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Exploring the Impact of Twin Deficit on External Debt in Egypt During the period 2006-2022[1]

أثر العجز التوأم على الدين الخارجى فى مصر خلال الفترة (2006-2022)

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Abstract

The purpose of this research is to analyze the effects of both external and internal imbalances on external debt in Egypt during the period (2006-2022). The empirical analysis includes three stages, starting with conducting the Toda-Yamamoto causality test to ascertain the direction of causality between fiscal deficit, current account deficit, and external debt. Then, the autoregressive distributed lag (ARDL) approach is utilized to determine the short and long-run effects of fiscal deficit and current account deficit on external debt. Furthermore, the Break Least Squares (BLS) estimation is employed to explore whether the structural breaks that resulted from the political and economic events experienced during the study period have resulted in various effects on the relationship between the utilized variables.

The results of the Toda and Yamamoto causality test established the existence of causality running from current account balance to external debt as a percentage of GDP. The ARDL model revealed that the current account surplus reduces the external debt in the long run while the fiscal deficit increases external debt. The BLS detects multiple structural breaks and emphasizes the different effects during each period. This research has important implications regarding the importance of generating the current account surplus in mitigating the problem of external debt, also reducing the budget deficit is important as persistent deficit aggravates the external debt problem.

الملخص

يهدف هذا البحث إلى تحليل أثر الاختلالات الخارجية والداخلية على الدين الخارجي في مصر خلال الفترة (2006–2022). ويتضمن التحليل التجريبي ثلاث مراحل، تبدأ بإجراء اختبار السببية (Toda–Yamamoto) للتأكد من اتجاه العلاقة السببية بين العجز المالي وعجز الحساب الجاري والدين الخارجي. ومن ثم يتم استخدام نهج الانحدار الذاتي الموزع (ARDL) لتحديد الآثار القصيرة والطويلة المدى للعجز المالي وعجز الحساب الجاري على الدين الخارجي. علاوة على ذلك، تم استخدام تقدير المربعات الصغرى ذات الانكسارات (BLS) لاستكشاف ما إذا كانت الانكسارات الهيكلية التي نتجت عن الأحداث السياسية والاقتصادية التي شهدتها فترة الدراسة قد أدت إلى تأثيرات مختلفة على العلاقة بين المتغيرات المستخدمة.

أثبتت النتائج وجود علاقة سببية متجهة من رصيد الحساب الجاري إلى الدين الخارجي كنسبة من الناتج المحلي الإجمالي. وكشف نموذج ARDL أن فائض الحساب الجاري يقلل من الدين الخارجي على المدى الطويل بينما يؤدي العجز المالي إلى زيادة الدين الخارجي. وقد كشف نموذج BLS عن الفواصل الهيكلية المتعددة وأوضح التأثيرات المختلفة خلال كل فترة زمنية. ولهذا البحث دلالات مهمة تتعلق بأهمية تحقيق فائض في الحساب الجاري في التخفيف من مشكلة الدين الخارجي، كما أن تخفيض عجز الموازنة مهم لأن استمرار العجز يؤدي إلى تفاقم مشكلة الدين الخارجي.

1. Introduction

The issue of international debt is one of the major concerns of policymakers and ranks high on the international agenda. Many developing countries are struggling with the consequences of unprecedented levels of indebtedness. The theoretical and empirical literature on external debt suggests a wide range of factors that may contribute to the origin of the debt crisis of borrowing countries. It is often noted that countries borrow to finance their fiscal deficits and current account deficits.

Egypt like many developing countries has borrowed a huge amount of external funds because of budget deficits, trade deficits, and saving–investment gaps. Beyene and Kotosz (2020) asserted that government expenditure is one of the key factors that increase external debt due to budget deficits, which compel governments to borrow. Bilquees (2003) added that excessive domestic borrowing at high rates to finance deficits without any attempts at domestic resource mobilization and controlling the deficits over extended periods absorb all available domestic and external resources. Studies on current account adjustments and the factors that accelerate these adjustments are still relatively scarce. Also, a weakening in the exchange rate for countries whose import value is greater than the export value has the impact of increasing the amount of debt (Elmendorf & Mankiw, 1998). However, there is no consensus on the stated results as Calderon, Chong, and Zanforlin (2007) found that external debt does not have a significant impact on current account deficits in developing countries. Daneal & Ibrahim (2021) concluded that fiscal deficit is not a significant determinant of external debt in Nigeria.

1.1. Research Problem

It is apparent that the earliest empirical studies analyzing the effect of both the current account and the budget deficit on the evolution of external debt are

scarce and did not give consistent results. Therefore, the research problem is to analyze the impact of twin imbalances on external debt.

1.2. Research Importance

The importance of this research resides in the fact that Egypt has been suffering from the debt issue throughout the country's modern history, the year 2000s witnessed the falling back of the economy into the debt trap as a series of external political and economic shocks negatively impacted the traditional vulnerable sources of foreign exchange leading to successive devaluations of the pound. The increase in external debt in the period (2007-2010) was highly attributed to the global financial crisis in mid-2008, it was mostly an aggregate demand shock that reduced demand for Egyptian exports and lowered private investment due to increased uncertainty and weakened FDI. Then, after the revolution in 2011, state revenues, especially tax proceeds, were negatively affected by the witnessed political and economic instability; This hurts tourism revenues, exports, and FDI. To bridge the financing gap, the government signed a new agreement with the IMF in 2016 whereby the latter lent Egypt $12 billion over three phases. The Central Bank of Egypt (CBE) announced the adoption of a free float exchange rate regime on the 3rd of November 2016. This move came after years of foreign currency shortage in the aftermath of January's revolution in 2011, with international reserves dropping by about 45% to $19.6 billion in September 2016 against $35.5 billion in September 2010. The petroleum ministry also raised fuel prices amid governmental efforts to contain the widening budget deficit (Alex Bank, 2016). Therefore, Egypt's external debt has steadily increased since 2016. However, these reforms improved macroeconomic aggregates as, in 2019, before the pandemic and the war in Ukraine. GDP growth reached 5.6%, the inflation rate decreased to 9.4%, the unemployment rate declined to 7.9%, the overall fiscal deficit dropped to 8% – after having peaked at 16.5% in 2014 and international reserves increased to reach US$44 billion after plummeting to $14.9 billion in 2013 (Zaki, 2023). Egypt accessed funding from COVID-19-related facilities amounting to $8 billion from the IMF—$2.8 billion from the coronavirus rapid financing initiative and $5.2 billion in a one-year stand-by arrangement—besides other loans from the African Development Bank, the World Bank, and the international capital market (African Development Bank, 2021). Egypt's external debt rose from $36.8 billion in 2010 to $134.8 billion in 2020.

