International Journal of Economics and Finance; Vol. 14, No. 2; 2022
ISSN 1916-971X E-ISSN 1916-9728
Published by Canadian Center of Science and Education

Does External Debt Service Devalue Local Currency in the Long Run? Empirical Evidence from Egypt

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Received: November 30, 2021 Accepted: January 6, 2022 Online Published: January 7, 2022

doi:10.5539/ijef.v14n2p51 URL: https://doi.org/10.5539/ijef.v14n2p51

Abstract

The aim of this study is to identify the extent to which there is an effect of external debt service on the exchange rate in Egypt in the long run, where the change in the exchange rate has great importance in changing currency value and thus affecting its function as a store of value and a standard for forward payments and then in the redistribution of income and wealth, It also has an effect on some macroeconomic variables, such as inflation, exports, imports, and thus the current account. The study examines the estimation of the long-run relationship between the external debt service and the exchange rate in Egypt in the period 1980-2019 and relies on the exchange rate of the dollar against the Egyptian pound as a dependent variable, while the explanatory variables were the external debt service, gross capital formation, broad money growth, deposit interest rate, household final consumption expenditure, gross savings, and terms of trade adjustment. The methodology is based on Vector Error Correction (VEC) and the study concluded that there is a significant long-term relationship between the value of the Egyptian pound and all the variables explained in the study, as the error correction coefficient is negative and significant. Also, there is an inverse statistically significant relationship between the value of the Egyptian pound and each of the external debt service, the deposit interest rate, and gross savings; any change of 1% in the external debt service, the deposit interest rate, and gross savings leads to a devaluation of the Egyptian pound against the dollar by 4.8%, 0.04%, and 0.05%, respectively. The study also concluded that there is a positive, statistically significant relationship in the long term between the value of the Egyptian pound and each of gross capital formation, broad money growth, households' and NPISHs' final consumption expenditure, and terms of trade adjustment, as any change of 1% in these variables leads to an increase in the value of the Egyptian pound by 0.16%, 0.05%, 0.27%, and 6%, respectively. This study recommends that decision makers consider all the reasons that would reduce the external debt service in order to preserve the value of the Egyptian currency in the long run.

Keywords: Egypt, External Debt Service, exchange rate, devaluation, Vector Error Correction

1. Introduction

There is extensive literature on the benefits of public debt in foreign currencies. The most important potential benefits of foreign currency debt include access to a larger investor base, reduced crowding out of private sector lending in domestic markets or repeat inflationary financing (Bua, Juan, & Andrea, 2014), lower returns on foreign currency issuance, access to longer maturities, ability to build official foreign currency reserves and improved short-term stability term longevity in difficult times. Also, in developing countries, the state resorts to external borrowing to provide the private sector's needs of foreign exchange, whether by lending where companies cannot access foreign money markets or by guaranteeing loans. Moreover, external borrowing in foreign currencies may lead to more discipline fiscal and monetary, whereby the government's incentive to create inflation decreases to reduce the value of the local currency. But foreign currency financing is risky and tends to be volatile, cyclical and subject to sudden stops (Cavallo & Tavella, 2013).The issuance of foreign currency on a large scale can increase the external vulnerability of a country as seen by investors and credit rating agencies. The presence of foreign currency debt, along with real exchange rate volatility increases the volatility of GDP growth and capital inflows (Eichengreen, Hausmann, & Panizza, 2005a).

Also, a significant depreciation of the local currency may significantly increase the interest burden as calculated in that currency. In addition, external debt may cause problems in the economy; it increases the country's

exposure to external conditions, especially when debt is contracted at a variable rate and with rising global interest rates, which leads to an increase in debt service costs. A depreciation also leads to increased debt service (in terms of the domestic currency), and when the country borrows to cover the growing deficit, external borrowing leads to an unsustainable level of debt, an excessive share of debt service in total government spending, and a significant use of foreign currency to service debt which may lead to a debt crisis in the long term (Beaugrand, Loko, & Mlachila, 2002). As for external borrowing for the purpose of formation of foreign exchange reserves. If foreign money is sterilized, it leads to the same effects of domestic loans as increasing interest rates and excluding private investment. If money is not sterilized, external financing is accompanied by increased domestic demand and thus results in pressure on inflation or the balance of payments (Beaugrand, Loko, & Mlachila, 2002). The rest of this study is organized as follows: Section 2 gives the Empirical Review. Section 3 presents the methodology and model estimation. Finally section 4 gives the results and conclusion.

2. Empirical Review

Most of the empirical studies agreed on the existence of an inverse significant relationship between the value of the currency and the service of the external public debt, despite covering different periods of time and different explanatory variables and their application to different countries. The following table 1 shows a summary of the results of some of these studies.

