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By Mohammed I. Abdu

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Egypt Public Debt Dynamic and its' Trajectory Projection

Mohammed I. Abdu

"The views expressed in this Paper are those of the author and do not necessarily represent the organization he works for".

Abstract- **Egypt's general government debt recorded a precarious level at the end of the fiscal year 2015/16 by 103.2% of GDP. Although the economic reform program has succeeded in putting the debt level on a downturn path, the debt level is still high compared to the other middle-income economies countries group and is subject to significant risks. The paper aims to identify the main drivers of the change in Egypt's general government debt as a percentage of the GDP, starting from 1999 to 2019 by using a multiple regression model. Also, the paper reviews the Egyptian public debt trajectory under different scenarios for the upcoming five years (2020 – 2024). The findings of the applied model correspond to the economic theory, as both the previous year debt and exchange rate lead to an increase in the debt level as a percentage of GDP. On the other hand, real GDP growth, interest rate, and the primary balance have a reduction effect. Furthermore, the model is used to forecast the debt level over the medium term under different scenarios. The results show that the debt level as a percentage of GDP is expected to spike in 2020 and then return to the downturn trajectory gradually. Also, the compound shock consisting of the shrink of real GDP growth and exchange rate depreciation will have the most severe effect.**

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I. Introduction

Even before the outbreak of (COVID-19) pandemic, there was an ongoing debate about the accumulation of public debt across the world; since the increasing debt level has become a global phenomenon, not only affecting developing and emerging markets, but also developed countries. However, this increase in debt level raises concerns about whether it could be a harbinger of fiscal crisis. (Badia, Medas & Xiang, 2020)

The United Nations Conference on Trade and Development (UNCTAD) estimated that the ratio of global debt to GDP at the beginning of 2018 was one third higher than that recorded at the beginning of the global financial crisis in 2007/08, and almost four times the global GDP. (Hawkins, Blankenburg & Kozul-Wright, 2019)

Egypt experienced cycles of public debt accumulation over the past decades. The highest record of general government debt as a percentage of GDP over the past two decades was registered in the fiscal year 2016/17 by 103.2%. Due to the longstanding challenges of the Egyptian economy at that time, the Egyptian government has initiated the economic reform program to address the economic challenges including the large budget deficit that leads to the accumulating public debt. (IMF, 2016)

The economic reform program has led to an improvement in macroeconomic indicators. Real GDP grew stably by 5.3% and 5.6% in the fiscal years 2017/18 and 2018/19, respectively, compared to 4.2% in 2016/17, and on average of 3.5% during the fiscal years 2012/13–2015/16. Given the drivers for economic growth, the contributions of both net exports and investment have increased, while the contribution of consumption, which was historically the main driver for economic growth, has decreased. (Arab Republic of Egypt Ministry of Finance [Mof], 2019)

Furthermore, the economic reforms address fiscal imbalances. The applied measures on both revenue and expenditure sides have led to a consecutive decline in the overall balance deficit. Between the fiscal year 2015/16 and 2018/19, the overall balance deficit narrowed by 5.1% to represent 7.4% of GDP, while the primary balance position turned from a deficit to a surplus during the same period.

Together, the robust GDP growth and the improvement in the fiscal situation have led to a gradual decline in the debt level as a percentage to GDP, since the general government debt as a percentage of GDP decreased between the fiscal year 2015/16 and 2018/19 roughly by 13% to become 83.8% in 2018/19.

Despite this notable decline in Egypt's debt to GDP ratio, it is considered to be high and subject to significant risks. The structure of government debt is one of those risks since the external component was growing gradually from 8.2% in the fiscal year 2015/16 to 21.4% in the fiscal year 2018/19; which exposed the government finance to external shocks. Also, the domestic debt has a challenging maturity, since more than one-third of the outstanding debt is issued on a maturity that is less than one year, and hence exposes the government to refinancing risks.

Moreover, the considerable contingent liabilities represent another source of fiscal risk. Apart from the high debt level and risky structure, there are challenges pertaining to government debt management. The institutional setup is fragmented since the responsibility

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of managing the debt is dispersed across the Ministry of finance, the Central bank, and the Ministry of international cooperation, along with limited coordination. Additionally, the slowdown in the momentum of GDP growth could be another source of risk. (World Bank Group [WB], 2019)

This paper examines the different factors that may affect the public debt level as a percentage of GDP over the period from 1999 to 2019. Also, it aims to forecast the trajectory of general government debt as a percentage of GDP on the medium term from 2020 to 2024 under different scenarios. The paper also depicts the magnitude and the dynamic of Egypt's general government debt and its structure.

II. Theoretical Background and Literature Review

This paper uses equation (1) to determine the main drivers of Egypt general government debt ratio to GDP through linking the accumulation of the stock of debt over time to fiscal balance, exchange rate, and other factors (Piscetek, 2019)

The basic formula for the evolution of public debt could be characterized as follows:

$$D_{t+1} = \frac{e_{t+1}}{e_t} * \left(1 + r^f_{t+1}\right) * D^f_t + \left(1 + r^d_{t+1}\right) * D^d_t - (T_{t+1} + G_{t+1} - S_{t+1}) + O_{t+1} + RES_{t+1} \quad (1)$$

Obligations associated with the stock of debt from the previous period

Primary Fiscal Balance

Other one-time factors

This equation is adopted by the IMF debt sustainability analysis tool for market access countries. Where superscript "f", "d" refer to items denominated in foreign and domestic currency, respectively, and subscripts refer to periods. Where (D) is the stock of public debt, (e) is the nominal exchange rate, (r) is the effective nominal interest rate, (T) is the total public sector revenues, (G) is the total grants to the public sectors, (S) is the public expenditures excluding interest payment, (O) is other identified debt-creating flows, and (RES) is a residual ensuring that the identity holds.