1.3. Research Methodology

To analyze the effect of budget deficit and current account deficit on external debt in Egypt, three mechanisms are applied: ***First***, the researcher runs a Var-Granger Causality Wald test between external debt, fiscal deficit, and current account deficit. ***Second***, the Autoregressive distributed lag (ARDL) model, bound Co-integration, and Error Correction Model (ECM) are conducted to test both the short-run relationship and the long-run dynamics between the stated variables. ***Finally***, the Break least square (BLS) method with structural breaks and time-varying settings captures a clearer picture of the relationship. This helps to capture the challenges that faced the Egyptian economy during the study period including the 2008 financial crisis, the 2011 revolution, the COVID-19 pandemic, and the negative repercussions of the Russian invasion of Ukraine. Quarterly data is used from 2006 to 2022 on the current account, budget deficit, and external debt from the Central Bank of Egypt website.

1.4. Research Hypothesis

This research aims to test the following hypothesis:

a. The current account surplus decreases external debt.
b. A budget deficit increase increases external debt.
c. structural breaks and different periods result in varying effects of twin deficits on external debt.

1.5. Research Plan

This paper includes the following sections: the trend of external debt, fiscal deficit, and current account balance in Egypt, literature review, theoretical background, empirical analysis, and finally, conclusion and policy implications.

2. The trend of External debt and twin deficit in Egypt

Figure (1) shows the evolution of external debt, budget deficit, and current account deficit as a percentage of GDP from Q1 2006 till Q3 2022. The appendix gives graphs of the initial values of external debt and GDP. External debt experienced a declining trend till Q1 2010/2011. The appointment of the new cabinet led by Prime Minister Nazif in July 2004 helped reduce the country's debt burden, enhancing the debt-to-GDP ratio to decrease from 111% in Q1 2005/2006 to 64% in Q1 2008/2009. After the global financial crisis, the Egyptian industrial sector exports, including textiles and consumer goods, witnessed a sharp decline (after continuous growth since 2006) due to the decrease in imports from the main export destinations - USA and E.U. (African Development Bank, 2009). The

0.78% surplus of Q1 2007/2008 turned to a deficit of 0.88% in Q1 2009/2010 [(2)]. The budget deficit in Egypt increased from 5.9% in Q1 2005/2006 to 6.8% in Q1 2008/2009.

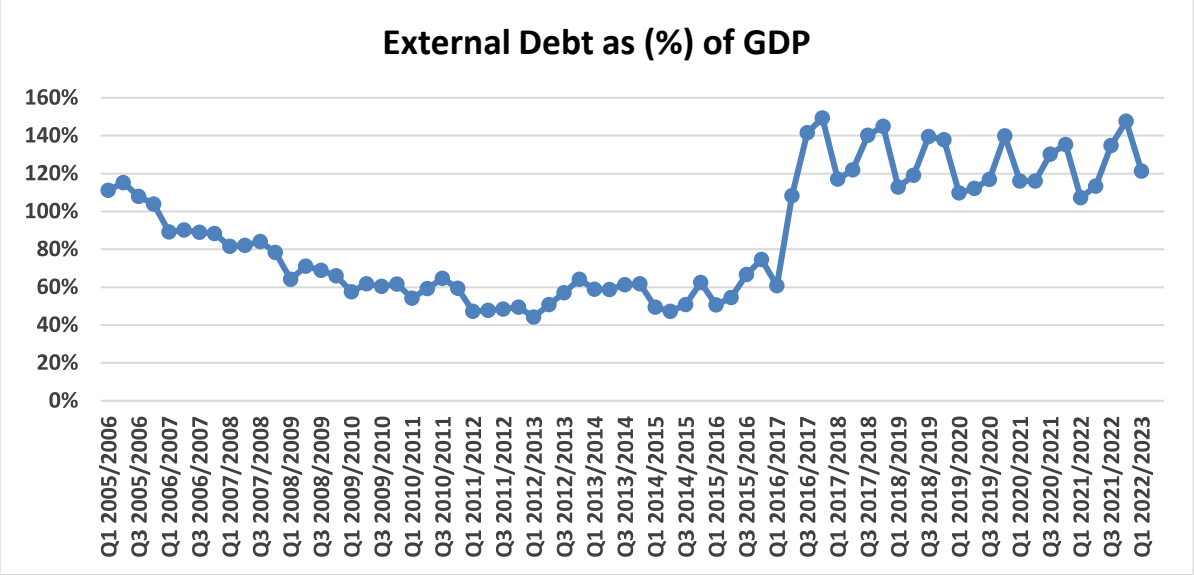
Since the Egyptian uprising in 2011, the problem of public debt has been aggravated by low GDP growth, large fiscal deficits, external debt, and exchange rates (IMF, 2015). Taxes were affected seriously due to the economic downturn and the budget deficit recorded its highest level in Q3 2012/2013 (21%). At the same time, the current account deficit has widened sharply due to declining tourism revenue and the effects of weak manufacturing and hydrocarbon exports, consequently, the current account deficit widened to reach -4.55% in Q3 2011/2012. The situation improved thereafter; it reached a surplus of 0.67% in Q1 2013/2014. External debt increased slightly from 47% in Q1 2011/2012 to 49% in Q1 2013/2014.

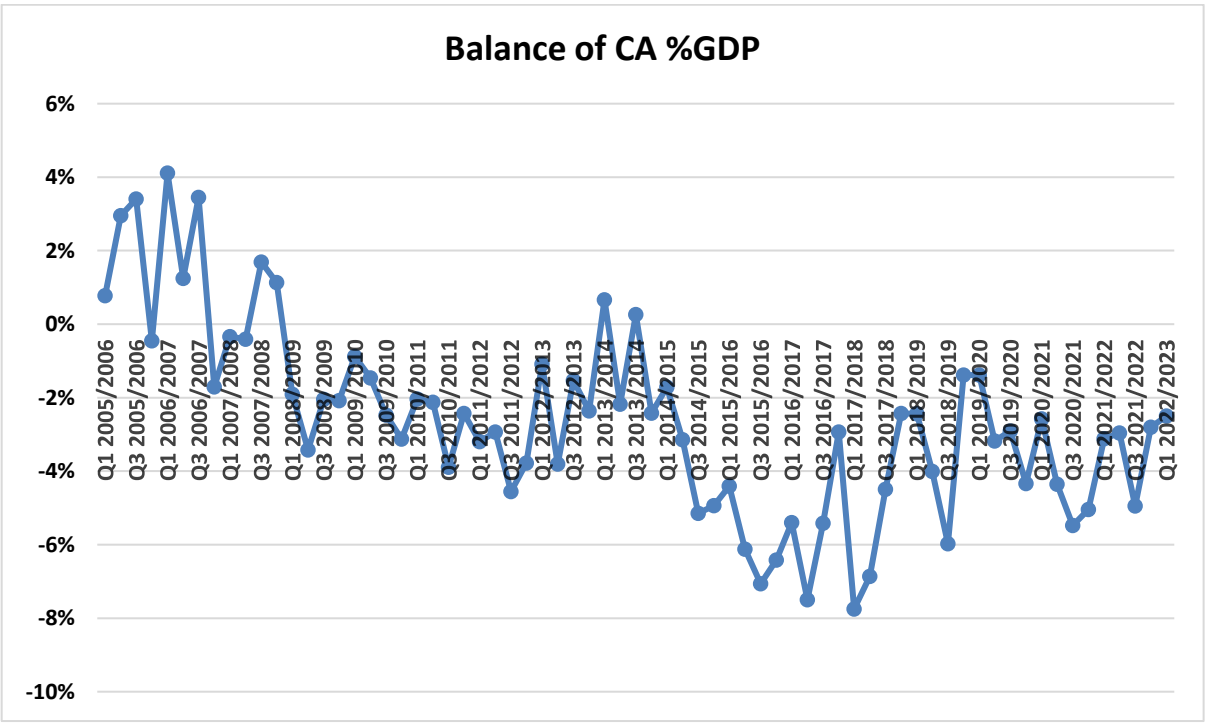
With limited sources of foreign currency and the surge in external debt, the external position of Egypt has been deteriorating. In November 2016, Egypt concluded an agreement with the International Monetary Fund (IMF) and implemented a floatation of the Egyptian pound as a result Egypt's external debt increased significantly. This was accompanied by increased external borrowing from the IMF's Extended Fund Facility, along with the associated financing package from the World Bank, and African Development Bank as well as other bilateral partners (such as the GCC) and the international Eurobond issuances (Alnashar, 2019). The external debt GDP ratio nearly doubled from 60 % in Q1 2016/2017 to 117% in Q1 2017/2018. The float also intensified the current account deficit from -4.4 % in Q1 2015/2016 to -7.75 % in Q1 2017/2018.

