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Investigating the Impact of Real Exchange Rate and Current Account Deficit on External Debt in Egypt During the Period (1980–2022)

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أثر سعر الصرف الحقيقي وعجز الحساب الجاري على الدين الخارجي في مصر خلال الفترة (1980-2022)

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Abstract

This study examines the impact of the real exchange rate, the current account deficit, and their combined effect on external debt in Egypt. This study employed the ARDL bounds testing procedure for annual time-series data spanning 1980–2022. This study finds a long-run cointegration relationship between variables in the empirical model. The results reveal that real exchange rate depreciation and current account deficits stimulate external debt. However, their combined effect is that real exchange rate depreciation negatively moderates the impact of the current account deficit on external debt in Egypt. This finding suggests that real exchange rate depreciation can act as a buffer, thus reducing the impact of the current account deficit on external debt. Accordingly, this study recommends that government policies should reduce foreign currency-denominated debt to reduce exposure to exchange rate risks, develop domestic capital markets to provide alternative sources of financing, reduce reliance on external debt, utilize hedging instruments such as currency swaps to mitigate the impact of exchange rate fluctuations on external debt, address the causes of the current account deficit by improving export competitiveness, and adopt import substitution strategies to enhance the effectiveness of real exchange rate adjustments.

Keywords: Exchange rate, current account deficit, external debt, combined effect, Egypt

Introduction

In 2020, total global debt surged to an unprecedented level of around USD 226 trillion and 263 percent of global GDP (Kose et al., 2021). This significant increase can be attributed to the outbreak of the COVID-19 pandemic and the associated recession witnessed worldwide. Global external debt accumulation was further amplified by the Russia-Ukraine War in 2022 and other country-specific factors.

Rapidly increasing debt has not only been experienced by developing and transition economies but also by developed economies. Governments depend on various internal and external sources to finance expenditures and implement development policies. In developing countries, public debt is a crucial tool for increasing public expenditures and accelerating economic growth. However, overdependence on borrowing may result in severe unfavorable economic consequences, such as a high debt service burden, crowding out of private investments, and increased vulnerability to economic shocks. Unsustainable debt levels can drain government revenues, induce capital flights, and lead to defaults (IMF, 2021).

Additionally, indebted governments face four risk sources. Public debt is perceived as the main risk factor. However, a high external debt-to-GDP ratio increases the vulnerability of government finances to external shocks. Debt maturity is also a risk factor. Short-term debt maturity exposes governments to refinancing risk. Moreover, high-debt services expose the economy to debt spirals and impose further challenges on debt management (Kose et al., 2020). Finally, government liabilities are considered a hidden source of fiscal risk (Polackova, 1998).

External debt escalates due to several internal and external economic and political factors. Internal economic factors include a lack of domestic financial resources, reduction in international reserves, insufficient foreign exchange, past accumulated debt, high debt service payments, and persistently rising fiscal and current account deficits. Political challenges such as political instability, corruption, and poor institutional quality may also trigger external debt accumulation. On the other hand, rising energy and commodity prices, high global interest and inflation rates, and wars are among the most important external drivers of external debt (Okwoche & Nikolaidou, 2024; Tarek & Ahmed, 2017; Tiruneh, 2004).

For several decades, Egypt relied on external debt to finance its growing deficits. Egypt`s external debt has been increasing by 6% annually since 1980. However, the Egyptian economy has experienced successive cycles of debt accumulation over the past decade. In 2016, the Egyptian government secured a conditional loan from the International Monetary Fund (IMF) contingent upon liberalizing the exchange rate regime and devaluing the Egyptian pound (IMF 2016). This devaluation increases the cost of borrowing and contributes significantly to external debt accumulation in Egypt (Hashem and Fahmy, 2019). The outbreak of the COVID-19 pandemic in 2020, followed by the Russia-Ukraine War in 2022, worsened the government's fiscal and external positions. In 2022, external debt, external debt to GDP ratio, and external debt service surged significantly to USD 163 billion, 34.2% and USD 17.9 billion, respectively (World Bank, 2023). This continuous increment raises concerns about external debt sustainability and raises the following questions: To what extent do real exchange rates and current account deficits affect external debt? What are the combined effects of Egypt's external debt?

Unlike the most recent empirical studies on the determinants of Egypt's public debt (Abdu, 2020; Alnashar, 2019; Hashem & Fahmy, 2019), and external debt (Youssef, 2024; Ghaly, 2023), this study

focuses on investigating the impact of real exchange rates, current account deficits, and their combined effect on external debt. The relative importance of the study is reinforced by its time span, which covers the major changes witnessed by the Egyptian economy, including the structural adjustment programs adopted, successive domestic currency devaluations, and international economic events, such as financial crises and the recent COVID-19 pandemic. The findings of this study will serve as a catalyst for policymakers in Egypt to manage external debt sustainably.

The remainder of this paper is organized as follows. Section 2 presents an overview of the theoretical and empirical literature. Section 3 presents an analytical overview of Egypt's exchange rate development, current account deficit, and external debt. Sections 4 and 5 present the model specification, data, and econometric methodology. Section 6 presents the empirical results. Section 7 concludes the study and offers policy recommendations.

Literature Review

This section outlines the theoretical framework of this study. Then, empirical literature examining the impact of the exchange rate and current account deficit on external debt is presented.

Theoretical Framework

The relationship between current account deficit and external debt can be explained by the "Two Gap" model introduced by Chenery and Strout (1966) and the "Three Gap" model extended by Bacha (1990). Both models are perceived as extensions of the growth model. In their seminal works, Harrod (1939) and Domar (1946) assert that the desired growth rate of a country depends on capital accumulation, which in turn depends on the savings rate. The two-gap model posits that there are two primary gaps constraining economic growth in any country: the savings–investment gap and the foreign exchange gap. A savings–investment gap occurs when a country's domestic savings are insufficient to finance the desired level of investment required for economic growth. However, a foreign exchange gap arises when a country's export earnings are inadequate to cover import payments. The "Two Gap" model is derived from the expenditure approach of GDP calculation in an open economy without government intervention and can be expressed by equations 1 and 2:

$$Y = C + I + X - M \quad (1)$$

$$S - I = X - M \quad (2)$$

where Y is income, C is consumption, I is investment, X is exports, M is imports, and S is savings. S-I is the savings–investment gap, and X-M is the foreign exchange gap.