Table 1. Summary of some empirical studies

Study	Methodology	Results
Ajayi, R. A.,& Jongmoo, J.C. (1993).	This paper proposes a structural model that is an aggregation of an asset and a monetary model of exchange rates along the Frankel Line (1983), modified to include external debt. Estimate this model for a sample of 18 LDCs.	The results of this study showed that debt, in addition to the usual variables such as money supply and interest rates, has a largely significant and negative impact on the external values of most of the countries' currencies.
Aderemi, Timothy Ayomiunde et al. (2020). study checked The relationship between external debt and exchange rate fluctuations in Nigeria during the period from 1981 to 2018.	This study used an Autoregressive Distribution Lag model (ARDL), and the variables used exchange rate fluctuations as dependent variables, and external debt, debt service payment, and foreign reserves as independent variables.	External debt as a means of financing the budget deficit which has been discouraged in Nigeria in the short term because its servicing and repayment especially puts pressure on the foreign exchange market in the short term and thus leads to exchange rate fluctuations in terms of depreciation of nairan in Nigeria.
Alam, Noor and Fauziah Md. Taib (2013). this study designs a model wherein the relationship of external public debt with budget deficit, current account deficit, and exchange rate depreciation are empirically tested. The study is dichotomy that covers empirical analysis of panels of a group of six “Debt Trap Countries (DTC)” namely as, India, Indonesia, Nepal, Pakistan, Sri Lanka, and Thailand and eight “Non Debt Trap Countries (NDTC)” as Bangladesh, Fiji, Korea, Malaysia, Myanmar, Papua New Guinea, Philippines, and Singapore, of Asian Pacific Developing Countries (APDC).The study period of thirty years (1971 to 2000).	In model, the benefit of autoregressive (dynamic) modeling has been taken as granted for using the option of lagged value(s) of the regress and as explanatory variable.	The results showed a positive relationship between the external public debt, the budget deficit, the current account deficit, and the exchange rate depreciation.
Mutua et al. (2020). The research examined the impact of external debt service on the exchange rate in Kenya. Times series data was used for the period 1982 to 2016.	The Vector Autoregression model was estimated using first difference of the variables. The Impulse Response Functions and variance decomposition were estimated.	The external debt service had a negative impact on the exchange rate in the short-run in Kenya.

Titus Freeman Ifeanyi, Nwanne & Richard, Eze. (2015). The aim of this study is to investigate the relationship between external public debt servicing and receipt and exchange rate fluctuations in Nigeria from 1981 to 2013.	The variables were used in this study included external public debt receipts, external public debt servicing, and exchange rate Fluctuations. This study used multiple regressions (Ordinary Least Square) and Co-integration to establish the short-run and long-run relationship.	The results of the study showed that foreign debt receipts and foreign debt service have short and long-term positive relationships with exchange rate fluctuations in Niran. The study concluded that while the receipts of the external public debt positively affect the exchange rate, the service of the external public debt negatively affects the exchange rate.
Kouladoum Jean-Claude ; Dombou T. Dany R. (2019). The objective of this work is to analyze the effect of external debt on the real exchange rate in Chad from 1975 to 2014.	The generalized method of moment is used in this study	The results showed that debt service affects negatively and significantly real exchange rate in Chad.
Odera, Q. A. (2015). This study empirically investigated the effects of external public debt on real effective exchange rate (REER) volatility in Kenya under the complete float regime for period 1993 to 2013.	A linear model was used and exchange rate volatility was regressed against inflation, interest rates, and GDP growth rate, money supply to GDP ratio and external debt to GDP ratio using the Ordinary Least Square technique.	The results showed that external debt to GDP ratio had negative and significant effect on REER volatility in Kenya.

3. Methodology and Model Estimation

This study examines the estimation of the relationship between Exchange rate and Debt service on external debt in Egypt in the period 1980-2019 in long run. The study relied as a dependent variable on the Exchange rate of the dollar against the Egyptian pound (the number of dollar units of the pound), while the explanatory variables were the Debt service on external debt, Gross capital formation, Broad money growth, Deposits interest rate, Household final consumption expenditure, Gross Savings and Terms of trade adjustment. The methodology is based on both the Vector Error Correction (VEC) through Eviews 12.

$$EXCHANGE = \alpha + \beta 1\ DEBTSERVICE + \beta 2\ CAPITAL + \beta 3\ M2GROWTH + \beta 4\ INTEREST + \beta 5\ HOUSEHOLD + \beta 6\ GSAVINGS + \beta 7\ TOT + \varepsilon \quad (1)$$

Where:

EXCHANGE: Exchange Rates, US dollar per domestic currency.

M2: Broad money growth (annual %).