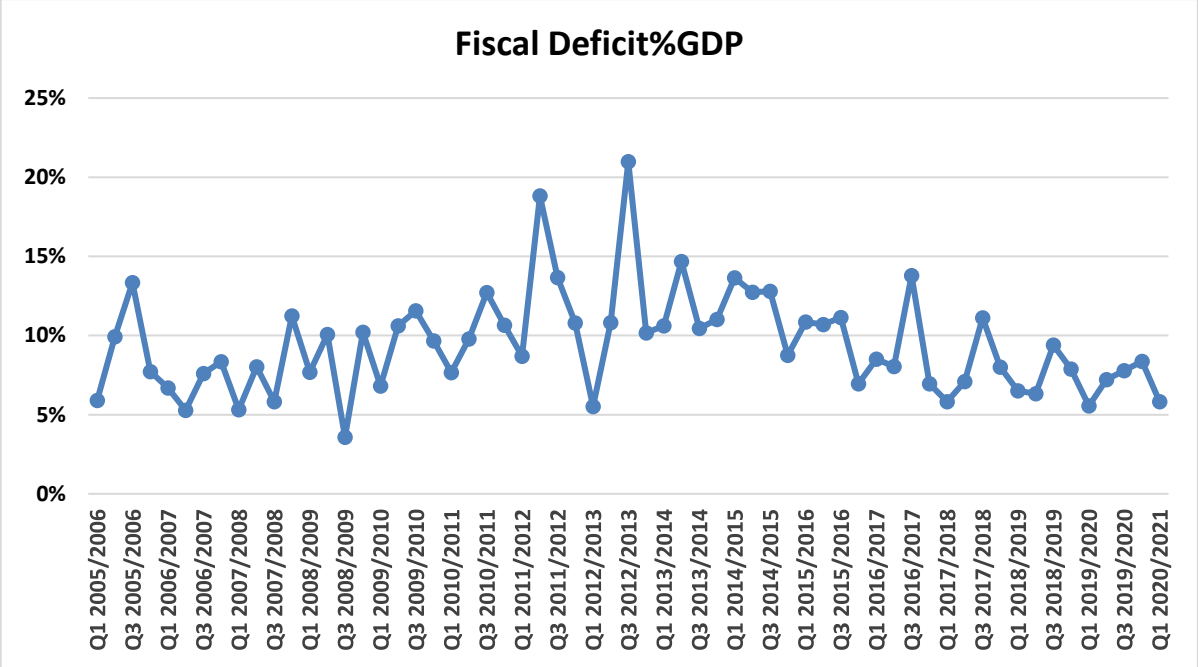
Between Q1 2014/2015 and Q1 2017/2018, the fiscal deficit experienced a declining trend (from 13.6 % to 5.8 %). This is related to decreasing energy subsidies in 2013/2014 and to the Tax Reform Program applied in 2014 that includes (a) broadening of the tax base, (b) tax on property, (c) 10 % tax on capital gains and dividends, (d) additional 5 % tax on incomes exceeding EGP 1 million of physical persons and corporate bodies, (e) increase in taxes on alcohol (+200% average) and cigarettes (+50%) (EEDC, 2015: 11-14).

[(2)] Note that governments, around the world, have engaged in active fiscal policies characterized by a significant increase in the budget deficit, in response to the effects of the 2008 global crisis sparked by problems of funding and liquidity that began in the U.S. and transmitted around the world.

Figure (1): External debt, current account, fiscal deficit as a percentage of GDP (Q1 2005/2006-Q1 2022/2023)







Source: author's calculation using data from the Central Bank of Egypt Website

At the outset of the COVID-19 crisis, foreign reserves started depleting rapidly, due to large-scale portfolio outflows, the drop in tourism receipts and decreasing merchandise export proceeds, and the decline in Suez Canal revenues, in tandem with the disrupted international trade. To relieve the immediate Balance of Payments (BoP) pressures, Egypt issued a US$5 billion sovereign Eurobond and sought a stopgap loan under the IMF's Rapid Financing Instrument (RFI) worth US$2.8 billion, as well as a subsequent Stand-By Arrangement (SBA) worth US$5.2 billion. In addition, Egypt borrowed US$2 billion from a UAE-led commercial bank consortium (Al Nashar et al., 2020). In this regard, the fiscal deficit increased from 5.5% in Q1 2019/2020 to 8.3% in Q4 2019/2020 [(3)]. The current account deficit increased from -1.4% in Q1 2019/2020 to -2.5% in Q1 2022/2023 and the external debt ratio increased sharply at first from 110% in Q1 2019/2020 to 121% in Q1 2022/2023.

3. Literature Review

The twin deficit hypothesis proposes that there is a causal relationship between the fiscal deficit and the current account deficit. It derived its basis from the national income identity (NII), which is obtained from the Keynesian spending equation, and penned on the Mundell-Fleming model:

$$CA = (Spr - Ipr) + (Sg - Ig) \quad (1)$$

[(3)] The last data point available for fiscal deficit.

Where CA is the current account, Spr and Ipr are private savings and investment, respectively; and Sg and Ig are government savings and investment. Sg – Ig is equivalent to the fiscal balance (Thompson et al., 2021).