According to Chenery and Strout (1966), if the savings–investment gap is not equal to the foreign exchange gap, foreign capital inflows are required to eliminate this difference between the two gaps. Bacha (1990) extended the "Two Gap" model to include a third gap, which is the fiscal gap. The "Three Gap" model is formulated in an open economy with government intervention as follows:

$$X - M = (S - I) + (T - G) \quad (3)$$

where T and G are the government revenue and expenditure, respectively, and (T-G) is the fiscal surplus.

The Three-Gap Model illustrated in equation (3) provides a framework for understanding how domestic economic imbalances (savings-investment gap, fiscal deficit) and external imbalances (current account deficit) interact to drive the accumulation of external debt.

According to the Marshall-Lerner Condition, domestic currency depreciation makes a country`s goods and services relatively cheaper than those of foreign countries. This causes an increase in foreign demand for domestic goods and services, and hence stimulates domestic exports. Furthermore, domestic currency depreciation makes foreign goods and services more expensive than domestic ones. This causes a decrease in the demand for imports (Blanchard, 2017). Consequently, domestic currency depreciation increases export competitiveness and improves the country's trade and current account balances. Marshall-Lerner provided a condition that a currency depreciation will improve the trade balance only if the sum of the price elasticity of demand for exports and the price elasticity of demand for imports is greater than one.

While currency depreciation can potentially enhance export competitiveness, it may initially have a negative short-term impact on a country's trade balance. This phenomenon is known as the J-curve hypothesis (Rodseth, 2000). The J-curve describes the initial deterioration of the trade balance following currency devaluation before it eventually improves. This is because the immediate impact of depreciation often involves increased import costs, whereas export volumes may take time to adjust.

On the other hand, recent economic literature emphasized the "currency mismatch" and "balance sheet effects" of domestic currency depreciation on external debt. Cespedes et al. (2001), Aghion et al. (2004), and Berganza et al. (2004) argue that exchange rate depreciation increases a country's external indebtedness. This impact is more significant for countries with substantial foreign currency-denominated debt. When domestic currency depreciates, servicing these foreign currency debts becomes significantly more expensive, increasing external indebtedness and vulnerability to the debt crisis.

Empirical Literature

Various empirical studies have analyzed the impact of exchange rates and current account deficits on external debt. In studying the impact of current account deficits on external debt in Sri Lanka during the period (1971-2012), Nath (2023) found that current account deficits have a negative effect on the debt-GDP ratio in the long run. However, in the short run, current account deficits were found to positively affect the debt-GDP ratio. In a comparative study between two groups of countries (12 oil and gas exporting and 12 oil and gas importing countries) for a period spanning 2004–2013, Waheed (2017) showed that the current account deficit has a significant positive impact on external debt in oil-exporting countries. Beyene and Kustoz (2020) show that trade deficit, government budget deficit, saving-investment gap, and debt service increased external debt in Ethiopia during the period (1981-2016); however, inflation, trade openness, and real GDP growth reduced external debt accumulation.

Empirical literature on the impact of exchange rates on external debt is extensive. Utilizing the linear and nonlinear autoregressive distributed lag (ARDL) model in Indonesia, Nazamuddin et al. (2024) find that the exchange rate increases external debt in the country. In addition, the results of the nonlinear ARDL estimation show that the effect of the foreign exchange rate on external debt is asymmetric, where the depreciation of the Indonesian rupiah leads to an increase in the country's external debt, while its appreciation leads to a decline in the country's external debt. Using time series data from Pakistan for 1973 to 2021, Zahra et al. (2023) examine the impact of the real effective exchange rate, fiscal deficits, foreign direct investment, and economic expansion on external debt.

The results confirm that the real effective exchange rate, foreign direct investment, fiscal deficit, and economic growth positively and significantly affect external debt in the long run. However, in the short run, the real effective exchange rate and fiscal deficit negatively impact external debt, whereas economic growth positively affects external debt.

Based on cross-country analysis, Dawood et al. (2021) employed a panel generalized method of moments (GMM) to investigate the impact of the exchange rate, among other determinants, on external debt for a panel of 32 Asian developing and transitioning economies during the period (1995-2019). The results indicate that the exchange rate positively impacts external debt. Adamu (2019) used the Johansen Cointegration approach and the vector error correction model (VECM) in Nigeria during the period (1970-2017). The results reveal that domestic currency devaluation, fiscal deficit, and debt relief increase external debt, while gross domestic savings and international oil prices reduce external debt. Adane et al. (2018) used the ARDL model on time-series data from 1981 to 2016 in Ethiopia. The results revealed that the exchange rate, primary budget deficit, and domestic savings positively impact Ethiopian external debt accumulation, while the inflation rate and resource balance negatively affect external debt.

Using the ARDL cointegration technique, Al-Fawwaz (2016) found that exchange rate, trade openness, and terms of trade had a positive impact on external debt, whereas gross domestic product per capita had a negative impact on external debt in Jordan during the period (1990-2014). Additionally, Adamu and Rasiah (2016) found evidence that the exchange rate and fiscal deficit increased external debt in Nigeria during the period (1970-2013). In Pakistan, Awan et al. (2015) concluded from the VECM estimates that domestic currency depreciation, government fiscal deficit, trade openness, and escalated external debt, while terms of trade had a negative impact on external debt during the period (1976-2010). In a study conducted on five MENA countries (Tunisia, Morocco, Egypt, Jordan, and Turkey) using cointegration for the period (1970-2006), Neaime (2009) found that despite the enormous external debt accumulated in Egypt, the devaluation of the Egyptian Pound stimulated export competitiveness, decreased the current deficit, and reduced pressure for servicing enormous external debt.

The literature provides a crucial foundation for this study by highlighting the individual impacts of both exchange rate and current account deficits on external debt. The literature review reveals that previous studies obtained different results regarding the impact of exchange rates and current account deficits on external debt. Furthermore, empirical studies have investigated the individual impacts of exchange rates and current account deficits on external debt, often treating these variables in isolation. However, there is a significant gap in the literature regarding the combined and interactive effects of these two factors. Accordingly, this study aims at addressing this gap by empirically testing the following hypotheses.