To simplify the equation and to measure the debt burden as a ratio of GDP, the previous equation is divided by the GDP and expressed as follows:

$$d_{t+1} = \frac{e_{t+1}}{e_t} * \left(1 + r^f_{t+1}\right) * d^f_t + (1 + r^d_{t+1}) * d^d_t - pb_{t+1} + SFA_{t+1} \quad (2)$$

Where (d) represents the debt as a ratio of GDP, (pb) is the primary balance as a percentage of GDP, and (SFA) is the unidentified residual as a percentage of GDP. (IMF, 2013)

The equation can be further simplified if all debt is assumed to be denominated in local currency and the residual is ignored. So, it will be represented as follows:

$$d_{t+1} = \left(\frac{1+r}{1+g}\right) d_t - pb_{t+1} \quad (3)$$

Where (d) is the stock of debt as a ratio of GDP, (r) is the real interest rate, (g) is the GDP growth, and (pb) is the primary balance as a ratio to GDP. (Cherif & Hasanov, 2012).

Several studies attempted to determine the effects of different factors on the evolution of public debt as a ratio to GDP, while other studies tried to forecast the level of public debt. Abbas, et al. (2013) study analyzed the scale of the problem of public debt in advanced economies, in addition to identifying the factors that drive debt as a percentage of GDP using a sample of 30 advanced economies for the period between 1980 and 2011.The paper found that reducing the debt level requires well designed fiscal consolidation and sustainable GDP growth over the medium term.

Anaya and Pinenkowski (2015) study explained how the prime drivers of public debt interact with each other. The study focused on specific factors; namely, GDP growth, primary balance, interest rate, and inflation. Using a sample of 15 countries, the study found that some interactions aggravate the impact of the shocks leading to debt accumulation, while others stabilize debt dynamics.

Nikoloski's and Nedanovski (2016) study provided an analysis for the Republic of Macedonia debt dynamics and its' structure for 16 years from 2000 to 2016. Also, the study submitted a recommendation to Macedonia policy makers that the borrowed funds should be directed to productive purposes. Otherwise, it might push the country's economy into an unsustainable zone.

Piscetek (2019) study analyzed the effects of four main variables; real interest rate, real GDP growth, exchange rates, and primary balance on the development of New Zealand's public debt ratio to GDP. The study monitored debt dynamics over a decade after the global financial crisis (2008-2018), and introduced a forecast for the period from (2019-2023), in addition to a medium-term projection for the period (2024-2033).

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Regarding the studies that focused on the driver of Egypt public debt and tried to present a forecast to its' trajectory, Alba, Al-shawarby, and Iqbal (2004) aimed in their study to investigate the main drivers for public debt accumulation in Egypt at the beginning of the 21st century, and assessed the sustainability of fiscal trend in that period. Also, the study forecasted the public debt as a percentage to GDP, according to a number of scenarios, for the period from 2004 to 2018.The study found that Egypt's public debt as a percentage to GDP was high compared to other lower middle-income countries in that period. Also, the study indicated that Egypt's debt had been driven by structural factors rather than cyclical factors. Furthermore, the paperargues that fiscal adjustment was needed to sustain the public debt.

The main objective of the study of El-Mahdy and Torayeh (2009) was to analyze and assess whether Egypt's domestic public debt behavior is consistent with a sustainability path. In the same context, the study estimated the impact of some macroeconomic variables on the domestic public debt, it introduced a forecast for the level of domestic public debt as a ratio of GDP for ten years, from 2007 to 2017. Moreover, the study states that a deep fiscal reform and policies to stimulate GDP growth were needed to sustain the debt on the medium term.

Another study by Massoud (2014) that focused on identifying public debt problems in Egypt, introduced a forecast for the level of public debt as a percentage of GDP for the period from 2013 to 2020 under different scenarios. The study's main findings were as follows: Egypt's public debt is expected to be sustainable until 2020; real GDP growth has a positive effect in reducing the debt to GDP ratio; fiscal consolidation is a key factor in reducing debt level.

Alnashar (2019) study has also sought to assess the main drivers of the evolution in Egypt's public debt from the fiscal year 2001/02 till 2016/17 through using two different techniques: first, the debt dynamics decomposition exercise, and second, structural VAR analysis. Furthermore, the study argued that the exchange rate and primary balance have equal importance in the determination of government debt accumulation over the period that the paper covered.

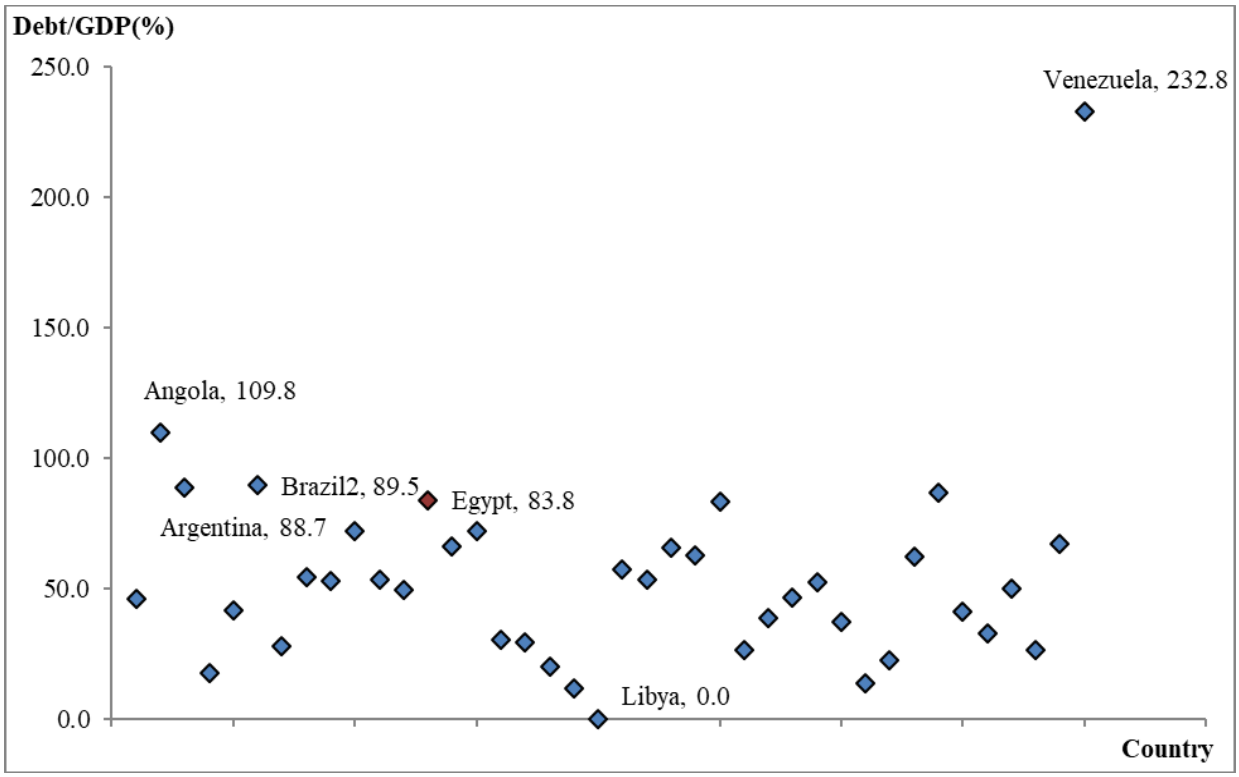
These mentioned studies covered a prior period to the study in our hand, except Alnashar's (2019) study, which monitored an overlapping period with the period covered in this study. However, Alnashar (2019) study was limited to analyzing the factors that influence the debt to GDP ratio, while this study includes a forecast of the debt level as a percentage of GDP for the upcoming five years, from 2020 to 2024.