DEBTSERVICE: Debt service on external debt, public and publicly guaranteed (PPG) (TDS, current US$)

CAPITAL: Gross capital formation (% of GDP).

M2GROWTH: Broad money growth (annual %).

INTEREST: Deposit interest rate (%).

HOUSEHOLD: Households and NPISHs final consumption expenditure (% of GDP).

GSAVINGS: Gross savings (% of GDP).

TOT: Terms of trade adjustment (constant LCU).

ε: White-noise error term.

The data obtained from the World Bank website (https://data.worldbank.org/indicator/DT.TDS.DPPG.CD) and IMF (International Financial Statistics).

Table 2 shows the descriptive statistics for the study variables. It is clear that the data for all variables follow a normal distribution by the Jarque-Bera test where the null hypothesis was accepted except for the exchange rate and debt service variables. The data are distributed as a normal distribution where there is a probability > 0.05 for all study variables except for the exchange rate and debt service variables where the probability is < 0.05.

Table 2. Descriptive statistics for the variables of the study

	EXCHANGE	DEBTSERVICE	CAPITAL	M2GROWTH	INTEREST	HOUSEHOLD	GSAVINGS	TOT
Mean	0.500	2.66E+0	21.48	83.4867	9.46651	74.0503	20.82133	5.45E+10
Median	0.280	2.08E+0	19.52	82.5967	9.64687	73.9320	20.68581	5.12E+10
Maximum	1.430	7.85E+0	33.11	98.1361	12.3166	88.1239	35.47563	1.46E+11
Minimum	0.060	6.23E+0	13.64	66.4234	6.01666	63.0986	9.593465	-1.07E+10
Std. Dev.	0.526	1.68E+0	5.753	7.73518	2.05608	6.05974	6.433382	3.53E+10
Skewness	1.128	1.73614	0.671	0.26238	-0.26739	0.21691	0.343591	0.679766
Kurtosis	2.440	5.26205	2.125	2.66614	1.64205	2.71667	2.804237	3.385836
Jarque-Bera	9.003	28.6227	4.281	0.64474	3.55001	0.44748	0.850905	3.328663
Probability	0.011	0.00000	0.117	0.72442	0.16948	0.79952	0.653474	0.189317
Sum	20.020	1.07E+1	859.5	3339.46	378.660	2962.01	832.8533	2.18E+12
Sum Sq. Dev.	10.788	1.10E+2	1291.01	2333.48	164.871	1432.10	1614.148	4.85E+22
Observations	40	40	40	40	40	40	40	40

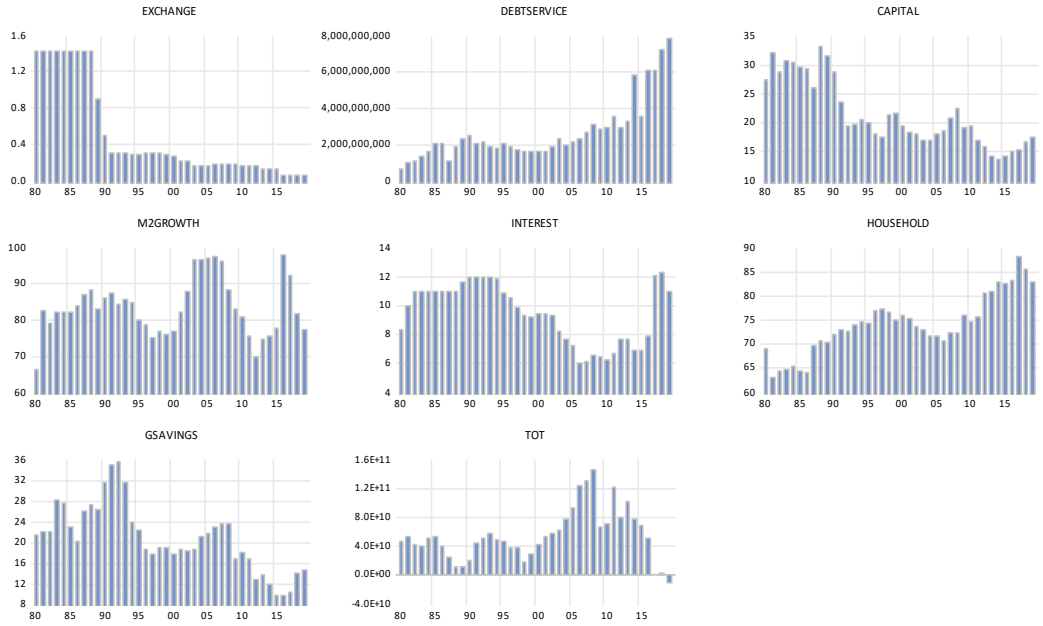

Figure 1. The graph of the study variables

3.1 Unit Root Test

The following Table 3 shows the results of the time series stability test will use the breakpoint unit root test will beuse. It is clear that all the variables are stable in the first difference with a constant enabling us to carry out Co-integration of study variables.