Hypothesis (1): There is a positive relationship between the real exchange rate and external debt in Egypt during the period (1980-2022).

Hypothesis (2): There is a positive relationship between current account deficit and external debt in Egypt during the period (1980-2022).

Hypothesis (3): There is a negative and significant combined effect between the real exchange rate and the current account deficit on external debt in Egypt during the period (1980-2022).

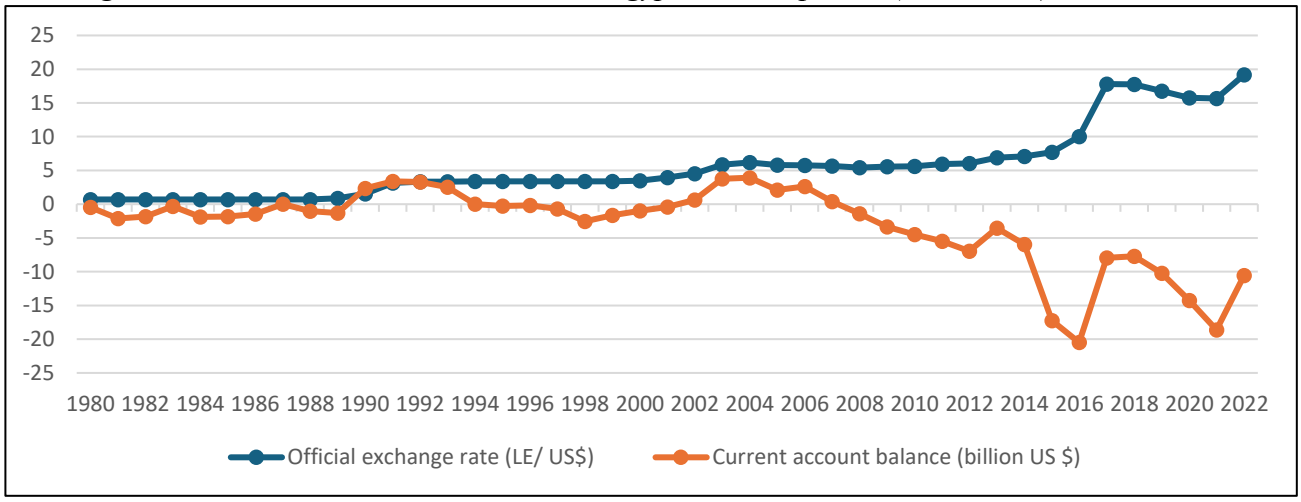
Analytical Overview on Exchange Rate, Current Account Deficit, and External Debt in Egypt

Development of Exchange Rate and Current Account Balance in Egypt

Figure (1) depicts the development of the exchange rate and current account balance in Egypt during the period (1980-2022). The current account balance in Egypt recorded a deficit during most of the study period. During the 1980s, the current account deficit increased steadily because of the open-door policy that was adopted in 1975. However, in 1987, the current account balance showed slight improvement. This can be attributed to establishing the free foreign exchange market and the devaluation of the Egyptian Pound, which has improved the confidence of foreign investors and boosted Egyptian exports (Dissou and Nafie, 2021).

Figure 1

Exchange rate and current account balance in Egypt over the period (1980-2022)



Source: Prepared by the author based on data from World Development Indicators (WDI).

In the early 1990s, the current account balance witnessed a surplus of USD 3.4 billion in 1991 due to the corrective measures implemented by the Egyptian government through applying the Economic Reform and Structural Adjustment Program (ERSAP). Under the ERSAP, the foreign exchange market was liberalized to unify the multiple rates that existed in the foreign exchange market. The exchange rate of the Egyptian pound devalued from 1.55 (LE/USD) in 1990 to 3.4 (LE/USD) in 1991 (World Bank, 2023).

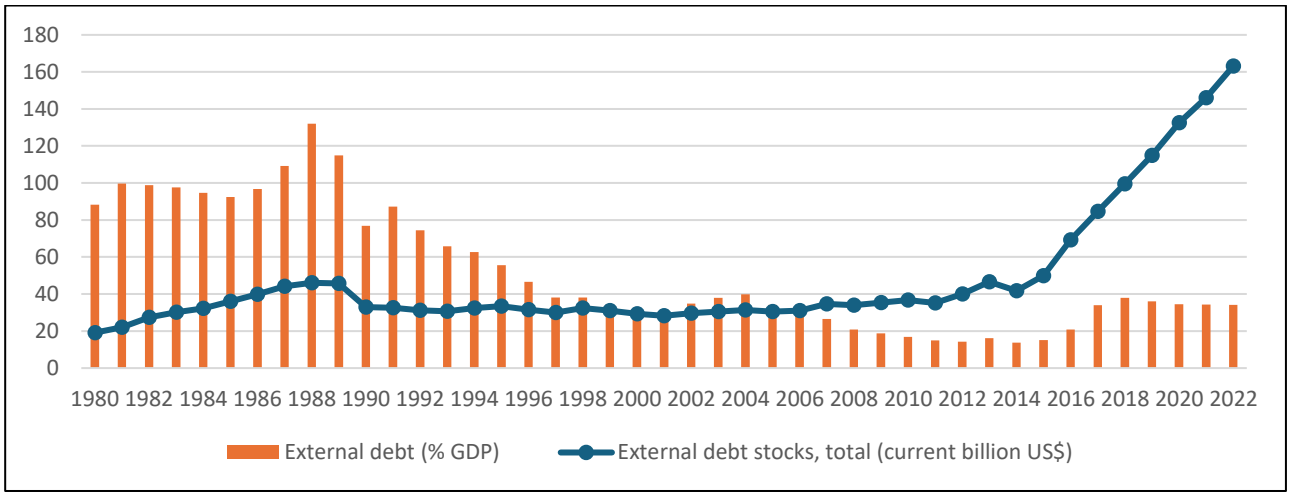
During the period (2002 -2007), the current account balance witnessed surpluses. It peaked at USD 3.9 billion in 2004. This improvement coincided with the successive devaluations of the Egyptian pound in 2001and 2002, and the adoption of a floating exchange rate regime in 2003 (Dissou and Nafie, 2021). Since 2008, the current account deficit has witnessed an increasing trend. This was mainly due to the decline in Egyptian exports after the global financial crisis in 2008, in addition to the decline in tourism revenues and loss of foreign investors' confidence after the 2011 revolution. In 2017, the depreciation of the Egyptian pound to around 17.8 (LE/USD) was accompanied by a significant decline in the current account deficit by approximately 60%. During the period (2016 - 2022), there was an apparent co-movement between the exchange rate and the current account balance, where the current account deficit reached USD 10.5 billion in 2022 (World Bank, 2023).