Many studies tested the twin deficit hypothesis in Egypt and accepted the reverse causality hypothesis which reveals that there exists unidirectional causality from the current account deficit to the budget deficit. In the description of this outcome, a deterioration in the current account position leads to a slowdown in economic growth which results in a budget deficit. Only Mostafa (2021) found that twin divergence holds in Egypt between 1980 and 2018, this means that the increase in budget deficit leads to an improvement in the current account. The summarized literature review is given in Table (1) which includes two groups of research; the first group analyzes the twin deficit hypothesis, and the second group concerns studies that analyze the effect of internal and external imbalances on external debt.

Table (1): Summarized literature review

Studies analyzing the twin deficit hypothesis				
Author(s) [Year]	**Methodology**	**Country**	**Variables (Period)**	**Summary of Results**
Khalid Abdelhamid Hasanin [2022]	ARDL, Granger's causality test	**Egypt**	Budget deficit, GDP, and Trade balance deficit (1975-2020)	- There is a unidirectional causal relationship going from the trade balance deficit to the budget deficit. - There is an inverse relationship between budget deficit and Trade balance deficit in the long run. - Refusing the twin deficit hypothesis in Egypt, and the acceptance of the reverse causality hypothesis.
Eman Mohamed Abd Al-latif Mostafa [2021]	Granger's causality test, Akaike criteria, ADF, and VECM	**Egypt**	(1980-2018) GDP, Budget deficit, Current Account, Real Exchange rate, Real interest rate, and GDP growth rate	- There is a positive relationship between current account balance, Budget deficit, and Real interest rate. - The increase in Budget deficit causes an improvement in the current account in the long run. - The Twin deficit hypothesis isn't accepted in Egypt and there is a twin divergence which means that the increase in budget deficit leads to an improvement in the current account.
Mohamed Sayed Abed [2020]	ARDL, Toda, and Yamamoto causality test	**Egypt**	Current Account deficit, Budget Deficit, Domestic Saving, and Domestic Investment (as a percentage of GDP) (1974-2018)	- The rejection of the Twin Deficit hypothesis and the confirmation of a reverse twin deficit in Egypt during the period of the study. - Policymakers in Egypt should target the Current Account deficit to support fiscal consolidation in Egypt (reducing Budget Deficit as a ratio of GDP)

Shereen Adel Noseir (2019)	Cointegration test & ARDL model & Granger causality test	**Egypt**	(1977-2015) Current account deficit, budget deficit (as a percentage of GDP), exchange rate, interest rate & gross capital formation.	- External deficit & internal deficit are cointegrated. - Long-run analysis reveals that budget deficit had a positive effect on current account deficit & current account deficit had a positive effect on budget deficit. - The causality test revealed that the current account deficit causes a budget deficit (reverse causality hypothesis).
Nashwa Abd Rabboh [2019]	ARDL, Granger's causality test	**Egypt**	(1975-2018) Budget Deficit, Current Account, GDP, Real Exchange rate, Real interest rate, and Trade openness (X+M)	- There is a unidirectional causal relationship going from the current account deficit to the budget deficit (reverse causality). - There is a direct relationship between budget deficit and Current Account deficit in the short run. - Policymakers in Egypt should target the Current Account deficit
Omneia Helmy and Chahir Zaki (2017)	Granger causality test and an error-correction mode	**Egypt**	2002-2014 current account (% of GDP and level), budget deficit (% of GDP and level), and real quarterly GDP per capita	The twin deficit hypothesis is rejected and a reversed causality running from the current account to the budget deficit exists. This is chiefly attributed to the fact that Egypt relies more on domestic sources to finance its deficit rather than external sources.
Ibhagui (2018)	fixed effects, generalized methods of moments, pooled mean group, and dynamic fixed effects models.	**panel data samples of Sub-Saharan African countries**	1985 -2013 Gross external debt, Real effective exchange rate, current account balance, openness (X+M)	External debt expands current account deficits when countries have high openness to trade, with the direction of trade tilting more towards imports.
Studies analyzing the relationship between the twin deficit & external debt				
Smita Nath (2021)	Co-integration, Error correction model and Granger causality.	**India**	(1970-2019) Debt GDP ratio, current account balance, fiscal deficit.	-Regarding the twin deficit hypothesis, the analysis indicates a unidirectional Granger causality running from fiscal deficit to current account deficit in the short run. -There is a unidirectional causality running from fiscal deficit to debt-GDP ratio & from current account balance to debt-GDP ratio. -Current account balance has a negative impact on the debt-GDP ratio in the short as well as the long run. -Fiscal deficit affects the debt-GDP ratio positively in the short run whereas negatively in the long run.
Daniel & Ibrahim (2021)	Error Correction Mechanism; Granger causality	**Nigeria**	1981-2019 gross domestic product, degree of openness, exchange rate	- Fiscal deficit is not a significant determinant of external debt in Nigeria. There is causality flowing from budget deficit and degree of openness as well as budget deficit and gross domestic product

Al-Banna, Sayed Taha & Hossam Gamil (2020)	ARDL, Bound test, ECM	**Jordan**	External debt, Budget deficit, GDP, inflation rate, interest rate (1980-2018)	- There is a positive relationship between (External debt, inflation, interest rate) & (After-aid Budget deficit)
Rossanta Dwi Handoyo, Angga Erlando, Nita Tri Astutik (2020)	The ARDL method, EWS method.	**Indonesia**	Short-term foreign exchange reserves, debt-total external debt, inflation, IMF- GDP credit, and domestic – GDP.	- There is a positive relationship between budget deficit & the long-term current account deficit, while a negative correlation was observed in the short term. - The current account deficit was not a leading indicator of the debt crisis. - Exports & real GDP growth are not appropriate for demonstrating the debt crisis. - Inflation & IMF-GDP credit were leading indicators for the debt crisis.
Manal Gaber Morsi (2020)	Granger's causality test, and Johansen and Juselius test	**Egypt**	1990-2019 External Debt, exports, GDP, inflation rate, exchange rate, money aggregate (M2), total monetary reserves, external loans as a ratio of GDP.	There is an inverse unidirectional causal relationship between Exports and External Debt.
Sara B. Alnashar (2019)	Vector-Autoregression analysis	**Egypt**	(quarterly data for FY 2004/05—FY 2016/17) Primary deficit, public business sector borrowing, interest rate, exchange rate, and government debt.	Primary deficit and exchange rate depreciations have been the leading causes of debt accumulation in Egypt.
Dissanayake (2016)	VAR Granger causality	**Sri Lanka**	1980-2014 -Budget Deficit as a % of GDP, rate of inflation, exchange rate. -Real GDP growth rate -debt (as % of GDP	There was a unidirectional relationship between the budget deficit and debt. The budget deficit Granger causes debt (sum of cumulative domestic debt and foreign debt).

Empirical studies neglected to address the relationship between twin deficits and external debt. Indeed, previous research focused on the causal relationship between fiscal deficit and current account deficit. To the best of our knowledge, no studies analyzed the effect of external and internal imbalances on external debt in Egypt, therefore, this research aims to address this topic using a recent data set.