Table 3. Summary of results of the Unit root test

	Test Augmented Dickey Fuller (ADF)				
variables	Level		First Difference		
	Constant	Trend	Constant	Trend	Summery
EXCHANGE	-2.35**	-1.91	-2.23**	-2.56	I(1)
DEBTSERVICE	3.35	3.26	-0.565	-10.37*	I(1)
CAPITAL	-1.50	-2.23	-6.57*	-6.66*	I(1)
M2GROWTH	0.04	-2.57	-6.14*	-6.03*	I(1)
INTEREST	0.16	-1.93	-4.99*	-4.89*	I(1)
HOUSEHOLD	0.96	-0.77	-7.07*	-7.48*	I(1)
GSAVINGS	-0.71	-1.25	-4.95*	-4.90*	I(1)
TOT	-1.18	-1.61	-6.77*	-6.71*	I(1)

Note. 1) For ADF and PP tests, ***, ** and * denote rejection of a unit root hypothesis based on Mackinnon (1991) critical values at 10%, 5% and1percentage respectively.

3.2 Co-Integration Test

From Table 4 which shows the results of Co- integration test, it is clear that there is three models for the Co-integration of study variables that enables us to use the Vector error correction model to estimate the long-term relationship between Exchange rate, Debt service on external debt, Gross capital formation, Broad money growth, Deposits interest rate, Household final consumption expenditure, Gross Savings and Terms of trade adjustment.

Table 4. The result of Cointegration test

HypothesizedNo. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.88	261.04	159.53	0.00
At most 1 *	0.83	180.04	125.62	0.00
At most 2 *	0.71	113.06	95.75	0.00
At most 3	0.52	66.01	69.82	0.10
At most 4	0.45	38.50	47.86	0.28
At most 5	0.16	16.02	29.80	0.71
At most 6	0.13	9.48	15.49	0.32
At most 7 *	0.11	4.37	3.84	0.04

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values.

HypothesizedNo. of CE(s)	Eigenvalue	Max-EigenStatistic	0.05 Critical Value	Prob.**
None *	0.88	81.00	52.36	0.00
At most 1 *	0.83	66.99	46.23	0.00
At most 2 *	0.71	47.04	40.08	0.01
At most 3	0.52	27.51	33.88	0.24
At most 4	0.45	22.47	27.58	0.20
At most 5	0.16	6.54	21.13	0.97
At most 6	0.13	5.11	14.26	0.73
At most 7 *	0.11	4.37	3.84	0.04

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values.

3.3 Vector Error Correction (VEC)

The results of the long-term relationship between Exchange rate, Debt service on external debt, Gross capital formation, Broad money growth, Deposits interest rate, Household final consumption expenditure, Gross Savings and Terms of trade adjustment were estimated in the equation (2) and in Table 5.

$$EXCHANGE = -26.37 - 4.80DEBTSERVICE + 0.16CAPITAL + 0.06M2GROWTH - 0.04INTEREST + 0.271HOUSEHOLD - 0.054GSAVINGS + 6.07TOT \quad (2)$$

From the equation 2 and Table 5 bellow, it is clear to us through the estimated relationship in the model that: First: There is a significant long-term relationship between the value of the Egyptian pound against the dollar and all the variables explained in the study, as the error correction coefficient is negative and significant. Second: There is an inverse statistically significant relationship between the value of the Egyptian pound and each of the debt service on external debt, the deposit interest rate and Gross savings, as any change of 1% in the debt service on external debt, the deposit interest rate and Gross savings leads to a devalue of the Egyptian pound against the dollar by 4.8 %, 0.04%and 0.05% respectively. Third: There is a positive statistically significant relationship in the long term between the value of the Egyptian pound against the dollar and each of Gross capital formation, Broad money growth, Households and NPISHs final consumption expenditure and Terms of trade adjustment, as any change of 1% in these variables leads to an increase in The value of the Egyptian pound against the dollar by 0.16%, 0.05%, 0.27% and 6%, respectively.

The value of coefficient R^2 reached 87.5%, meaning that the independent variables in the model explain an amount of 87.5% of the change in the value of the Egyptian pound against the dollar.