Development of External Debt in Egypt During the Period (1980-2022)

According to the World Bank, external debt comprises five broad categories: public, publicly guaranteed, private non-guaranteed long-term debt, short-term debt, and IMF credit utilization. During the first half of the 1970s, Egypt's external debt was relatively moderate. However, it began to gradually increase in the mid-1970s. In 1974, it reached USD 2.21 billion due to the economic consequences of the October 1973 war. It further jumped to USD 6.36 billion in 1976 following the implementation of the open-door policy in 1975, which resulted in a significant increase in imports and hence a chronic current account deficit (Sharaf, 2022; Youssef, 2024). Figure (2) illustrates the development of external debt in Egypt during the period (1980-2022).

Figure 2

External debt stocks and external debt to GDP ratio in Egypt over the period (1980-2022)



Source: Prepared by the author based on data from World Development Indicators (WDI).

During the 1980s, external debt in Egypt increased. It reached USD 27.3 billion, almost equal to the country`s GDP in 1982. This is mainly due to the unprecedented increase in the fiscal deficit that peaked at 25.3% of GDP and the current account deficit that reached 6.7% of GDP. In 1988, the external debt increased to USD 46.15 billion, and simultaneously, the external debt-to-GDP ratio reached its peak of approximately 132% of the country's GDP. This significant increase can be attributed mainly to macroeconomic imbalances that arose during that period. Additionally, foreign exchange revenues experienced a sharp decline due to several internal and external factors, including a slowdown in international economic growth rates and a decline in international oil prices, which was accompanied by a reduction in Egyptian workers' remittances and a sudden drop in Suez Canal revenues (Helmy, 2022). Furthermore, tourism revenue was adversely affected by successive terrorist attacks during this period. As a result, foreign exchange reserves declined from 13% of total external debt in 1980 to 5.5% in 1989, and consequently, the Egyptian pound depreciated by 85% against the USD from 0.7 LE/USD in 1980 to 1.55 LE/USD in 1990.

By the beginning of the 1990s, external debt indicators showed significant improvements. Total external debt stocks decreased by around 12% from USD 33.3 billion in 1990 to USD 29.2 billion in 2000. The external debt-to-GDP ratio declined to 29.28% in 2000 compared to 87.20% in 1991. Moreover, the external debt service-to-export ratio decreased from 47.2% in 1990 to 4.9% in 2000. This improvement can be attributed to the implementation of the Economic Reform and Structural Adjustment Program (ERSAP) in 1991 to reduce structural imbalances, in addition to external debt rescheduling and relief by the IMF, World Bank, and other creditor countries such as the United States

and Gulf Council Countries (GCC) (Mohieldin & Kouchouk, 2004). This also increased foreign exchange reserves to external debt ratios from 10.9% to 48.8% during the period (1990-2000).

The global economy witnessed an international financial crisis in 2008, whereas Egypt's external debt steadily increased to USD 36.8 billion in 2010. The Arab Spring uprisings in 2011 and their adverse economic and political consequences contributed to a severe fall in foreign exchange reserves by around 60% from USD 37 billion in 2010 to USD 14.9 billion in 2013. This foreign exchange shortage was reflected in the total external debt, reaching USD 46.3 billion in 2013. In 2014, the external debt, however, dropped to USD 41.7 billion due to the development grants and donations received from the GCC countries (Central Bank of Egypt, 2015).

Since 2015, Egypt's external debt has sharply increased. It climbed from USD 49.8 billion in 2015 to USD 163 billion in 2022. This could be attributed to several factors. First, the IMF provided the extended fund facility to Egypt in accordance with the economic reform program launched by the Egyptian government in 2016 (IMF, 2019). Subsequently, the use of IMF credit increased from USD 1.25 billion in 2015 to USD 21.75 billion in 2022. Second, there were successive devaluations of the foreign exchange rate, whereas the Egyptian pound lost around 90% of its value during the period (2016-2022). Finally, the slowdown of the global economy during the COVID-19 pandemic has reduced foreign capital inflows to Egypt.

External debt accumulation is further complicated by rising external debt payments. Meanwhile, escalating external debt during the period (2015-2022) was associated with an increase in external debt service by approximately fivefold, from USD 3.7 billion in 2015 to USD 17.9 billion in 2022, representing more than 3% of the country's GDP and 23% of its export revenues.

Model Specification and Data

Using the three-gap model as a theoretical framework and based on Beyene and Kustoz (2020), the baseline model specified to investigate the impact of the exchange rate and current account deficit on external debt in Egypt takes the following functional form.

$$ED_t = \gamma_0+\gamma_1 REX_t + \gamma_2\, CAD_t + \gamma_3 SG_t + \gamma_4\, FD_t + \gamma_5 GDPPC_t + \gamma_6 RES_t + \varepsilon_t \quad (4)$$

where ED_t is external debt as a percentage of GDP, REX_t is the real exchange rate (LE/$), CAD_t is the current account deficit as a percentage of GDP, SG_t is the saving-investment gap as a percentage of GDP, FD_t is the fiscal deficit as a percentage of GDP, $GDPPC_t$ is the gross domestic product per capita, and RES_t is the total reserves as a percentage of external debt.

To examine the combined effect of the exchange rate and current account deficit, both variables interact, and the interaction term is added to Equation (4). Therefore, the empirical model is expressed as:

$$ED_t = \gamma_0+\gamma_1 REX_t + \gamma_2\, CAD_t + \gamma_3 REX_t * CAD_{t_t} + \gamma_4\, SG_t + \gamma_5 FD_t + \gamma_6 GDPPC_t + \gamma_7 RES_t + \varepsilon_t \quad (5)$$

where γ_0 is the constant term and γ_1 to γ_7 are the coefficients of the model variables. ε_t is the white noise error term.