4. Theoretical background:

Over the last four decades, the external debt of many developing countries has risen dramatically due to chronic current account problems, lack of capital,

and fiscal imbalances (Beyene and Kotosz, 2020). Therefore, foreign debt is needed to cover three deficits, namely the gap in investment savings, the budget deficit, and the current account deficit.

4.1. Budget deficit and external debt

In the face of public deficits, governments either resort to money creation or external and domestic financing. If options are available, the choice boils down to cost and risk. The budget deficit can be covered directly by money creation by the central bank or, more generally, by increased credit by the banking system. The direct cost can be minimal, or even nil, but macroeconomic risks are substantial. Excessive monetary financing results in excess overall demand, which, in turn, translates into inflation or, under a fixed exchange rate, pressure on the balance of payments.

The second option involves domestic borrowing from the banking system and the private sector, this requires a relatively well-developed financial intermediation system. It reduces inflationary pressures and the risk of external debt crises. However, it tends to have a crowding-out effect on private investment and thus penalize growth. External borrowing often appears attractive because of lesser crowding out on private investment and reduced risks of inflationary pressures (Beaugrand et al., 2002).

4.2. Budget deficit, current account deficit, and external debt

A country that does not generate sufficient savings to finance its investment needs must attract surplus foreign savings, in the form of a capital inflow. Such a country records negative net foreign asset purchases, or equivalently, is a net borrower from the world.

Using national income accounting, we can demonstrate how the equivalence of the current account balance and net capital inflows arises. Specifically, the national income accounts treat gross national product (GNP) as the sum of income derived from producing goods and services under the following categories: private consumption (C), private investment (I p), government goods and services (G), and exports (X). Imports (M) are treated as negative to avoid the double counting of consumption or investment goods purchased at home but produced abroad (Higgins & Klitgaard, 1998). Thus, GNP is given by:

$$GNP = C + Ip + G + X - M$$

X - M represents net exports plus net factor income. The current account includes imports and exports of goods and services, net payments for factor

services such as interest paid on securities, and profits from foreign direct investment.

A second basic equation in the national income accounts is based on the insight that any income received by individuals also has four possible uses: it can be consumed (C), saved (S p, for private savings), paid in taxes (T), or transferred abroad (Tr). Because GNP is simply the sum of the income received by all individuals in the economy:

GNP = C + S p + T + Tr.

By equating the two expressions for GNP developed above, canceling out C, and rearranging terms, we derive the following equation:

X - M - Tr = (S p - I p) + (T - G),

with X - M - Tr equaling the current account.

In other words, the current account balance equals the surplus/deficit of private savings over investment and the gap between government tax receipts and government expenditure on goods and services, that is, the government budget surplus/deficit.

A final equation is needed to clarify the link between the current account balance and the net flow of foreign investment capital. Savings can be classified according to the type of asset it buys, it can be used to purchase domestic physical capital, domestic government debt, or a sort of foreign asset (FA). Recalling that net issuance of government debt is equal to the government budget deficit, G - T, we have:

S p = I p + (G - T) + FA.

Rearranging, we have

FA = (S p - I p) + (G - T) → FA = X - M.

This last equation represents that a country is a net borrower from the rest of the world when domestic private savings are less than private investment spending plus the government budget deficit.

5. Empirical Model

While the link between a country's fiscal deficit and current account deficit [4] has been frequently scrutinized, much less has been written on the link between its external debt and both deficits. Therefore, to test the hypothesis that current account deficit and budget deficit increase external debt, several methods are utilized.

[4] In our empirical application, we use data for the current account and not for the trade balance since it helps not to estimate an identity.

As a preliminary step, the stationarity properties of the data are investigated using the Augmented Dickey-Fuller (ADF) in addition to the break unit root test. If the variables were found stationary at level, the traditional Granger non-causality test is utilized, however, if some variables were stationary at first difference, the modified procedure of Toda and Yamamoto (1995) will be used. As some of the variables used are stationary at level and others are stationary at first difference, the non-Granger causality test of Toda and Yamamoto is used as it avoids the problems associated with the ordinary Granger causality test when the series are non-stationary. The basic idea of the Toda and Yamamoto approach is to augment the correct VAR order (p) by the maximal order of integration of the variables (m), and then estimate the augmented VAR that guarantees the asymptotic distribution of the Wald statistics. Three stages are involved in implementing those procedures. The *first* stage is to determine the maximum order of integration (m) of the variables in the system. The ***second*** stage involves estimating a Vector Auto-Regressive (VAR) model of the variables at levels with the optimal lag length determined based on the Akaike Information Criterion (AIC). Subsequently, we make sure that the VAR is well-specified. [5] In the ***third*** stage, the favored VAR model is constructed, and additional m lags of each variable are inserted into each equation. The modified Wald procedure has been used to test the VAR (k) model for causality where k = (p + m).

After testing for causality, the ARDL model is estimated. This method was developed by Pesaran et al. (2001), it possesses a set of advantages in contrast with several other cointegration test methods as it does not require all variables to be stationary at the specified level and it also allows for varying optimal lags on each variable (Litsios and Pilbeam, 2017). Moreover, the ARDL framework includes testing for the existence of the short and long-run relationship among the variables. If cointegration existed based on the bound test, then the following step is to estimate the long and short-run coefficients (Pesaran et al., 2001). A check for serial correlation is performed using the Breusch–Godfrey serial correlation LM test, and finally, the stability of the model is investigated by the CUSUM test. Perron (1989) showed that failure to allow for an existing break leads to a bias that reduces the ability to reject a false unit root null hypothesis. To overcome this, Perron proposed allowing for a known or exogenous structural break in the ADF tests. Therefore, a modified Dickey-Fuller test which allows for levels and

[5] The VAR residual LM test is used to check for autocorrelation and the estimated model is checked for the stability conditions by finding the inverse root.

trends that differ across a single break date is utilized. The testing framework follows the work of Perron (1989) and Vogelsang and Perron (1998). This is important for this research as the study period contains several structural breaks including the 2008 global financial crisis and January 25th, 2011, revolution, and its aftermath. Egypt has entered a period of greater political stability after the government adopted an IMF-sponsored multi-year stabilization program in late 2016. The implemented reform required a significant policy adjustment anchored by the liberalization of the foreign exchange market. The COVID-19 pandemic in 2020, and the negative repercussions of the Russian invasion of Ukraine in 2021 represented new challenges. Therefore, an additional model will be estimated using the Break least square method that allows for structural breaks during the study period.

5.1. Variables & Data Sources

Quarterly data is used from 2006 to 2022 on the current account, budget deficit, and external debt from the Central Bank of Egypt website. Those variables are utilized as a percentage of GDP (calculated by authors using GDP data from the same source) GDP growth data is from the Ministry of Planning and Economic Development. Using quarterly data helps to capture the internal and external challenges that faced Egypt during the study period.