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Table 5. VEC estimates

Cointegrating Eq:	CointEq1
EXCHANGE(-1)	1.000000
DEBTSERVICE(-1)	-4.80E-10
	(1.8E-11)
	[-27.1889]
CAPITAL(-1)	0.160618
	(0.01029)
	[15.6156]
M2GROWTH(-1)	0.057483
	(0.00225)
	[25.5339]
INTEREST(-1)	-0.044933
	(0.01898)
	[-2.36679]
HOUSEHOLD(-1)	0.271421
	(0.01068)
	[25.4073]
GSAVINGS(-1)	-0.054814
	(0.00522)
	[-10.5007]
TOT(-1)	6.07E-12
	(1.3E-12)
	[4.78192]
C	-26.35668

Error Correction:	D(EXCHANGE)	D(DEBTSE...)	D(CAPITAL)	D(M2GROW...)	D(INTEREST)	D(HOUSEH...)	D(GSAVINGS)	D(TOT)
CointEq1	-0.194925	-2.17E+08	-0.546743	7.404341	-0.001972	-1.603608	4.667484	-2.02E+09
	(0.04852)	(4.4E+08)	(1.75530)	(3.56521)	(0.72426)	(1.76483)	(2.10540)	(2.2E+10)
	[-4.01743]	[-0.49004]	[-0.31148]	[2.07683]	[-0.00272]	[-0.90864]	[2.21691]	[-0.09203]
D(EXCHANGE(-1))	0.852944	1.34E+09	2.406341	-8.034553	0.028012	-0.020262	-10.14400	-1.05E+11
	(0.14074)	(1.3E+09)	(5.09142)	(10.3413)	(2.10078)	(5.11908)	(6.10692)	(6.4E+10)
	[6.06057]	[1.04423]	[0.47263]	[-0.77694]	[0.01333]	[-0.00396]	[-1.66107]	[-1.65607]
D(EXCHANGE(-2))	-0.173569	8.06E+08	12.96385	17.68694	0.127030	-0.183225	2.963982	2.46E+10
	(0.14915)	(1.4E+09)	(5.39569)	(10.9593)	(2.22632)	(5.42500)	(6.47187)	(6.7E+10)
	[-1.16374]	[0.59165]	[2.40263]	[1.61388]	[0.05706]	[-0.03377]	[0.45798]	[0.36468]
D(DEBTSERVICE (-1))	-2.15E-11	-0.818529	-5.98E-10	-8.01E-10	2.63E-10	7.77E-11	1.23E-10	-7.509688
	(2.0E-11)	(0.18442)	(7.3E-10)	(1.5E-09)	(3.0E-10)	(7.3E-10)	(8.8E-10)	(9.12878)
	[-1.06618]	[-4.43836]	[-0.81917]	[-0.53997]	[0.87250]	[0.10581]	[0.14050]	[-0.82264]
D(DEBTSERVICE (-2))	2.66E-11	-0.057777	-2.42E-10	3.69E-09	-1.45E-10	-4.54E-10	9.90E-11	-3.591259
	(1.9E-11)	(0.17322)	(6.9E-10)	(1.4E-09)	(2.8E-10)	(6.9E-10)	(8.2E-10)	(8.57450)
	[1.40229]	[-0.33354]	[-0.35281]	[2.65084]	[-0.51364]	[-0.65778]	[0.12031]	[-0.41883]
D(CAPITAL(-1))	0.002875	25105362	-0.136364	-1.645009	-0.013471	0.134431	-0.642058	1.05E+09
	(0.00892)	(8.2E+07)	(0.32283)	(0.65570)	(0.13320)	(0.32458)	(0.38722)	(4.0E+09)
	[0.32221]	[0.30789]	[-0.42240]	[-2.50878]	[-0.10113]	[0.41417]	[-1.65814]	[0.26072]
D(CAPITAL(-2))	0.032337	1.58E+08	0.001305	-1.173394	0.038893	0.348479	-0.410893	-5.38E+09
	(0.00851)	(7.8E+07)	(0.30796)	(0.62550)	(0.12707)	(0.30963)	(0.36938)	(3.9E+09)
	[3.79873]	[2.03355]	[0.00424]	[-1.87593]	[0.30608]	[1.12546]	[-1.11238]	[-1.39801]
D(M2GROWTH(-1))	0.012823	85830775	0.047778	0.120499	0.070007	0.105999	-0.173528	-1.44E+09
	(0.00335)	(3.1E+07)	(0.12115)	(0.24606)	(0.04999)	(0.12180)	(0.14531)	(1.5E+09)
	[3.82909]	[2.80497]	[0.39438]	[0.48971]	[1.40051]	[0.87024]	[-1.19420]	[-0.95142]
D(M2GROWTH(-2))	-0.002644	5896693.	0.158567	-0.129844	-0.039765	-0.075782	0.086906	4.35E+08
	(0.00259)	(2.4E+07)	(0.09366)	(0.19024)	(0.03865)	(0.09417)	(0.11235)	(1.2E+09)
	[-1.02131]	[0.24925]	[1.69294]	[-0.68252]	[-1.02894]	[-0.80471]	[0.77356]	[0.37159]
D(INTEREST(-1))	0.036182	2.85E+08	-0.827983	-2.052522	0.608567	0.993765	-0.540004	-6.04E+09
	(0.01723)	(1.6E+08)	(0.62349)	(1.26637)	(0.25726)	(0.62687)	(0.74784)	(7.8E+09)
	[2.09940]	[1.80947]	[-1.32799]	[-1.62079]	[2.36559]	[1.58527]	[-0.72208]	[-0.77502]
D(INTEREST(-2))	-0.005051	1.77E+08	0.285577	1.453278	-0.408548	-0.631532	0.877648	-3.81E+09
	(0.01473)	(1.3E+08)	(0.53300)	(1.08257)	(0.21992)	(0.53589)	(0.63930)	(6.7E+09)
	[-0.34285]	[1.31470]	[0.53580]	[1.34243]	[-1.85771]	[-1.17847]	[1.37282]	[-0.57236]
D(HOUSEHOLD(-1))	0.019758	71068385	0.557260	-2.386504	-0.021339	0.290612	-1.111277	-2.21E+09
	(0.01193)	(1.1E+08)	(0.43175)	(0.87693)	(0.17814)	(0.43409)	(0.51786)	(5.4E+09)
	[1.65555]	[0.65169]	[1.29071]	[-2.72143]	[-0.11978]	[0.66947]	[-2.14590]	[-0.41007]