The conditional marginal effect of current account deficit on external debt is obtained by the first derivative of equation (5) with respect to real exchange rate as follows:

$$\frac{\partial LnED_t}{\partial CAD_t} = \gamma_2 + \gamma_3 LnREX_t$$

The real exchange rate (LE/ USD) is expected to positively affect external debt because domestic currency depreciation increases the cost of external debt and its service burden, resulting in debt accumulation. Current account deficit is expected to positively affect external debt because it reflects the need for a country to borrow from abroad. The interaction term captures how the effect of the current account deficit on external debt changes as the real exchange rate varies. The sign of the interactive term between the real exchange rate and current account deficit is ambiguous. A negative coefficient implies that real exchange rate depreciation may weaken the effect of the current account deficit on external debt. Exchange rate depreciation may improve the trade balance and, hence, narrow the current account deficit by increasing the competitiveness of exports in global markets and simultaneously increasing the domestic price of imports. In addition, domestic currency depreciation can make domestic assets, such as stocks and bonds, more attractive to foreign investors. This can increase foreign capital inflows, which can help finance current account deficits and reduce the need for external borrowing. In contrast, a positive coefficient of the interaction term implies that real exchange rate depreciation may reinforce the impact of the current account deficit on external debt. This occurs when exchange rate depreciation induces capital flights and signifies the deterioration of the trade balance by increasing the cost of imports, thus amplifying the current account deficit.

Domestic macroeconomic imbalances, such as the saving-investment gap and fiscal deficit, are expected to positively impact external debt because they reflect the insufficiency of domestic resources that create an urgent need for external borrowing. Economic growth (proxied by per capita GDP) is expected to negatively affect external debt. A higher income level increases a country's dependency on domestic resources, instead of resorting to external borrowing. Foreign exchange reserves are expected to negatively affect external debt. High external reserves, including foreign currency assets, deposits, securities, gold reserves, and IMF Special Drawing Rights (SDRs), substitute for external debt to finance international payment imbalances.

Annual data on the official exchange rate (LE/USD), current account balance (percentage of GDP), domestic savings (current LCU), gross fixed capital investments (current LCU), consumer price index (2010=100) for Egypt and United States, Gross domestic product (current LCU), foreign reserves (as a percentage of external debt), and per capita gross domestic product (constant LCU) were drawn from the World Development Indicators (WDI) of the World Bank. In contrast, annual data for fiscal deficit (percentage of GDP) were extracted from the Ministry of Finance (MOF) and the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS). The real exchange rate is calculated using the consumer price index (CPI) of both Egypt and the United States as follows: official exchange rate of Egypt × CPI of the USA/ CPI of Egypt. The saving investment gap (percentage of GDP) is calculated as the difference between gross domestic savings (current LCU) and gross fixed capital investments (current LCU) as a ratio to the gross domestic product (LCU). All variables are expressed in their natural logarithms, except the saving–investment gap and current account deficit, as they may take either positive or negative values throughout their time series.

Econometric Methodology

To obtain robust results, this study employed an autoregressive distributed lag (ARDL) model. The ARDL model is advantageous compared with other time-series regression models. While the cointegration methodology of Engle and Granger (1987) and Johansen and Juselius (1990) requires all variables to be integrated in the same order, the ARDL model can be used to test for cointegration among the variables of interest, regardless of their order of integration. This study adopts the bounds

testing approach developed by Pesaran et al. (2001) to examine the long-run equilibrium relationship between model variables.

The initial step in the ARDL approach is to assess the stationarity properties of variables to determine their order of integration. It is important to ascertain whether none of the included series are integrated of order (2) or beyond to avoid spurious estimations. In this regard, this study applies the Augmented Dickey-Fuller (ADF) unit root test to the level and first difference of each series. After determining the order of integration of each variable, the Akaike information criterion (AIC) is adopted to identify the optimal order of lags. Once the optimal lag length is selected, cointegration between variables is established via a bounds test, which involves estimating the unconditional error correction model (UECM) specified by the following equation:

$$\Delta LnED_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\, \Delta LnED_{t-i} + \sum_{i=1}^{q_1} \alpha_{2i}\, \Delta lnREX_{t-i} + \sum_{i=1}^{q_2} \alpha_{3i}\, \Delta CAD_{t-i} + \sum_{i=1}^{q_3} \alpha_{4i}\, \Delta lnREX_{t-i} * CAD_{t-i} + \sum_{i=1}^{q_4} \alpha_{5i}\, \Delta SG_{t-i} + \sum_{i=1}^{q_5} \alpha_{6i}\, \Delta LnFD_{t-i} + \sum_{i=1}^{q_6} \alpha_{7i}\, \Delta LnGDPPC_{t-i} + \sum_{i=1}^{q_7} \alpha_{8i}\, \Delta LnRES_{t-i} + \beta_1 LnED_{t-1} + \beta_2 lnREX_{t-1} + \beta_3 CAD_{t-1} + \beta_4 lnREX_{t-1} * CAD_{t-1} + \beta_5 SG_{t-1} + \beta_6 LnFD_{t-1} + \beta_7 LnGDPPC_{t-1} + \beta_8 LnRES_{t-1} + \epsilon_t \quad (6)$$

Where, α_0 is the drift term, Δ is the first difference operator, $\alpha_{1i}, \alpha_{2i}, \alpha_{3i}, \alpha_{4i}, \alpha_{5i}, \alpha_{61i}, \alpha_{7i}\ and\ \alpha_{8i}$ are the coefficients of short-run dynamics of the corresponding variables, with lag length $p, q_1, q_2,\ q_3, q_4, q_5, q_6\ and\ q_7$ respectively, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7\ and\ \beta_8$ are the coefficients of the long-run multipliers and ϵ_t is a white-noise error term.

The Wald test was used to determine whether there was a long-run relationship between the model variables. The null hypothesis of no cointegration, that is, $H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$, is tested against the alternative that at least one of the $\beta_i, i = \{1,2,3,4,5,6,7,8\}$ is not equal to zero. The computed F-statistics were compared with the critical values provided by Pesaran et al. (2001) and Narayan (2005). If the computed F-statistic is below the lower critical value, the null hypothesis of no cointegration cannot be rejected. However, if the F-statistic is above the upper critical value, the null hypothesis of no cointegration is rejected, and there is evidence of a long-run relationship among the underlying variables. Nevertheless, if the F-statistic falls between the lower and upper critical values, the test is inconclusive.