5.2. *Model Specification*

According to Waheed & Abbas (2021), economic growth (GDP) is one of the most important determinants of external debt, therefore real GDP growth rate will be included in the model. Fisera et al. (2021) added that utilizing floating exchange rates will contribute to a greater increase in external debt burden over the long-term following currency depreciation. The floatation in the Egyptian pound in November 2016 necessitates including a dummy variable that takes the value 1 from Q4 2016 to Q3 2022.

Based on the model introduced by Nath (2021) analyzing the effect of fiscal deficit and current account deficit on external debt in India, the dependent variable is the external debt as a percentage of GDP (EXT/GDP), and the independent variables include current account as a percentage of GDP and fiscal deficit as a percentage of GDP, in addition to real GDP growth rate (GDP gr) and exchange rate dummy (ERD). The function has the following form:

EXT/GDP= F (CA/GDP, FD/GDP, GDP gr, ERD)

The review of economic literature reveals that both fiscal deficit and current account deficit are expected to increase external debt. Therefore, we

expect that the coefficient of FD/GDP will be positive, and that of CA/GDP will be negative.

5.3. Empirical Results

5.3.1. Unit root test

The results of the ADF test revealed that both CA/GDP and GDP gr were stationary at level, while EXT/GDP and FD/GDP are stationary at first difference as shown in Table (2). The break unit root test showed that EXT/GDP is stationary with a structural break in Q3 2016 which is compatible with the timing of the floatation of the Egyptian pound. FD/GDP is stationary according to the break unit root test with a structural break in Q1 2012 which is compatible with the Egyptian revolution in 2011 as shown in Table (2).

Table (2): ADF Unit Root Test

	Intercept	**Trend**	**Break Unit root test**	
			Breakpoint test statistic	Break date
EXT/GDP	-0.83	-2.13	-8.057***	Q3 2016
D(EXT/GDP)	-3.311**	-3.45*		
CA/GDP	-4.20***	-4.9***		
FD/GDP	-1.7	-1.09	-7.708***	Q1 2012
D(FD/GDP)	-10.69***	-7.9***		
GDPgr	-3.79***	-3.76**		

*** 1% symbolizes the significance at the 1 % level. ** symbolizes the significance at 5%. * symbolizes the significance at 10%.

5.3.2. Causality test

The second step concerning the Toda and Yamamoto causality test established the existence of causality running from CA/GDP to EXT/GDP as illustrated in Table (3). The null hypothesis of no causality from FD/GDP to EXT/GDP cannot be rejected. It was apparent that no causality was found between CA/GDP and FA/GDP in either direction, this may be due to the aforementioned breaks that the Egyptian economy experienced that may result in contradicting effects before and after the break date.

Table (3). Toda- Yamamoto VAR Granger non-causality test (2006-2022)

Null Hypothesis	***Chi-square***	***Direction of causality***
EXT/GDP does not granger cause CA/GDP	***6.558644***	***none***
CA/GDP does not granger cause EXT/GDP	***14.25911****	***CA/GDP causes EXT/GDP***
EXT/GDP does not granger cause FD/GDP	***5.384395***	***none***
FD/GDP does not granger cause EXT/GDP	***0.3662***	***none***
FD/GDP does not granger cause CA/GDP	***3.483910***	***none***
CA/GDP does not granger cause FD/GDP	***0.931443***	***none***

****, **, * indicates rejection of the null hypothesis at 1% , 5% and 10% significance level respectively.*

5.3.3. ARDL model results

After conducting the causality test, the ARDL model was estimated using Eviews 9, after ensuring that all utilized variables were stationary either at level or at first difference. The optimum lagged order was ARDL (4,4,0,0). The bound test results ensured cointegration, as the value of the test statistic exceeded the upper critical bound value. The results of the Breusch–Godfrey serial correlation LM test ensured the absence of serial correlation. The estimated model was stable as revealed by the CUSUM test. Table 3 presents the results of the error correction model (ECM) and the long-run coefficients. In the short run, FD/GDP had a weak negative effect on EXT/GDP, that effect turned out to be positive in the long run (a 1% increase in FD/GDP leads to a 5% increase in EXT/GDP). The effect of CA/GDP is also significant in the long run (a 1 % increase in CA/GDP leads to a decrease in EXT/GDP by 2.7%). The absolute value of the long-run coefficient of FD/GDP is higher than that of CA/GDP. The CA surplus will result in decreasing external debt both in the short and long run. The speed of adjustment is 0.7, so about two quarters or even less are needed for long-run equilibrium to be attained as shown in Table (4). The results reveal that we can accept the first two hypotheses of our research as the CA surplus decreases external debt and FD increases external debt, but this is apparent in the long run.

Table (4). ARDL (4,4,0,0) [Dependent variable: EXT/GDP]

Short-run Coefficients (2006-2022)		**Long-run Coefficients**	
D(EXT/GDP)(-1)	**-0.05**	**FD/GDP**	**5.07*** (1)**
D(EXT /GDP)(-2)	**-0.31*****	**CA/GDP**	**-2.7***
D(EXT/GDP)(-3)	**-0.388*****	**GDP gr**	**-0.46**
D(FD/GDP)(-1)	**0.07**	**Trend**	**-0.0137*****
D(FD/GDP)(-2)	**-2.18*****		
D(FD/GDP)(-3)	**-1.53** ***	**R^2**	**0.957**
D(FD/GDP)(-4)	**-0.8****	**Prob. F. LM test**	**0.3188**
Dum(2016_2022)	**0.57*****		
Coint. Eq(-1)	**-0.495*****		

(1) PVALUE = 0.055. *The White coefficient covariance matrix is applied.*

5.3.4. Break least square model (BLS)

As the study period includes many political and economic events that may have contradicting effects on the study variables [(6)], the BLS model with structural breaks and time-varying setting could capture a clearer picture of the relationship. This method allows the mean to be time-varying with different values, cj, where

[(6)] the break unit root test confirms the existence of structural breaks in the utilized variables.

j = 1, ⋯ , M, M is the number of segments in terms of distinguishing values of the mean. The least square method can be employed to obtain the best-fitted values in each segment with the dates of breaks. This study employs the Bai and Perron method for detecting multiple structural breaks which allows testing for multiple breaks at unknown dates. To identify the breaking points, a maximum number of breaks, L max, is set at 2, and 15 % trimming percentage.

Table (5) reports the multiple breaks in the link between EXT/GDP and both CA/GDP and BD/GDP. The first break was identified in 2009 Q2, signifying the lagging effect of the global financial crisis of 2008, the second break occurred in 2016 Q4 which is related to the floatation of the Egyptian pound.

Between 2006 and 2009, there was a positive significant relationship between the budget deficit and current account deficit on the one hand and external debt on the other hand.

Table (5) illustrates that there is a weak negative association between budget deficit and external debt during the period 2009Q3 - 2016Q3 (a 1% increase in budget deficit leads to a 0.8 % decrease in external debt). This can be explained by the fact that Egypt relied on foreign currency from tourism and FDIs before the Egyptian revolution in 2011, while after the revolution, there was a noticeable decrease in foreign currency that caused an increase in external debt. The share of external debt of overall public debt has experienced an increasing trend since 2014/15 signifying a shift from domestic to foreign debt. At the same time, reducing energy subsidies and implementing tax reform resulted in a slight reduction in the budget deficit.