D(HOUSEHOLD(-2))	0.017988	2.44E+08	0.140056	-0.719733	-0.022429	0.174155	-0.804611	-5.72E+09
	(0.00934)	(8.5E+07)	(0.33797)	(0.68645)	(0.13945)	(0.33980)	(0.40538)	(4.2E+09)
	[1.92546]	[2.85493]	[0.41441]	[-1.04848]	[-0.16084]	[0.51252]	[-1.98485]	[-1.35417]
D(GSAVINGS(-1))	0.009650	10402508	0.270555	-0.036814	0.013467	0.031884	0.263426	1.18E+09
	(0.00450)	(4.1E+07)	(0.16269)	(0.33045)	(0.06713)	(0.16358)	(0.19514)	(2.0E+09)
	[2.14583]	[0.25314]	[1.66296]	[-0.11141]	[0.20062]	[0.19491]	[1.34990]	[0.57850]
D(GSAVINGS(-2))	-0.010606	9876284.	0.003379	-0.024277	0.023349	-0.241107	-0.271530	1.51E+09
	(0.00397)	(3.6E+07)	(0.14365)	(0.29176)	(0.05927)	(0.14443)	(0.17230)	(1.8E+09)
	[-2.67105]	[0.27221]	[0.02352]	[-0.08321]	[0.39395]	[-1.66942]	[-1.57595]	[0.83811]
D(TOT(-1))	-4.84E-13	0.006586	-5.39E-12	-4.85E-12	-4.76E-12	2.90E-11	-4.36E-11	-0.493005
	(6.3E-13)	(0.00580)	(2.3E-11)	(4.7E-11)	(9.5E-12)	(2.3E-11)	(2.8E-11)	(0.28716)
	[-0.76267]	[1.13530]	[-0.23480]	[-0.10406]	[-0.50272]	[1.25510]	[-1.58289]	[-1.71680]
D(TOT(-2))	6.64E-13	-0.001961	9.78E-13	8.12E-11	-5.97E-12	4.87E-12	2.70E-11	-0.332849
	(6.8E-13)	(0.00618)	(2.4E-11)	(5.0E-11)	(1.0E-11)	(2.5E-11)	(2.9E-11)	(0.30593)
	[0.98231]	[-0.31726]	[0.03995]	[1.63334]	[-0.59110]	[0.19802]	[0.91926]	[-1.08801]
C	0.021898	2.78E+08	-0.095895	0.784066	0.042182	0.490943	0.011709	3.56E+08
	(0.01281)	(1.2E+08)	(0.46344)	(0.94130)	(0.19122)	(0.46596)	(0.55587)	(5.8E+09)
	[-1.70937]	[2.37589]	[-0.20692]	[0.83296]	[0.22060]	[1.05362]	[0.02106]	[0.06140]
R-squared	0.875244	0.800135	0.598760	0.707579	0.567208	0.475675	0.685300	0.412919
Adj. R-squared	0.763620	0.621308	0.239756	0.445939	0.179973	0.006543	0.403726	-0.112364
Sum sq. resids	0.054939	4.59E+18	71.90305	296.6308	12.24136	72.68637	103.4460	1.12E+22
S.E. equation	0.053773	4.91E+08	1.945346	3.951221	0.802672	1.955914	2.333351	2.43E+10
F-statistic	7.840998	4.474357	1.667835	2.704401	1.464764	1.013946	2.433817	0.786088
Log likelihood	67.97950	-780.6404	-64.79214	-91.00978	-32.03793	-64.99259	-71.52116	-925.0131
Akaike AIC	-2.701594	43.16975	4.475251	5.892420	2.704753	4.486086	4.838982	50.97368
Schwarz SC	-1.917905	43.95344	5.258941	6.676110	3.488443	5.269776	5.622671	51.75737
Mean dependent	-0.037027	1.83E+08	-0.305092	-0.053979	-0.001351	0.498366	-0.201380	-1.44E+09
S.D. dependent	0.110601	7.98E+08	2.231106	5.308265	0.886388	1.962344	3.021739	2.31E+10