Once cointegration between variables is established, the long-run equilibrium relationship can be estimated as follows:

$$LnED_t = \beta_0 + \sum_{i=1}^{p} \beta_1\, LnED_{t-i} + \sum_{i=1}^{q_1} \beta_2\, LnREX_{t-i} + \sum_{i=1}^{q_2} \beta_3\, CAD_{t-i} + \sum_{i=1}^{q_3} \beta_4\, LnREX_{t-i} * CAD_{t-i} + \sum_{i=1}^{q_4} \beta_5\, SG_{t-i} + \sum_{i=1}^{q_5} \beta_6\, LnFD_{t-i} + \sum_{i=1}^{q_6} \beta_7\, LnGDPPC_{t-i} + \sum_{i=1}^{q_7} \beta_8\, LnRES_{t-i} + \mu_t \quad (7)$$

where μ_t denotes the error term. The Short-run dynamics can be captured using the restricted error correction model (ECM):

$$\Delta LnED_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\, \Delta LnED_{t-i} + \sum_{i=1}^{q_1} \alpha_{2i}\, \Delta LnREX_{t-i} + \sum_{i=1}^{q_2} \alpha_{3i}\, \Delta CAD_{t-i} + \sum_{i=1}^{q_3} \alpha_{4i}\, \Delta LnREX_{t-i} * CAD_{t-i} + \sum_{i=1}^{q_4} \alpha_{5i}\, \Delta SG_{t-i} + \sum_{i=1}^{q_5} \alpha_{6i}\, \Delta LnFD_{t-i} + \sum_{i=1}^{q_6} \alpha_{7i}\, \Delta LnGDPPC_{t-i} + \sum_{i=1}^{q_7} \alpha_{8i}\, \Delta LnRES_{t-i} + \phi ECT_{t-i} + \mu_t \quad (8)$$

Where, ϕ captures the speed of adjustment to restore long-run equilibrium following a shock to the system.

For the estimated model to be reliable, the error term should be serially independent (Pesaran et al., 2001). Hence, the error term was tested for serial correlation and heteroskedasticity by adopting

the Breusch-Godfrey test and Breusch–Pagan Godfrey tests. Serial correlations in the error term invalidate the bounds test, whereas heteroscedastic errors can lead to inefficient estimates. Finally, diagnostic tests, such as the Jarque-Bera normality test and stability tests using the Cumulative Sum (CUSUM) and CUSUM of squares, were applied to assess the validity and reliability of the model.

Results and Discussion

This section presents and discusses the econometric model's empirical findings.

Stationarity Tests

Before testing the long-run relationship between the model variables, the order of integration of each variable in the model was checked using the augmented Dickey-Fuller (ADF) unit root test. Table (1) presents the results of the ADF unit root tests. The results revealed that the included series is a mix of I(0) and I(1). However, none of them were integrated into Order 2.

Table 1

Augmented Dickey-Fuller (ADF) unit root test

Variable	*ADF-statistic*				
	Level		First difference		I(D)
	Constant	Constant and trend	Constant	Constant and trend	
LnED	-1.5959	-1.5149	-4.215***	-4.297***	I(1)
LnREX	-0.8555	-2.6653	-3.6876***	-3.652**	I(1)
CAD	-3.3815**	-2.9180	-6.1300***	-6.136***	I(0)
SG	-3.6747***	-3.4577	-4.6202	-4.548***	I(0)
LnFD	-2.5882	-2.4943	-2.9750**	-2.984	I(1)
LnGDPPC	-0.5846	-3.8275**	-4.0828***	-3.975**	I(0)
LnRES	-2.0648	-1.1917	-3.6371***	-3.924**	I(1)

Note(s): *** and ** indicate that the estimated coefficients are statistically significant at the 1% and 5% levels, respectively.

Source: Computed using E-views packages.

The Bounds Test for Cointegration

The order of lags to be included in the regression model was determined using the Akaike Information Criterion (AIC). Three lags are chosen as a maximum for the specified model, and the optimal order of lags (1,1,3,2,1,1,2,2) is selected based on the AIC criterion. The results of the bound cointegration tests are presented in Table 2. The F-statistic value of the bounds test is 9.948, which is greater than the upper bound of the critical value of 5.031 at the 1% significance level. This reveals the existence of a long-run relationship between external debt and the included explanatory variables: real exchange rate, current account deficit, interactive variable between the real exchange rate and current account deficit, savings–investment gap, fiscal deficit, real per capita GDP, and total reserves.

Table 2

Results of the cointegration bounds test

F-Bounds Test			*Null Hypothesis: No level relationship*	
			n = 40	
Test Statistic	Value	Significance	I(0)	I(1)
F-statistic	9.948***	10%	2.152	3.296
		5%	2.523	3.829
		1%	3.402	5.031

Note(s): Lower and upper bound critical values were obtained from (Pesaran et al., 2001).

Source: Computed using E-views packages.

Estimation of Long-Run Relationship and Short-Run Dynamics

Table (3) reports the estimated long- and short-run coefficients of the ARDL model. The estimated long-run coefficients show a statistically significant positive relationship between the real exchange rate and external debt in the long run at the 1% level of significance. The estimated long-run coefficient reveals that a one-percentage-point increase in the real exchange rate leads to a 0.703% increase in external debt. This is attributed to the valuation effect of the exchange rate depreciation. When the exchange rate increases, the domestic currency depreciates and loses its value. This implies that much more funding will be required to repay accrued foreign currency-denominated debt and pay for its services. Previous studies, such as those by Nazamuddin et al. (2024) and Adamu (2019), have reported similar findings. However, in the short term, this effect was unexpectedly negative.

Regarding the current account deficit, the results reveal that a percentage point increase in the current account deficit results in a 6.578%[1] increase in external debt. This reflects the Egyptian economy's dependence on external borrowing to address trade deficits and net income payments. This result is consistent with the findings of Awan et al. (2015), Dawood et al. (2021), and Youssef (2024). A similar result was found for the short run, where a 1% increase in the current account deficit caused a 0.008% increase in external debt in the same period.