III. Egypt Government debt: Level, Magnitude, and Structure

a) The level of government debt

Egypt's economic situation has improved significantly after applying the economic reform program that was launched in 2016. The macroeconomic reforms have promoted growth and narrowed the overall deficit, putting public debt on a declining pass (International Monetary Fund [IMF], 2019). However, Egypt's public debt level as a percentage of GDP in 2019, compared to the emerging market and middle-income economies, is still high. This could be seen clearly from the figure (1):

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Source: IMF, Fiscal Monitor, IMF, April 2020

Figure (1): Egypt general government debt compared to the other middle-income economies

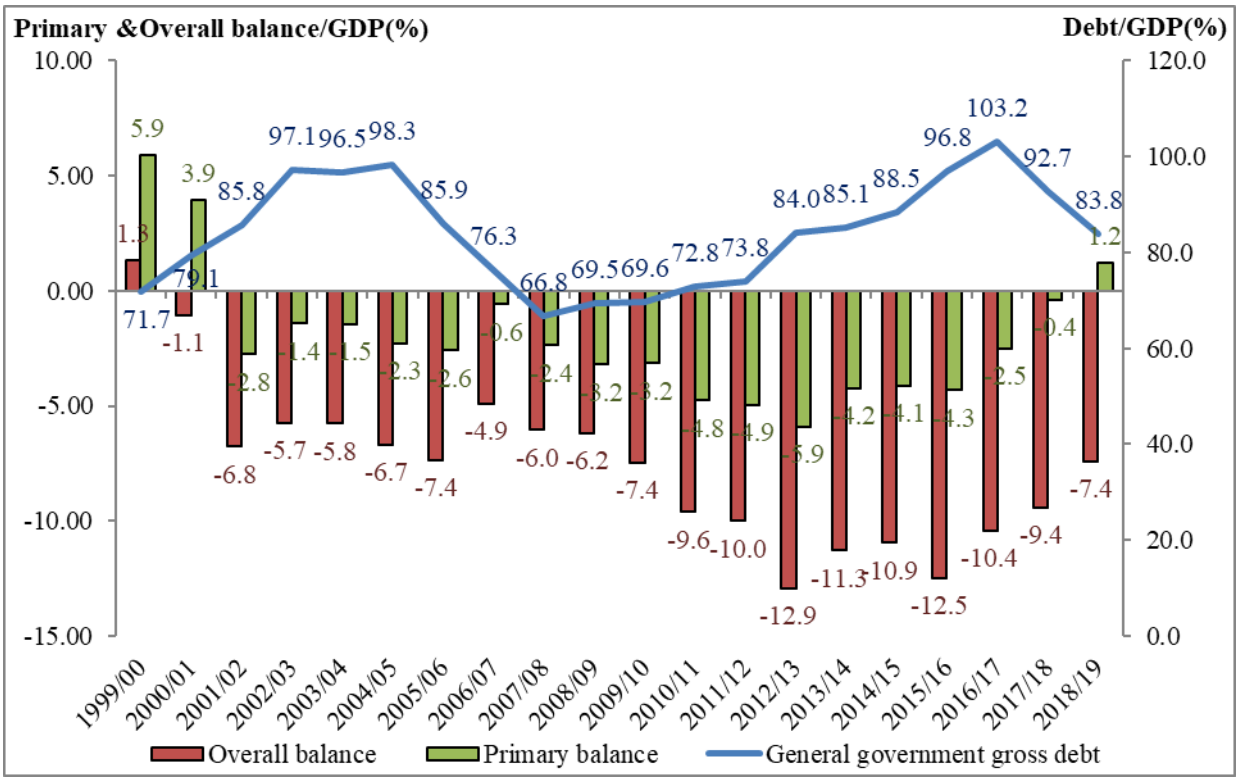
From figure (1), we could see that Egypt is one of those countries which has the highest debt to GDP ratio in the middle-income countries group by 83.8% after Venezuela the Southern American Country which remains in a deep political and economic crisis (Congressional Research Service [CRS], 2020), Angola, the African country that was affected hardly by the long decline in international oil prices (IMF, 2019), Brazil, which experienced notable fiscal deterioration from 2014 to 2017 (Holland, 2019), and Argentina that is grappling with a sharp economic crisis and has a long history of defaulting external debt (CRS, 2020).

b) Egypt general government debt magnitude

Egypt experienced a cycle of public debt accumulation over the past decades. At the end of the fiscal year 2018/19, Egypt government public debt was reported as 83.8% of GDP, 78.6% in domestic currency, and approximately 21.4% in foreign currency.

