000	0.001	0.83	0
	(0.96)	(-0.61)	(-0.15)	(0.03)	(0.25)	(9.97)[a]	
PBV	0.01	0.009	-0.20	0.02	-0.007	-1.20	4
	(0.37)	(0.10)	(-2.15)[b]	(1.09)	(-1.19)	(-1.94)	
LDIF	-0.01	-0.02	-0.03	0.002	-0.002	0.63	1
	(-2.92)[a]	(-2.47)[b]	(-3.98)[a]	(1.93)[b]	(-2.28)[b]	(7.14)[a]	

Numbers in parentheses denote t-statistics
Superscripts a, b, and c denote statistical significance at the 1%, 5% and 10% level respectively.

Cointegration

To test for the existence of a long-run equilibrium relationship, cointegration, between the economic variables as suggested by Equation 1, the two-stage estimation procedure proposed by Engle and Granger (1987) is employed. While the first stage tests for cointegration among variables, the second stage estimates an error correction model for those equations for which cointegration is found.

Ten versions of Equation 1 of the dollarization ratio are estimated.

1. $F = LE + LDIF$
2. $F = DEP + LDIF$
3. $F = LE\ SPT + LDIF$
4. $F = DEP + PBV$
5. $F = LESPT + PBV$
6. $F = LE$
7. $F = DEP$
8. $F = LESPT$
9. $F = PBV$
10. $F = LDIF$

The main purpose of this study is not to choose an opportunity cost variable. Rather, it is to test whether currency substitution exists in Egypt irrespective of the choice of the opportunity cost variable, as well as, the specification of the equation. Five equations are tested by including both the different proxies of expected depreciation (*LE, DEP* and *LESPT*) and the different proxies of interest rate differential (*PBV* and *LIDIF*) in the same equation (Equations 1-5). Another five equations are tested by including only one opportunity cost variable at a time (Equations 6-10). The Augmented Dickey-Fuller unit root test is then applied to the residuals from the cointegrating regressions.

The system-based tests developed by Johansen (1988) and extended by Johansen and Juselius (1990) is first used to check the number of cointegrating vectors. Results (not shown here) show that the null hypthesis of no cointegrating vectors can be rejected in favor of the alternative that r=1 for eight out of the ten estimated vectors. The exceptions are Equations 6 and 8.

As suggested by preliminary investigation of the data, all equations include a shift dummy that captures the 1991 financial liberalization. When the presence of a unit root in the data is tested against the hypothesis of stationary fluctuation in the presence of structural change, findings indicate that the intercept dummy, D_L with the value of 0 prior to 1991:II and 1 afterwards, enters significantly in all of the series.

Table 3 presents estimates of these equations, results of the Augmented Dickey-Fuller unit roots tests on their residuals, and whether these equations yield satisfactory error correction models as it appears in the row labeled (*ECM*). The model is considered to be satisfactory if the error correction term (the saved residuals when testing for integration) is negative and significant.

The null hypothesis of no cointegration is rejected in all ten cases. The presence ofcointegration implies that there is a long-run equilibrium relationship governing the demand for foreign currency denominated deposits, measured by the ratio of foreign to domestic money (*F*) and the opportunity cost of holding money balances. The significance of the time trend (*T*) in nine out of the ten estimated cointegrating equations (except Equation 1 in Table 5) suggests that it might be capturing the effects of other determinants of the demand for foreign currency denominated deposits that are missing in such specifications.

After May 1991, financial liberalization and deregulation have increased the return on assets included in *M2* raising their share in the portfolio allocation of wealth, and decreasing the share of foreign currency denominated deposits. This is reflected on the significant negative sign of the dummy variable (D_L) in Table 3 which shows that only six out of the ten models estimated, yielded satisfactory error correction models (models 4, 6, 7, 8, 9 and 10).

In general, these results indicate that the demand for foreign currency denominated deposits are more closely related to differential return than to either the level of exchange rate (*LE*), or to the deviation of the black market exchange rate from the official exchange rate (*LESPT*). The results of cointegration tests suggest that cointegration requires including the interest rate differential. The variable thought to affect the demand for foreign currency deposits in Egypt, expected depreciation (proxied by *LESPT* or *LE*), is not necessary for cointegration. This implies that Egyptians shift between foreign and domestic currency in response to interest rate differentials, rather than to variations in exchange rate (*LE* or *LESPT*) as suggested by previous empirical studies on currency substitution in Egypt.