Furthermore, the interactive term between the real exchange rate and the current account deficit has a statistically significant negative coefficient. This result indicates that the impact of the current account deficit on external debt is weaker when the real exchange rate depreciates. When the domestic currency depreciates, domestic assets, such as stocks, bonds, and real estate, become cheaper and attractive to foreign investors. This increases foreign capital inflows into the domestic economy and substitutes for external debt to finance the current account deficit. Fadl and Ghoneim (2020) provide evidence of a significant positive relationship between exchange rate depreciation and foreign capital inflows to Egypt.

The results also show that the savings–investment gap and fiscal deficit have significantly positive effects on external debt at the 1% significance level. That is, an increase in the savings–investment gap by 1% results in an increase in external debt of 3.738%[2], ceteris paribus. This indicates that insufficient domestic savings to finance investments urge external borrowing, resulting in external debt accumulation. This result is consistent with that of Tiruneh (2004) and Tiruneh Kotosz (2020). Additionally, a one percentage point increase in fiscal deficit causes a 0.772% increase in external debt. This implies that as government expenditures exceed their revenues, the government is forced to borrow from foreign entities to finance this deficit. It is worth mentioning that the fiscal balance in Egypt has experienced a persistent deficit since the mid-1970s. This result is supported by Adamu and Rasiah (2016) and Adane et al. (2018). Similar to the results for the long run, the savings–investment gap and fiscal deficit have a significantly positive impact on external debt in the short run. A 1% increase in the savings–investment gap and fiscal deficit caused an increase in external debt by 0.6% and 0.206%, respectively, in the same period.

[1] Since the current account deficit is not log transformed while the external debt is log transformed, we will exponentiate the coefficient for the current account deficit and then subtract 1 from the result and multiply by 100 to get the percent change in the external debt for every unit change in the current account deficit.

[2] Since the saving investment gap is not log transformed while the external debt is log transformed, we will exponentiate the coefficient for the saving- investment gap and then subtract 1 from the result and multiply by 100 to get the percent change in the external debt for every unit change the saving investment gap.

Furthermore, a 1% increase in per capita GDP reduces external debt by 6.570% in the long run and 2.446% in the same period at the 1% significance level. This is justified by the fact that, as the economy grows, income levels increase, domestic savings rise, government revenues increase, and resource gaps decrease. This reflects that an increase in the relative abundance of domestic financial resources reduces Egypt's dependence on external debt. This result is consistent with the findings of Swamy (2015), Al-Fawwaz (2016), Dawood et al. (2021), and Waheed (2017).

External reserves have a statistically significant negative effect on Egypt's external debt. Holding the other factors constant, a 1% increase in external reserves decreases external debt by 0.299% at the 5% significance level. Foreign exchange reserves are alternative sources of external financing. A high foreign exchange reserve reduces the need for external borrowing and external debt.

The error correction term is negative and statistically significant at the 1% significance level. This indicates a relatively moderate speed of convergence in the long-run dynamics of the variables. This indicates that approximately 55% of the last period's disequilibrium was corrected in the current period. The adjusted R^2= 0.85 which reflects the goodness of fit of the estimated model.

Table 3

Estimated long-run and short-run parameters of the ARDL model

Long run estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$LnREX$	0.7034***	0.1309	5.3722	0.0000
CAD	0.0637***	0.0208	3.0557	0.0068
$LnREX * CAD$	-0.0913***	0.0217	-4.1902	0.0006
SG	0.0367***	0.0096	3.7979	0.0013
$LnFD$	0.7724***	0.1590	4.8570	0.0001
$LnGDPPC$	-6.5701***	1.0103	-6.5026	0.0000
$LnRES$	-0.2990**	0.1175	-2.5444	0.0203
C	29.6880***	4.4041	6.7408	0.0000

Short-run estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob
$\Delta LnREX$	-0.264**	0.0952	-2.7763	0.0125
ΔCAD	0.008**	0.0034	2.4742	0.0235
$\Delta CAD(-1)$	-0.016***	0.0025	-6.4734	0.0000
$\Delta CAD(-2)$	-0.013***	0.0027	-5.1366	0.0001
$\Delta LnREX * CAD$	0.001	0.0033	-0.4060	0.6895
$\Delta LnREX * CAD(-1)$	0.010***	0.0035	3.0393	0.0071
ΔSG	0.006***	0.0021	3.2031	0.0049
$\Delta LnFD$	0.206***	0.0323	6.3871	0.0000
$\Delta LnGDPPC$	-2.446***	0.7496	-3.2639	0.0043
$\Delta LnGDPPC(-1)$	5.202***	0.9545	5.4501	0.0000

$\Delta LnRES$	-0.330***	0.0804	-4.1051	0.0007
$\Delta LnRES(-1)$	-0.171**	0.0615	-27845	0.0122
$ETC(-1)$	-0.553***	0.0486	-11.3721	0.0000

Notes: *** and ** indicate that the estimated coefficients are statistically significant at the 1% and 5% levels, respectively.
Source: Computed using E-views packages

Diagnostic Checks

Table (4) presents the results of the diagnostic checks. The Lagrange multiplier (LM) test of the residual serial correlation statistic and the F-statistic of the Breusch-Pagan-Godfrey test applied to test homoscedasticity provided no evidence of either serial correlation or heteroskedasticity in the error term. In addition, the Jarque–Bera normality test provides no evidence to reject the assumption of normality.