Public debtis linked to the deficit, and rising public debt could be a consequence of persistent fiscal deficit, since fiscal deficit needs to be financed through debt. Over time, the growth in public debt burden puts additional pressure on the fiscal accounts through the increase in interest payment components, which may lead to a deficit-debt spiral with adverse implications on fiscal stability and economic growth balance to service it (Alba et al., 2004).

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Source: IMF, World Economic Outlook Database, IMF, October 2019
IMF, Fiscal Monitor, IMF, April 2020

Figure (2): Egypt general government debt and overall and primary balance (1999/00 - 2018/19)

Figure (2) shows the level of general government debt, overall and primary balance, as a percentage of GDP over the last two decades. The figure clearly shows that general government debt is correlated to primary and overall balance and that the overall balance has a direct impact on the amount of the debt.

Furthermore, the average of Egypt general government debt over the last two decades was 84.5% of GDP, and reached its peak at the end of fiscal year 2016/17, registering 103.2% of GDP. On the other hand, overall and primary balance registered their maximum deficit by 12.9% and 5.9% of GDP, respectively, by the end of the fiscal year 2012/13 over the monitored two decades.

The Egyptian economy faced adverse conditions at the beginning of the 21st century. Due to the exacerbation of the 11th of September attacks, the region's security problems and world economic slowdown, which resulted in a drop in public revenues and a slowdown in growth (African Development Bank/Organization for Economic Cooperation and Development [AfDB/OECD], 2003). Also, the Central Bank of Egypt (CBE) announced the float of the Egyptian pound (Selim, 2010). As a result of all these events, Egypt's general government debt reached its peak in the first decade of the 21th century registering 98.3% at the end of fiscal year 2004/05. During that period, the government carried several of fiscal and structural reforms. Many laws were introduced, including the new income tax law no. 91 of 2005.The subsidized fuel price was raised twice in 2004 and 2006, and the electricity price increased in 2004. The pace of privatization was accelerated. Also, the government made the economy more open, increased the role of the private sector, and launched a comprehensive reform plan for the financial sector (Alissa, 2007). Those reforms had a positive result, including higher growth rates and a remarkable increase in the inward foreign direct investments. All these mentioned developments have resulted in a decline of the government debt to GDP ratio to reach its' lowest point over the whole monitored period in the end fiscal year 2007/08, registering 66.8%.

Since the fiscal year 2008/09, the general government debt as a ratio to GDP has started to grow gradually, impacted by the consequence of the global financial crisis, and the government, fiscal stimulus package, to counter its' negative impact. This was followed by the economic downturn that Egypt has gone through within the period of political and social instability that has taken place after the 25th of January revolution (Alnashar, 2019) and led to the peak of Egypt government debt as a ratio of GDP in 2016/17.

Since Egypt's adoption of the economic reform program in November 2016, the macroeconomic

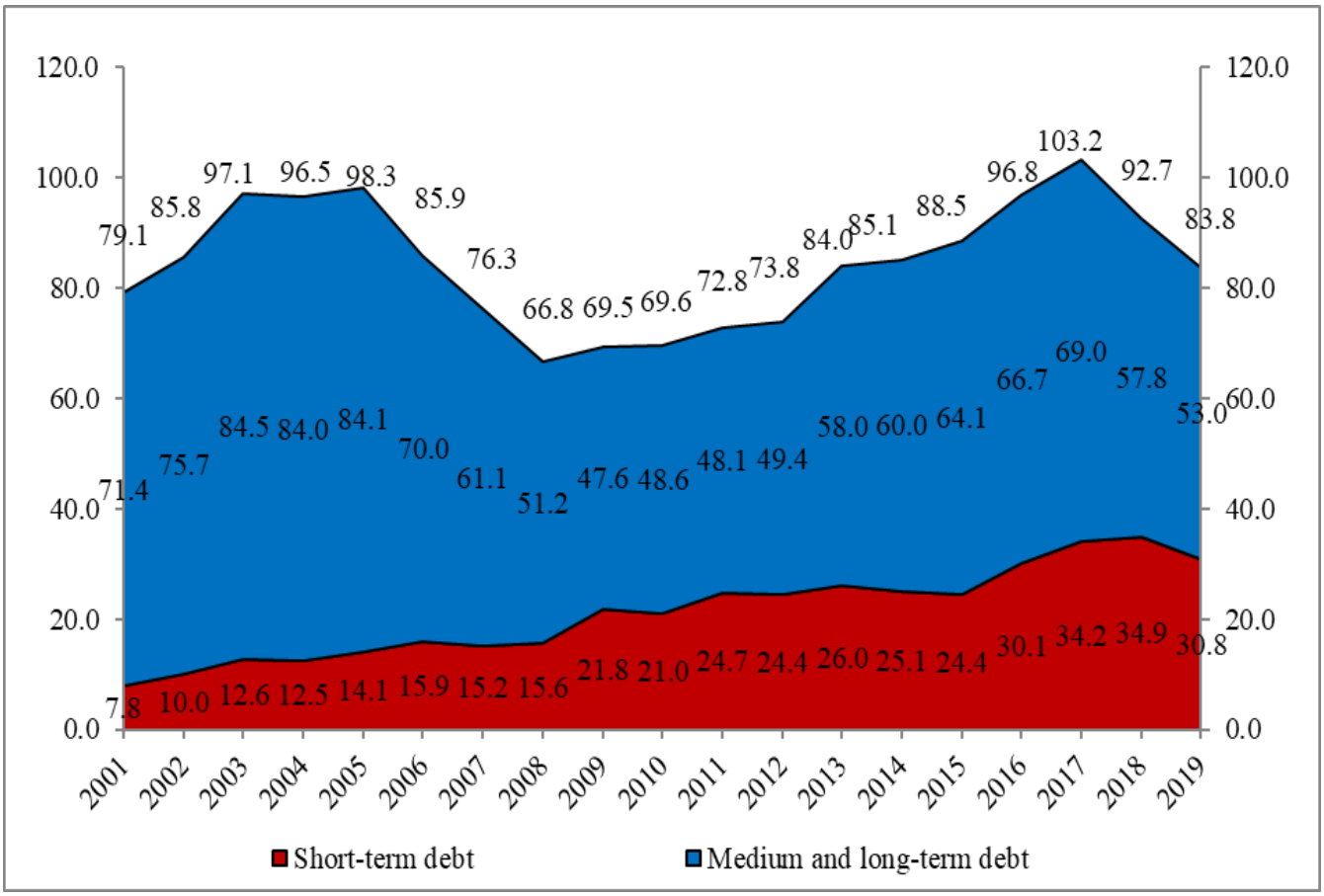
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situation has improved significantly; where the GDP has returned to its strong growth, and the overall balance has shrunk to a single digit, while the primary balance has turned to a positive amount (IMF, 2019). All these evolutions have put the general government debt as a ratio to GDP in a down turn pass to record 83.8% at the end of the fiscal year 2018/19.