Determinant resid covariance (dof adj.)	1.45E+36
Determinant resid covariance	7.01E+33
Log likelihood	-1861.762
Akaike information criterion	108.8520
Schwarz criterion	115.4698
Number of coefficients	152

3.4 Test the Quality of the Model

In order to test the quality of the model, the researcher tested the normal distribution of the Residual, which is shown in Table 6, where it was found that the Residual is distributed naturally. The null hypothesis is assumed thatthe Residual follow the natural distribution. The researcher tested the residual serial correlation; the results of thistest in the table 7 indicated that there is no residual serial correlation between the errors in order to accept the nullhypothesis that suggests the independence of random errors. The Heteroskedasticity test presented in Table 8 hasbeen accepted for the null hypothesis, which assumes the homoscedasticity of the study variables and rejects the Heteroskedasticity. Also Wald Test results in table 9 illustrate the significance of all study variables. From previous model quality tests, it is clear that the model is acceptable and can be relied on.

Table 6. VEC Residual Normality Tests result

Orthogonalization: Cholesky (Lutkepohl)

Null Hypothesis: Residuals are multivariate normal Sample: 1980 2019 Included bservations:37

Component	Skewness	Chi-sq	df	Prob.*
1	0.073165	0.033011	1	0.8558
2	-0.396474	0.969348	1	0.3248
3	0.055639	0.019090	1	0.8901
4	-0.276932	0.472929	1	0.4916
5	-0.183628	0.207935	1	0.6484
6	0.151318	0.141198	1	0.7071
7	-0.547155	1.846168	1	0.1742
8	0.376072	0.872153	1	0.3504
Joint		4.561833	8	0.8032

Component	Kurtosis	Chi-sq	df	Prob.
1	2.859015	0.030644	1	0.8610
2	4.230105	2.332786	1	0.1267
3	2.389228	0.575108	1	0.4482
4	3.152320	0.035769	1	0.8500
5	3.116423	0.020896	1	0.8851
6	3.250144	0.096465	1	0.7561
7	4.021635	1.609096	1	0.2046
8	3.697286	0.749570	1	0.3866
Joint		5.450333	8	0.7085
Component	Jarque-Bera	df	Prob.	
1	0.063654	2	0.9687	
2	3.302134	2	0.1918	
3	0.594198	2	0.7430	
4	0.508698	2	0.7754	
5	0.228831	2	0.8919	
6	0.237663	2	0.8880	
7	3.455264	2	0.1777	
8	1.621723	2	0.4445	
Joint	10.01217	16	0.8660	

*Approximate p-values do not account for coefficient estimation.

Table 7. VEC residual serial correlation LM tests

Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	69.51626	64	0.2971	0.993758	(64, 29.6)	0.5233
2	77.08978	64	0.1262	1.187665	(64, 29.6)	0.3088
3	76.77634	64	0.1314	1.179150	(64, 29.6)	0.3167
Null hypothesis: No serial correlation at lags 1 to h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	69.51626	64	0.2971	0.993758	(64, 29.6)	0.5233
2	1275.864	128	0.0000	NA	(128, NA)	NA
3	NA	192	NA	NA	(192, NA)	NA

*Edgeworth expansion corrected likelihood ratio statistic.