In 2017, external debt saw a peak in growth rates due to the floatation of the Egyptian pound and the increase in external borrowing from the IMF. This structural break is reflected in the period 2016 Q4 – 2021 Q4. During this period, the fiscal deficit reinforced external debt while the current account deficit had an insignificant effect. An increase in BD/GDP of 1% was associated with a 5.8% increase in ED/GDP.

Table (5): Breal Least Square

Dependent Variable: PERC_EXTERNAL_DEBT
Method: Least Squares with Breaks
Sample (adjusted): 2006Q3 2021Q4
Included observations: 62 after adjustments
Break Type: Bai-Perron tests of L+1 vs. L sequentially determined breaks
Break selection: Trimming 0.15, Max. breaks 2, Sig. level 0.05
Breaks: 2009Q3, 2016Q4
Allow heterogeneous error distributions across breaks

Variable	Coefficient	Std. Error	t-Statistic	Prob.
2006Q3 - 2009Q2 -- 12 obs				
PERC_CA	3.704120	0.924891	4.004925	0.0002
PERC_FISCAL_DEFICIT	1.606975	0.603048	2.664755	0.0101
2009Q3 - 2016Q3 -- 29 obs				
PERC_CA	0.220421	0.828142	0.266163	0.7911
PERC_FISCAL_DEFICIT	-0.816471	0.383191	-2.130718	0.0377
2016Q4 - 2021Q4 -- 21 obs				
PERC_CA	-2.090862	1.369945	-1.526238	0.1328
PERC_FISCAL_DEFICIT	5.807467	0.794723	7.307538	0.0000
Non-Breaking Variables				
C	0.674417	0.049874	13.52229	0.0000
PERC_GDP_GR	-0.001330	0.656624	-0.002025	0.9984

R-squared	0.913660	Mean dependent var	0.843228
Adjusted R-squared	0.902467	S.D. dependent var	0.323379
S.E. of regression	0.100992	Akaike info criterion	-1.627639
Sum squared resid	0.550765	Schwarz criterion	-1.353170
Log-likelihood	58.45682	Hannan-Quinn criteria.	-1.519876
F-statistic	81.63314	Durbin-Watson stat	1.805163
Prob(F-statistic)	0.000000		

In summary, the results of both the ARDL model and the BLS method are compatible concerning the effect of FD/GDP on external debt. The ARDL model reveals that FD/GDP has a negative impact on EXT/GDP in the short run that turns out to be positive in the long run. The BLS shows that FD/GDP has a negative impact on EXT/GDP during the period (2009Q3 - 2016Q3) and a positive effect during the period (2016 Q4 – 2021 Q4). Also, the significant dummy variable in the ARDL model and the breaks specified by the BLS indicate that the floatation of the Egyptian pound in 2016 had a significant impact on external debt. Therefore, we accept the third hypothesis of this research that structural breaks and different periods result in varying effects of twin deficits on external debt. These results are compatible with those of Nath (2021) and Al Nashar (2019).

6. Conclusion

A wide range of factors contribute to the high external debt burdens in emerging economies, those factors are mainly associated with budget deficits, trade deficits, and saving-investment gaps. For Egypt, the value of external debt more than tripled during the last decade, the fact that made the burden of external debt a matter of great concern to policymakers.

The novelty of this research resides in examining the impact of twin deficits, both budget deficit and trade deficit, on the development of external debt in Egypt during the period (2006-2022). Quarterly data is used to capture several challenges that faced the Egyptian economy during the study period including the global financial crisis (2008), the January 2011 revolution, the floatation of the Egyptian pound in the 4th quarter of 2016, the COVID-19 pandemic in the 1st quarter of 2020 and the Russian invasion of Ukraine in the beginning of 2021.

Analyzing the evolution of external debt and twin deficits, it is apparent that since the political uprising of 2011, the economic performance in Egypt has been poor. Excessive deficits and heavy borrowing to finance that deficit drain out the resources and international reserves. The 2016 floatation was followed by a rise in borrowing from international institutions, such as the IMF, accompanied by growing levels of current account deficit as a percentage of GDP.

Three basic methods were used to analyze the impact of twin deficits on external debt including the causality test, ARDL model, and BLS. The results of the Toda-Yamamoto non-granger causality test indicate the existence of unidirectional causality running from current account balance to external debt as a percentage of GDP. According to the results of the ARDL model, the current account surplus results in reducing external debt both in the short and long run. Fiscal deficit has a weak negative effect on external debt in the short run that turned out to be positive in the long run. In the long run, a 1% increase in FD/GDP leads to a 5% increase in EXT/GDP, while a 1 % increase in CA/GDP leads to a decrease in EXT/GDP by 2.7%. Therefore, we can accept the first two hypotheses of our research. The results of the BLS model show that between 2009 and 2016, the budget deficit had a weak negative effect on external debt. This can be attributed to the slight reduction in the budget deficit during this period after reducing energy subsidies and implementing tax reform that was accompanied by an increase in external borrowing. The budget deficit had a positive effect during the period (2016-2021) revealing that the increasing fiscal deficit increases external debt. Consequently, we accept the third hypothesis of this research which stated

that structural breaks and different periods result in varying effects of twin deficits on external debt. It is important to note that as Abed (2020) asserted, there is a long-term relationship between the two deficits, in which the current account deficit creates a budget deficit, this can help us in suggesting policy recommendations that can reduce external debt.

7. Recommendations and future research

After analyzing the basic drivers of external debt, it is apparent that both fiscal deficit and current account deficit in addition to exchange rate play a major role in debt surges in Egypt. Therefore, the policy implications that follow from this paper highlight the importance of (i) *fiscal policy reforms*; expenditure measures should aim at rationalizing unnecessary spending and enhancing the efficiency and quality of public spending. In this regard, what matters most is not only reducing specific items of government spending but also channeling those funds to productive investments. (ii) *Political stability* is an essential prerequisite for attracting new capital inflows and encouraging the increase in both domestic and foreign investments, this helps to fill the saving-investment gap and reduces the need for borrowing. (iii) *Structural imbalances* in the Egyptian economy need to be addressed to reduce twin deficits and consequently external debt. (iv) *Promoting exports* to narrow the trade deficit, thereby reducing the need to borrow or accumulate debt to finance imports. (v) *Avoiding the large and abrupt depreciation* of currency that results in adverse valuation effects of total government debt, which can be attained through maintaining the exchange rate to be market-determined. Note that in previous practices, increased demand for dollars while overvaluing the domestic currency generated dollar shortages which, in turn, led to a black market for foreign currency and to a general situation of uncertainty that increased the expectations for depreciation and further fueled demand for foreign currency.