c) Egypt General Government Debt Structure

This section reviews the structure of Egypt's general government debt according to two criteria: First, according to the debt maturity, and second, according to the currency of debt.

Figure (3) shows the structure of Egypt's general government debt based on maturity. Where Treasury bills are classified as short term debt, all other types of debt are classified as long term. From figure (3), we could note that the short term debt has grown steadily over the monitored period from 7.8% of GDP in 2001 to its' highest ratio in 2018 to record 34.9% of GDP. This ratio decreased in 2019 to represent 30.8% of GDP.



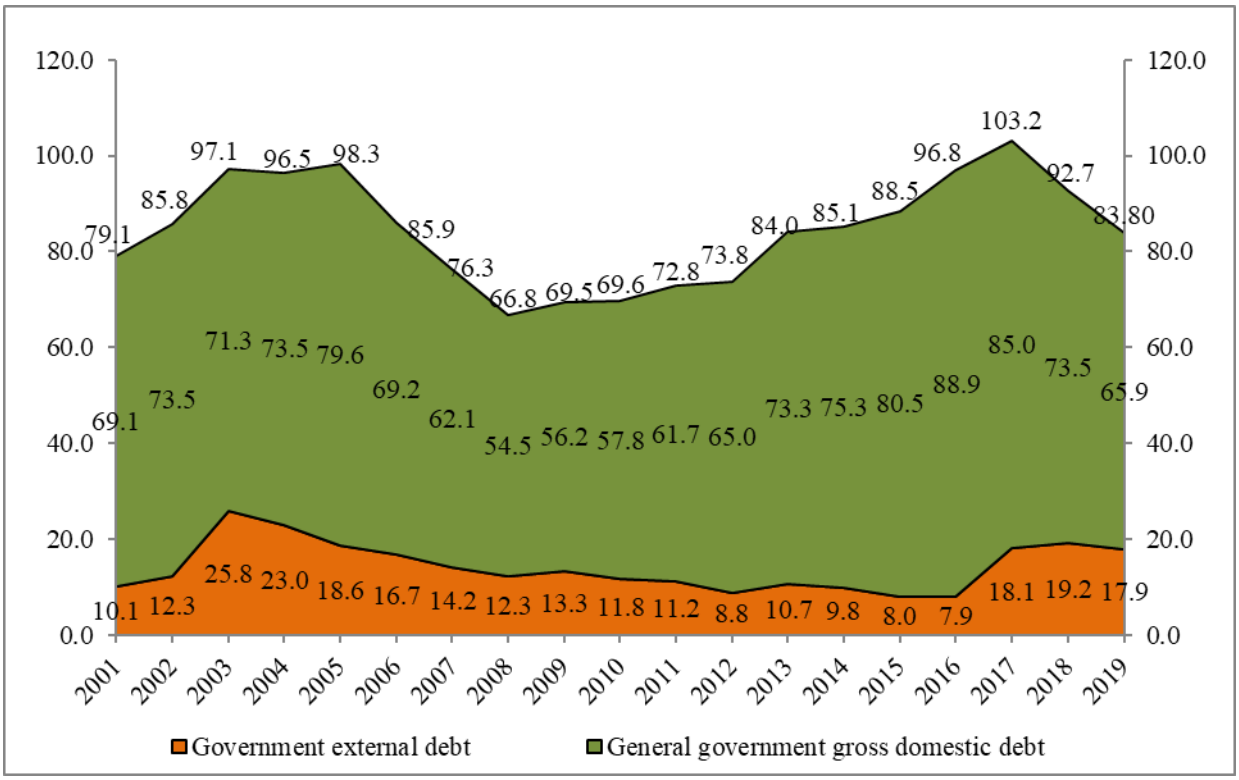
Source: Arab Republic of Egypt Ministry of Finance, The Financial Monthly Bulletin Central Bank of Egypt, Monthly Statistical Bulletin

Figure (3): Egypt general government debt by maturity (2001 – 2019)

Figure (4) shows the structure of general governmentdebt based on its' currency. Debt in foreign currency is classified as government external debt. From figure (4), we could note that the external debt over the monitored period has witnessed two episodes of spikes in 2003 and 2017 after the two times devaluation in 2003 and 2016.

The figure shows that government external debt has grown from 10.1% of GDP in 2001 to 25.8% of GDP in 2003 due to the Egyptian pound devaluation in January 2003. After that, the government external debt started to decrease steadily to reach its' lowest point in 2016. As a result of the second Egyptian Pound devaluation in November 2016 and the increase of external borrowing from the international financial institutions and international bond issuances, the government external debt increased to 18.1% and 19.2% of GDP in 2017 and 2018, respectively, then it started to decrease in 2019 to reach 17.9% of the GDP.