Error Correction Model

The dynamic error correction equations for the dollarization ratio (*F*) is then estimated, which is the second stage of the Engle-Granger methodology. The dynamic specification simply includes the first differences of all the variables found to be integrated of order one (nonstationary), and the levels of the variables found to be integrated of order zero

Table 3
Estimated Cointegrated Vectors and Unit Root Tests Results

	(1)	(2)	(3)	(4)	(5)
C	-1.21	-1.24	-1.24	-1.16	-1.10
	(-33.35)[a]	(-26.23)[a]	(-26.01)[a]	(-33.51)[a]	(-27.13)[a]
T	-0.03	0.07	0.07	- 0.06	0.07
	(-1.25)	(7.93)[a]	(8.04)[a]	(-2.41)[b]	(8.04)[a]
D_L	0.02	-0.02	-0.009	-0.15	-0.18
	(0.26)	(-0.14)	(-0.08)	(-2.91)[a]	(-2.59)[b]
LE	0.78			0.96	
	(4.93)[a]			(5.31)[a]	
DEP		-0.08			
		(-0.33)			
LESPT			-0.05		-0.04
			(-0.40)		(-0.29)
PBV				0.43	-0.15
				(-1.91)[c]	(0.56)
LDIF	1.77	2.07	2.32		
	(1.96)[b]	(1.64)[c]	(1.90)		
Unit Root Test on Residuals					
	2.56[b]	3.51[b]	3.09[b]	2.18[b]	2.31[b]
ECM	no	no	no	yes	no

Table 3-cont.

	(6)	(7)	(8)	(9)	(10)
C	-1.16	-1.18	-1.17	-1.21	-1.23
	(-34.13)[a]	(-23.49)[a]	(-24.94)[a]	(-27.55)[a]	(-27.21)[a]
T	-0.07	-0.06	0.06	0.07	0.07
	(-3.06)[b]	(-6.54)[a]	(6.57)[a]	(8.22)[a]	(8.11)[a]
D_L	-0.12	-0.22	-0.22	-0.17	-0.01
	(-2.22)[b]	(-3.12)[a]	(-3.02)[a]	(-2.61)[b]	(-0.11)
LE	0.99				
	(6.14)[a]				
DEP		-0.07			
		(-0.25)			
LESPT			-0.01		
			(-0.10)		
PBV				0.13	
				(0.51)	
LDIF					2.14
					(1.90)[c]
Unit Root Test on Residuals					
	2.29[b]	2.32[b]	2.39[b]	2.29[b]	2.56[b]
ECM	yes	yes	yes	yes	yes

NOTES: Numbers in parentheses denote t-statistics; a, b, and c denote significance at the 99, 95, and 90 percent confidante level. ECM indicates if the equation yields a satisfactory Error Correction Model.

(stationary). In addition, error correction terms derived from estimates of the cointegrating equations (residuals) are also included. The stationary residuals from estimated cointegrating regressions shown in Table 3, are used to estimate the error correction models.

Table 4 presents various estimates for the error correction model for equations for which cointegration is established. The six stationary residuals from the ten estimated cointegrating regressions are used to estimate six different error correction models for the ratio of foreign currency denominated deposits to total liquidity including deposits in Egypt (*F*). Each model with up to eight lags of each of the explanatory variables is estimated. [5]

Since the error term ε_{t-1}, the saved residuals obtained from estimating the cointegrating regression, reflects the disequilibrium response, the coefficient estimate on the error term is expected to be negative. The estimated coefficients on the error term in these six models have the expected sign and are therefore statistically significant. This implies that deviations from the long-run equilibrium relationship between the ratio of foreign to domestic money and the explanatory variables, rate of change in the exchange rate and interest rate differential, significantly affect the short-run composition of foreign and domestic money. This means that if in error, the ratio of foreign to domestic money grows too quickly and is above its long-run equilibrium level, the error term becomes bigger, and since its coefficient is negative, the ratio of foreign to domestic money is reduced next period. As shown in Table 4, in cases of departure from equilibrium, approximately 9 to 13% of the shock is corrected within one quarter.

Table 4. Error Correction Equations: Dollarization Ratio ΔF.

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
C	0.004	0.003	0.001	0.003	0.007	0.01
	(0.66)	(0.53)	(0.23)	(0.005)	(0.96)	(1.93)[c]
ΔLE_{t-1}	-0.13					0.44
	(1.46)					(3.18)[a]
DEP_{t-1}		-0.08				
		(-0.99)				
$\Delta LESPT_{t-1}$			-0.11			
			(-1.54)			
PBV_{t-1}				0.15		0.43
				(2.20)[b]		(3.12)[a]
$\Delta LDIF_{t-1}$					1.20	
					(1.98)[c]	
ΔLF_{t-1}	0.56	0.59	0.58	0.44	0.48	0.32
	(3.91)[a]	(4.13)[a]	(4.37)[a]	(3.09)[a]	(3.26)[a]	(2.05)[b]
ε_{t-1}	-0.13	-0.10	-0.11	-0.09	-0.10	0.12
	(-1.99)[b]	(-2.24)[b]	(-2.44)[b]	(-1.74)[c]	(1.82)[c]	(1.86)
R-sq.	0.25	0.27	0.29	0.30	0.28	0.37
D-W	2.29	2.38	2.32	2.42	2.21	2.09
SER	0.04	0.04	0.04	0.04	0.04	0.03

Numbers in parentheses denote t-statistics
Superscripts a, b, and c denote significance at the 99, 95, and 90 percent confidence level.
D-W is the Durbin Watson test for aucorrelation.
SER is Standard Error of Regression.