Future research is needed to identify several ways to improve the efficiency of government spending and well-developed market analysis to identify potential export opportunities. Also, the impact of the exchange rate policy on the current account needs to be analyzed.

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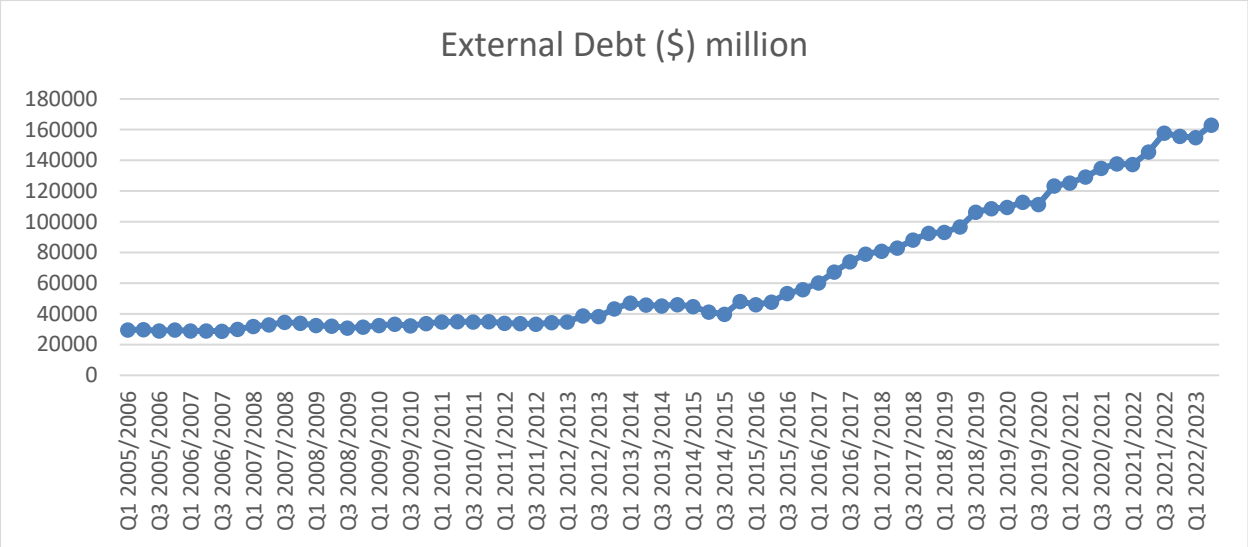
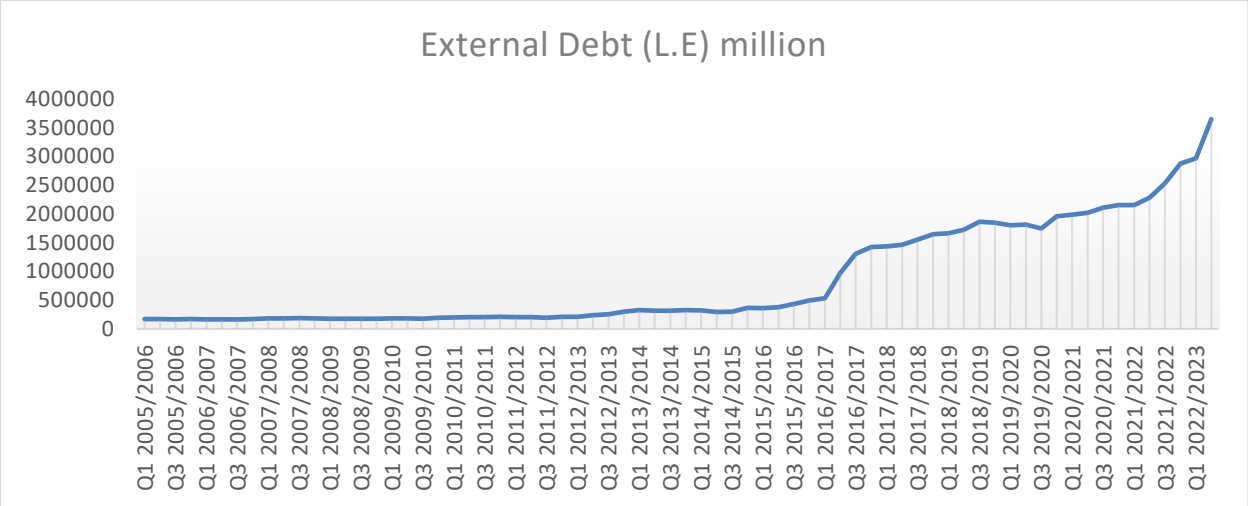
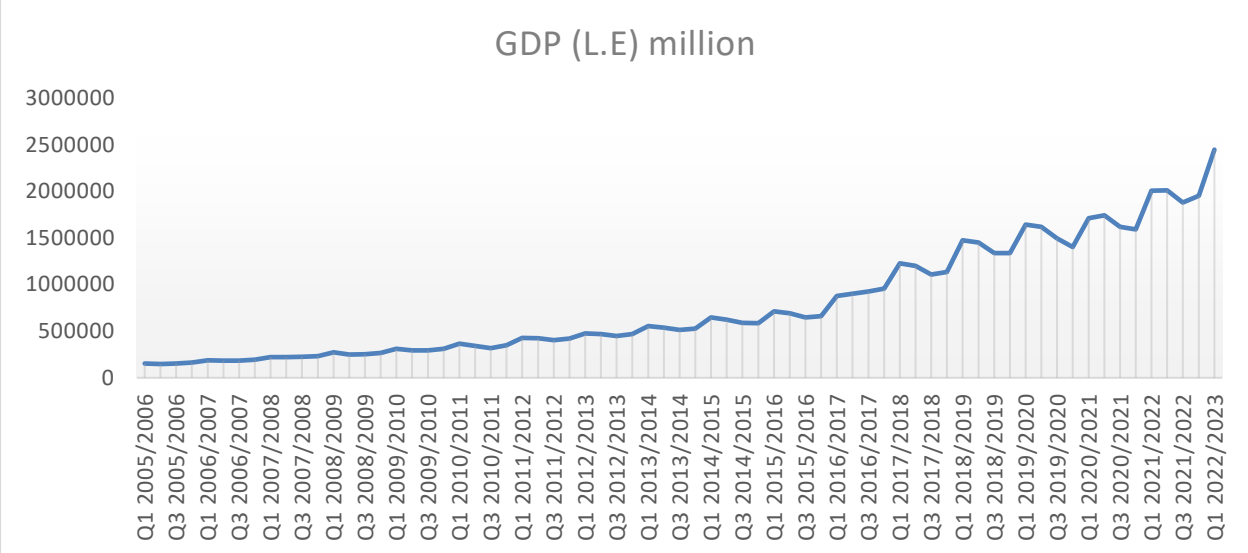
Appendix



Source: Central Bank of Egypt Website



Source: author's calculation using data from Central Bank of Egypt Website



Source: Ministry of Planning and Economic Development .