Table 8. VEC Residual Heteroskedasticity Tests (Levels and Squares)

Joint test:					
Chi-sq		df		Prob.	
1258.000		1224		0.2437	
			Individual components:		
Dependent	R-squared	F(34,2)	Prob.	Chi-sq(34)	Prob.
res1*res1	0.936298	0.864597	0.6734	34.64303	0.4371
res2*res2	0.956389	1.289998	0.5314	35.38639	0.4026
res3*res3	0.961125	1.454308	0.4904	35.56161	0.3947
res4*res4	0.968632	1.816451	0.4183	35.83939	0.3822
res5*res5	0.986674	4.355526	0.2039	36.50696	0.3530
res6*res6	0.817963	0.264316	0.9672	30.26462	0.6514
res7*res7	0.753680	0.179986	0.9918	27.88617	0.7608
res8*res8	0.903570	0.551190	0.8216	33.43210	0.4953
res2*res1	0.897255	0.513694	0.8417	33.19842	0.5067
res3*res1	0.968853	1.829744	0.4160	35.84755	0.3818
res3*res2	0.851582	0.337513	0.9349	31.50853	0.5903
res4*res1	0.960900	1.445613	0.4924	35.55330	0.3950
res4*res2	0.937492	0.882235	0.6662	34.68721	0.4350
res4*res3	0.982128	3.232635	0.2640	36.33875	0.3602
res5*res1	0.972238	2.060004	0.3804	35.97279	0.3763
res5*res2	0.995053	11.83287	0.0808	36.81698	0.3398

res5*res3	0.990290	5.999246	0.1528	36.64073	0.3473
res5*res4	0.967874	1.772224	0.4260	35.81135	0.3834
res6*res1	0.904245	0.555492	0.8193	33.45708	0.4941
res6*res2	0.902724	0.545882	0.8244	33.40078	0.4968
res6*res3	0.942059	0.956406	0.6375	34.85618	0.4271
res6*res4	0.963488	1.552246	0.4686	35.64905	0.3907
res6*res5	0.953109	1.195639	0.5580	35.26502	0.4082
res7*res1	0.863138	0.370978	0.9181	31.93611	0.5691
res7*res2	0.875178	0.412437	0.8963	32.38160	0.5470
res7*res3	0.934926	0.845126	0.6814	34.59227	0.4395
res7*res4	0.984690	3.783431	0.2307	36.43354	0.3561
res7*res5	0.934809	0.843504	0.6821	34.58794	0.4397
res7*res6	0.871540	0.399089	0.9034	32.24697	0.5537
res8*res1	0.874962	0.411620	0.8968	32.37358	0.5474
res8*res2	0.885348	0.454239	0.8738	32.75788	0.5284
res8*res3	0.785959	0.216000	0.9833	29.08049	0.7075
res8*res4	0.923109	0.706202	0.7434	34.15504	0.4603
res8*res5	0.991444	6.816583	0.1359	36.68344	0.3454
res8*res6	0.817508	0.263511	0.9675	30.24780	0.6522
res8*res7	0.771237	0.198313	0.9879	28.53575	0.7323

Table 9. Wald Test result

Wald Test: Equation: Untitled			
Test Statistic	Value	df	Probability
F-statistic	63.27229	(8, 29)	0.0000
Chi-square	506.1783	8	0.0000
Null Hypothesis: C(1)=0,C(2)=C(3)=C(4)=C(5)=C(6)=C(7)=C(8)=0			

Null Hypothesis Summary:		
Normalized Restriction (= 0)	Value	Std. Err.
C(1)	-2.92E-11	5.76E-12
C(2)	-0.010591	0.001770
C(3)	0.002546	0.000706
C(4)	0.036847	0.003841
C(5)	-0.050204	0.002701
C(6)	0.016536	0.001533
C(7)	-1.96E-12	1.99E-13
C(8)	1.04E-17	0.001666

Restrictions are linear in coefficients.

4. Conclusion

This study examines the estimation of the long-run relationship between the external debt service and the exchange rate in Egypt in the period 1980–2019 and relies on the exchange rate of the dollar against the Egyptian pound as a dependent variable, while the explanatory variables were the external debt service, gross capital formation, broad money growth, deposit interest rate, household final consumption expenditure, gross savings, and terms of trade adjustment. This study methodology is based on Vector Error Correction (VEC) and concludes that there is a significant long-term relationship between the value of the Egyptian pound and all the variables explained in the study, as the error correction coefficient is negative and significant. Also, there is an inverse statistically significant relationship between the value of the Egyptian pound and each of the external debt service, the deposit interest rate, and gross savings; any change of 1% in the external debt service, the deposit interest rate, and gross savings leads to a devaluation of the Egyptian pound against the dollar by 4.8%, 0.04%, and 0.05%, respectively. The study also concluded that there is a positive, statistically significant relationship in the long term between the value of the Egyptian pound and each of gross capital formation, broad money growth, households' and NPISHs' final consumption expenditure, and terms of trade adjustment, as any change of 1% in these variables leads to an increase in the value of the Egyptian pound by 0.16%, 0.05%, 0.27%, and 6%, respectively. This study recommends that decision makers consider all the reasons that would reduce the external debt service in order to preserve the value of the Egyptian currency in the long run.

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