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Source: Arab Republic of Egypt Ministry of Finance, The Financial Monthly Bulletin
Central Bank of Egypt, Monthly Statistical Bulletin

Figure (4): Egypt general government debt classified by currency (2001 – 2019)

IV. The Dynamic of Egypt Government Debt

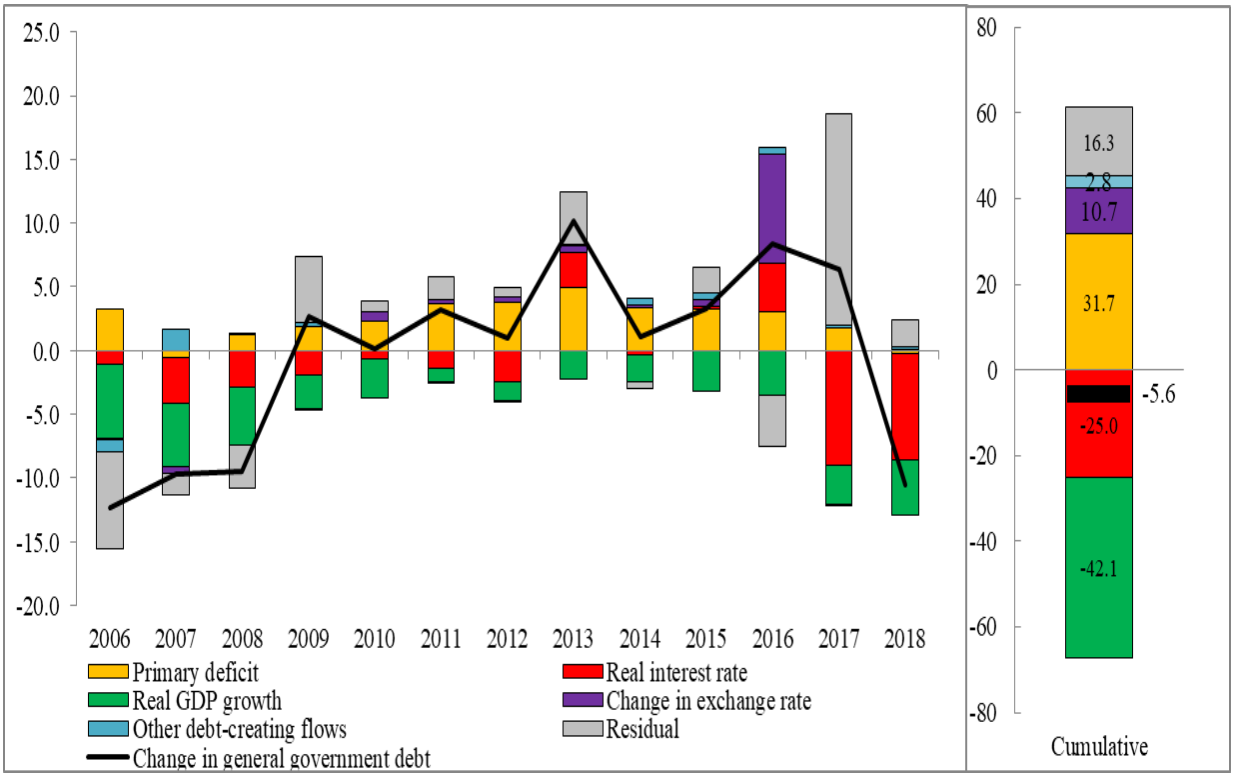
This part will investigate Egypt's general government debt drivers by using the International Monetary Fund tool for debt sustainability analysis for market access countries. It is the same tool that was used by Alnashar in her study (Alnashar, 2019).

The debt sustainability analysis tool for market access countries identifies the main drivers for the change in general government public debt, such as, primary balance, real GDP growth, real interest rate, exchange rate, other debt creating flows, and residuals. Due to the lack of data required for applying the analysis for the whole monitored period, the analysis is applied only in the period from 2005 till 2018.

Figure (5) and table (1) depict that general government debt as a percentage of GDP has decreased from 2005 till 2018 by 5.6%, as real GDP growth and real interest rate have contributed to the decrease of debt accumulation by 42.1% and 25%, respectively. On the other hand, primary balance, change in the exchange rate, other debt-creating flows, and the residual has resulted in the elevating of debt by 31.7 %, 10.7%, 2.8%, and 16.3%, respectively.

Also, it's also clear that debt as a percentage to GDP was decreasing steadily from 2005 till 2008 as a result of the strong real GDP growth over that period, the negative real interest rate, the appreciation in the national currency, and the contribution of unidentified items which brought down the general government debt ratio to GDP. Additionally, the contribution of primary balance and the other debt-creating flows was fickle.

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Source: International Moneatry Fund, World Economic Outlook, IMF, October 2019 Arab Republic of Egypt Ministry of Finance, The Financial Monthly Bulletin. Central Bank of Egypt, Monthly Statistical Bulletin

Figure (5): Contribution to changes in general government debt to GDP (2006 – 2018)

Over the period from 2009 to 2017, the general government debt as a percentage of GDP has started to grow rapidly from 69.5% to 103.2%. The main driver for that increase was the primary deficit, which recorded 3.1% on average, then the residual by 3%, the change in exchange rate by 1.2%, and the other debt-creating flows by 0.2% on average during the same period.

Over the same period, real GDP growth and real interest rate have mitigated the increase in the general government debt as a percentage of GDP since they contributed negatively by 2.5% and 1%, respectively.

It's important to mention that the other debt-creating flows, especially in the period from 2006 to 2008, includes the effect of privatization, while below the line transactions represent a considerable part of the residual. (Alnashar, 2019)

Table (1): Contribution to changes in general government debt to GDP (2006 – 2018)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Genreral government debt	85.9	76.3	66.8	69.5	69.6	72.8	73.8	84.0	85.1	88.5	96.8	103.2	92.7
Change in general government debt	-12.3	-9.7	-9.5	2.7	0.1	3.2	1.0	10.2	1.1	3.3	8.4	6.3	-10.5
Primary balance	3.2	-0.6	1.2	1.9	2.3	3.7	3.8	4.9	3.4	3.2	3.1	1.7	-0.2
Real Interest rate	-1.1	-3.5	-2.9	-1.9	-0.7	-1.4	-2.5	2.7	-0.4	0.2	3.8	-9.0	-8.3
Real GDP growth	-5.9	-5.1	-4.5	-2.7	-3.1	-1.1	-1.4	-2.2	-2.1	-3.2	-3.5	-3.1	-4.3
Exchange rate	-0.1	-0.5	0.0	-0.1	0.7	0.3	0.3	0.6	0.2	0.6	8.6	-0.1	0.1
Other debt-creating flowes	-0.9	1.6	0.0	0.3	0.0	-0.1	0.0	0.1	0.5	0.5	0.5	0.2	0.2
Residual	-7.6	-1.6	-3.3	5.1	0.9	1.9	0.7	4.1	-0.5	2.1	-4.1	16.6	2.1