[5] According to Thomas (1997, p.432), the precise lags on the differenced terms are not specified by the theorem. Therefore, the appropriate lag is determined by experimentation starting from eight lags (two years).

As discussed earlier, the currency substitution hypothesis predicts a positive/negative short run effect on the ratio of foreign to domestic money due to increases/decreases in the currency substitution variable, expected depreciation. Contradicting the intuitive predictions of the pure theory of currency substitution, the results show no relationship between the ratio of foreign to domestic money and the rate of change in exchange rate, regardless of the way it is specified (columns 1-3 in Table 4). Results show no dynamic short-run currency substitution behavior, as explained by the lagged first differences of *LESPT*, and *LE*, or changes in *DEP*.[(6)]

In the context of this model, currency substitution appears to be absent in the short term. The results also indicate that changes in the relative yield of dollar and Egyptian pound deposits *PBV* (columns 4 and 6 in Table 4) reflecting portfolio shifts, have a significant impact on dollarization. This result implies that Egyptians respond to changes in the interest rate differential, by shifting out of domestic currency denominated deposits into foreign deposits when interest rate differential favors foreign currency denominated deposits. The other specification of the interest rate differential (*LDIF*) as proposed by El-Erian (1988), is also found to be significant and has the positive sign (column 5).

Conclusion

In previous empirical studies on currency substitution in Egypt, authors have claimed to find evidence on the existence of currency substitution-foreign/domestic money responds positively/negatively to expected depreciation. However, in the light of severely limited capital markets and exchange controls in Egypt, the large increases in holdings of foreign currency denominated deposits may not constitute currency substitution. Rather, it is a systematic tendency of money holders to substitute different monies in their portfolios in response to respective opportunity costs, to protect the value of their wealth. This portfolio shift takes place, especially in an inflationary environment that is coupled with interest rate regulations. As a result, the value of available interest-bearing, as well as, non-interest-bearing domestic assets, is diminished. Consequently, this encourages domestic residents to shift out of domestic money into foreign money. Therefore, the furnished evidence is actually evidence of portfolio shifts, rather than currency substitution, holding foreign money as a medium of exchange.

In this study, quarterly data for Egypt covering the period 1981:IV to 1994:IV used to analyze the current episode of dollarization. As expected, given that foreign currency deposits in Egypt earn a competitive rate of return, using the coefficient of the expected rate of depreciation (*LE, DEP* or *LESPT*) as a measure of currency substitution, the results of error correction models suggest that currency substitution is essentially absent in the short-run in estimates of Egyptian foreign currency denominated deposits held in Egyptian banks. The results show no relationship between dollarization and expected depreciation.

[(6)] Specifying expected depreciation *DEP* as $\log(E_{t+1}/E_t)$, instead of $\log(E_t/E_{t-1})$ did not change findings of no evidence of short-run currency substitution behavior.

The results indicate that there is a positive relationship between dollarization ratio (*F*) and interest rate differential (*PBV* and *LDIF*). These results imply that residents respond to changes in interest rate differential rather than to expected depreciation when deciding the proportions of different monies comprising their portfolios. Therefore, it may be concluded that there is no evidence of dynamic short-run currency substitution in Egypt. Only the rate of return on interest-bearing foreign currency denominated deposits, reflecting portfolio shifts, appears to matter.

The fact that Egyptian residents use the expected rate of return on foreign currency denominated deposits when assessing the opportunity cost of money rather than expected depreciation, suggests that portfolio considerations, rather than transaction considerations, is the dominant factor behind holding foreign money. Therefore, it may be concluded that foreign money is held primarily as a store of value (dollarization) rather than as a medium of exchange (currency substitution). In addition, results suggest a long-run equilibrium relationship among the variables as specified in the estimated equations, and deviations from this relationship significantly affect the short-run domestic demand for foreign currency denominated deposits. Hence, the short-run impact of the demand for foreign currency denominated deposits on monetary policy is likely to be of little importance, which is plausible, given the institutional setting in Egypt. This implies that foreign money is held primarily as a store of wealth rather than for transaction purposes.

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