Table 4

Diagnostic tests

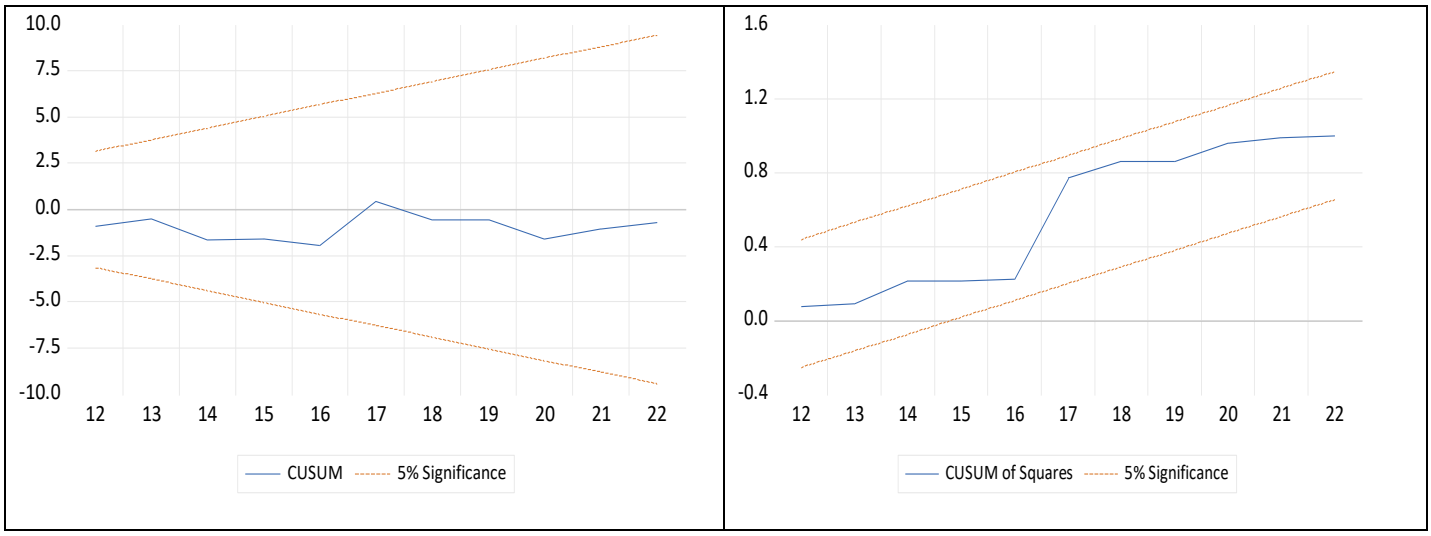
Test	***Test statistic***	***P-Value***
Breusch-Godfrey Serial Correlation LM Test	F – statistic 1.8415	0.1906
Breusch-Pagan-Godfrey Heteroscedasticity Test	F – statistic 1.0327	0.4768
Normality Test	Jarque-Bera 0.1710	0.9180

Source: Computed using E-views packages.

Furthermore, the stability of long-run estimates is examined using the cumulative sum of recursive residuals (CUSUM) and CUSUM of squares (CUSUMSQ) tests. Figure (3) plots the CUSUM and CUSUM-of-squares statistics to examine the stability of the estimated long-term relationship. The results reveal the stability of all estimated long-run parameters, because the plots of the two statistics lie consistently within the 5% significance critical bounds.

Figure 3

Plots of CUSUM and CUSUMSQ statistics for coefficient stability



Source: Prepared by the author using the E-views package.

Conclusion and Policy Recommendation

This study investigates the impact of the real exchange rate, current account deficit, and their combined effect on external debt in Egypt by employing the ARDL bounds testing procedure for time-series data spanning 1980–2022. The findings reveal that exchange rate depreciation and current account deficits stimulate external debts. The combined effect of the real exchange rate and current account deficit is significantly negative, indicating that real exchange rate depreciation can act as a buffer, reducing the impact of the current account deficit on external debt. In addition, the savings–investment gap and fiscal deficit increase external debt, whereas economic growth and foreign exchange reserves reduce external debt in Egypt.

These results have significant implications for policymakers. First, the study encourages borrowing in the domestic currency and reduces foreign currency-denominated debt whenever possible to reduce exposure to exchange rate risks. Second, we develop domestic capital markets to provide alternative financing sources and reduce reliance on external debt. Third, hedging instruments such as currency swaps are utilized to mitigate the impact of exchange rate fluctuations on external debt. Fourth, we address the causes of the current account deficit by improving export competitiveness and adopting import substitution strategies to enhance the effectiveness of real exchange rate adjustments. Fifth, the study ensures the sustainability of external debt by allocating external debt funds to high-yield sectors that generate returns exceeding interest payments.

Limitations of the Study and Future Research

This study investigates the impact of real exchange rates, current account deficits, and their combined effect on external debt. The limitation of the current study is that it examines the linear impact of the real exchange rate and current account deficit on external debt. Additional insights can be obtained from future research that investigates the asymmetric impact of the real exchange rate and current account deficit on external debt.

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أثر سعر الصرف الحقيقي وعجز الحساب الجاري على الدين الخارجي في مصر خلال الفترة (1980-2022)

المستخلص

تتناول هذه الدراسة تحليل أثر كل من سعر الصرف الحقيقي وعجز الحساب الجاري، فضلاً عن تأثيرهما التفاعلي، على الدين الخارجي في مصر. وقد استخدمت الدراسة منهجية اختبار الحدود (ARDL) لسلاسل زمنية سنوية تغطي الفترة من 1980 إلى 2022. وتوصلت النتائج إلى وجود علاقة توازنية طويلة الأجل بين متغيرات النموذج التجريبي. كما أظهرت النتائج أن انخفاض سعر الصرف الحقيقي وعجز الحساب الجاري يؤديان إلى زيادة الدين الخارجي. ومع ذلك، فإن التأثير التفاعلي لهذين المتغيرين يتمثل في أن انخفاض سعر الصرف الحقيقي يُخفف من تأثير عجز الحساب الجاري على الدين الخارجي في مصر. ويشير ذلك إلى أن انخفاض سعر الصرف الحقيقي يمكن أن يعمل كآلية لتخفيف أثر عجز الحساب الجاري على الدين الخارجي. وبناءً على ما سبق، توصي الدراسة بضرورة تبني سياسات حكومية تهدف إلى تقليل الديون المقومة بالعملات الأجنبية للحد من مخاطر تقلبات أسعار الصرف، وتطوير أسواق رأس المال المحلية لتوفير مصادر تمويل بديلة وتقليل الاعتماد على الدين الخارجي، واستخدام أدوات التحوط مثل عقود المبادلة العملة (Currency Swaps) للحد من آثار تقلبات أسعار الصرف على الدين الخارجي، ومعالجة الأسباب الجذرية لعجز الحساب الجاري من خلال تحسين القدرة التنافسية للصادرات، وتبني استراتيجيات إحلال الواردات لتعزيز فاعلية تعديلات سعر الصرف الحقيقي.

الكلمات الدالة: سعر الصرف، عجز الميزان الجاري، الدين الخارجي، الأثر التفاعلي، مصر