Source: Author Calculation by using IMF DSA for MAC

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V. Empirical Analysis for Egypt General Government debt Drivers

Based on the economic theory and previous studies, this section investigates the main drivers for the accumulation of Egypt's general government debt over the period from 1999 to 2018.

a) Choice of Variables

To empirically examine the main drivers for general government debt accumulation, the analysis includes five variables: general government debt/GDP, Gross domestic product at constant prices, General government primary balance, Egyptian Pound Exchange rate, and Treasury bills rate used as a proxy for the interest rate.

The world economic outlook (WEO), published by the IMF in October 2019, is the source of data for general government debt/GDP, Gross domestic product at constant prices, and General government primary balance, while the IMF International Financial Statistics (IFS) is the source of Egyptian Pound Exchange rate and Treasury bills rate.

b) Determination of the Stationarity of Data

The Augmented Dickey-Fuller (ADF) unit root test was used to test the stationarity status for time series variables after transforming the variables to their natural logs except for the interest rate. The test illustrated that all variables are not stationary except for the debt/GDP.

Therefore, I took the first difference for all other variables to become stationary. The results of the ADF test are presented in table (2):

Table (2): Augmented Dickey-Fuller (ADF) Unit Root Tests (1999 – 2018)

Variables	ADF	
	At level	At first difference
Log (D_t)	-3.861990*	-
Log (g)	-1.320759	-3.164164*
Log (pb)	-2.283031	-5.129596*
Log (ex)	2.349185	-2.563357*
R	2.180813	-4.447022*

Source: Author Calculations
** Indicates stationarity at 1%*

c) Model

To estimate the contribution of different variables to general government debt/GDP over the monitored period, I used the following Multiple Regression Model:

$$\ln (D_t) = C + \beta_1 \ln (D_{t-1}) - \beta_2 \Delta \ln (g) - \beta_3 \Delta \ln (pb) + \beta_4 \Delta \ln (ex) - \beta_5 \Delta (r) + e_t$$

Where:
D: General government debt/GDP
g: Gross domestic product at constant prices
pb: General government primary net lending/borrowing
ex: Egyptian Pound Exchange rate
r: Treasury Bill Rate

Table (3): Parameter Estimates of the Multiple Regression Model (2000 – 2019)

Dependent Variable: ln (D)
Method: Least Squares
Sample (adjusted): 2000 2019
Included observations: 20 after adjustments

Variable	Coefficient	Standard Error	t-Statistic	p-value
Constant	0.639358	0.281043	2.274949	0.0392
D_{t-1}	0.880180	0.065757	13.38530	0.0000
G	-3.023533	0.629119	-4.805981	0.0003
Pb	-0.021587	0.007475	-2.887821	0.0119
Ex	0.408857	0.081334	5.026870	0.0002
R	-0.012420	0.005950	-2.087190	0.0556*
R-squared	0.950924	Mean dependent var		4.420714
Adjusted R-squared	0.933396	S.D. dependent var		0.133410
S.E. of regression	0.034430	Akaike info criterion		-3.656451
Sum squared resid	0.016596	Schwarz criterion		-3.357731
Log likelihood	42.56451	Hannan-Quinn criter.		-3.598137

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F-statistic	54.25400	Durbin-Watson stat	1.926747
Prob(F-statistic)	0.000000		

Source: Author Calculations

Table (3) reports the parameter estimates for the multiple regression with general government debt as a percentage of GDP as the dependent variable. The coefficients of all variables have the expected sign and are statistically significant; only the interest rate is significant at 10%.

So, the estimated model will be as follows:

$$\ln (D_t) = 0.64 + 0.88 \ln (D_{t-1}) - 3.02\Delta\ln (g) - 0.02\Delta\ln (pb) + 0.41\Delta\ln (ex) - 0.01\Delta(r) + e_t$$

The model shows that the increase in last year's debt to GDP ratio by 1% increases the current year debt by 0.88%. Also, the increase in GDP growth by 1% decreases the debt to GDP ratio by 3%. Furthermore, the increase in the primary balance surplus by 1% decreases the debt to GDP ratio by 0.02%. On the other hand, the depreciation in Egyptian Pound by 1% increases the debt to GDP ratio by 0.41%, whereas the increase in interest rate by 1% decreases the debt to GDP ratio by 1.2%; this attributed to the fact that real interest rates are often negative in Egypt. The previous debt dynamic analysis supports the findings of the model, especially the relation between the debt/GDP ratio and real interest rate.

VI. Forecast Egypt General Government Debt

To forecast the general government debt ratio to GDP over the medium term for the period from 2020 till 2024,I used the same multiple regression model that was used to estimate the drivers after expending the model data to 2024.

As in the previous model, the world economic outlook (WEO), published by the IMF in October 2019, was the source of forecasted data for general government debt/GDP, Gross domestic product at constant prices, and General government primary balance. Furthermore, the Economist Intelligence Unit report about Egypt, generated in the 26th of August 2019, was the source of the forecasted exchange rate and interest rate for the period from 2020 to 2023, while the 2024 forecasted value was calculated as the average of values from 2020 to 2023. (Economist Intelligence Unit, 2019)

The ADF test is used to check the stationarity of all variables that were transformed to their natural logs. The test indicated that all variables are not stationary except for the debt/GDP. Table (4) presents the stationarity of the variables at the level and first difference:

Table (4): Augmented Dickey-Fuller (ADF) Unit Root Tests (1999 – 2023)

Variables	ADF	
	At level	At first difference
Log (D_t)	-3.857319*	-
Log (g)	0.194187	-3.432872*
Log (pb)	-2.004968	-5.787225*
Log (ex)	-0.826175	-3.311840*
R	-1.939085	-4.024314*

Source: Author Calculations

** Indicates that the variable is stationary at 1%.*

Table (5), reports the parameter estimates for the multiple regression with general government debt as a percentage of GDP as the dependent variable. The coefficients of all variables have the expected sign and are statistically significant; only the interest rate is significant at 10%.

The estimated model is as follows:

$$\ln (D_t) = 0.77 + 0.84 \ln (D_{t-1}) - 1.91\Delta\ln (g) - 0.02\Delta\ln (pb) + 0.44\Delta\ln (ex) - 0.01\Delta(r) + e_t$$

The model shows that the increase in last year's debt to GDP ratio by 1% increases the current year debt by 0.84%. Also, the increase in GDP growth by 1% decreases the debt to GDP ratio by 1.91%. Furthermore, the increase in the primary balance surplus by 1% decreases the debt to GDP ratio by 0.02%. On the other hand, the depreciation in Egyptian Pound by 1% increases the debt to GDP ratio by 0.44%. In contrast, the increase in interest rate by 1% decreases the debt to GDP ratio by 1.02%.

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Table (5): Parameter Estimates of the Multiple Regression Model (2000 – 2024)

Dependent Variable: ln (D)
Method: Least Squares
Sample (adjusted): 2000 2024
Included observations: 25 after adjustments

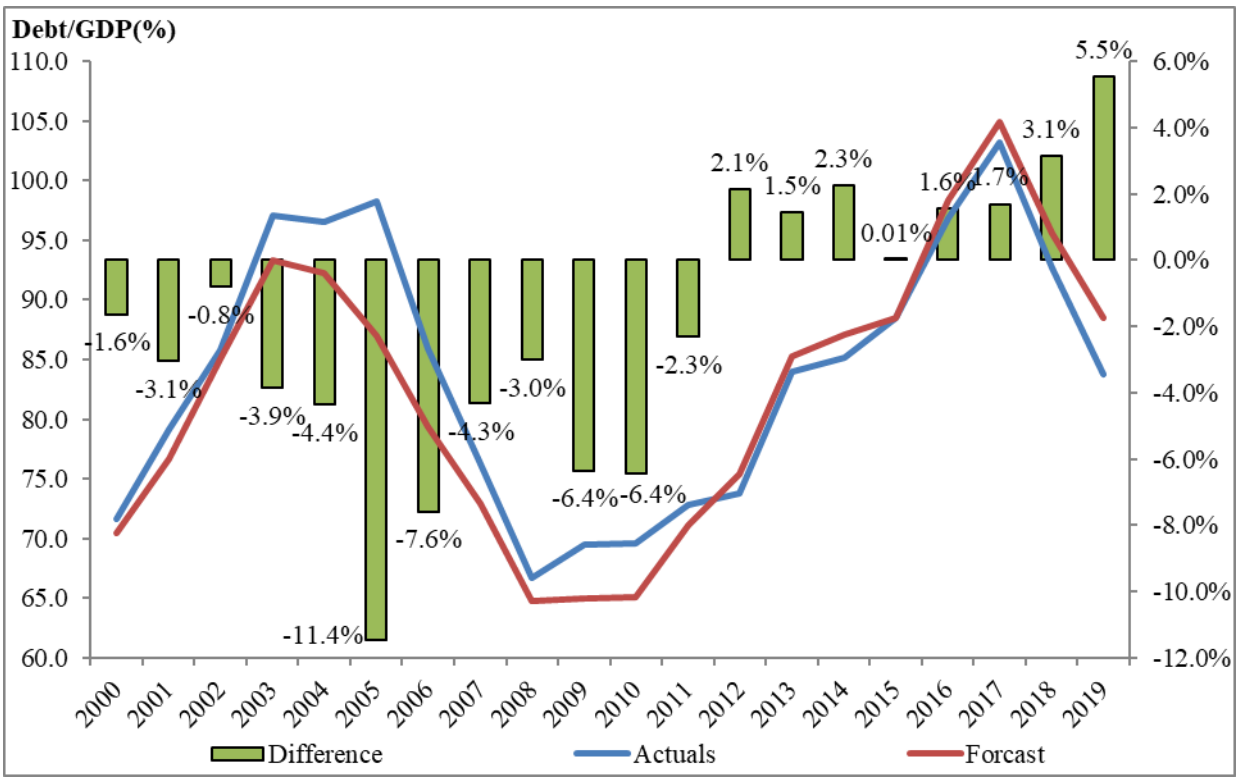
Variable	Coefficient	Standard Error	t-Statistic	p-value
Constant	0.769226	0.288493	2.666354	0.0153
D_{t-1}	0.838553	0.066579	12.59478	0.0000
G	-1.908235	0.486295	-3.924023	0.0009
Pb	-0.023494	0.007854	-2.991520	0.0075
Ex	0.444235	0.083026	5.350561	0.0000
R	-0.010211	0.005778	-1.767169	0.0933*
R-squared	0.931091	Mean dependent var		4.407326
Adjusted R-squared	0.912958	S.D. dependent var		0.124435
S.E. of regression	0.036712	Akaike info criterion		-3.565857
Sum squared resid	0.025608	Schwarz criterion		-3.273326
Log likelihood	50.57321	Hannan-Quinn criter.		-3.484721
F-statistic	51.34556	Durbin-Watson stat		1.803196
Prob(F-statistic)	0.000000			

Source: Author Calculations

Figure (6) depicts the actual and forecasted debt to GDP ratio for the period from 2000 to 2019.

According to figure (6), the model provides a reasonably acceptable forecast for the general government debt as a percentage of GDP over the monitored period. The average difference over the 20 monitored years is -1.9%; the highest difference registered in 2005 is -11.4% from the actual, and the lowest difference registered in 2015 is 0.01% from the actual.

It's important to mention that the model forecast shows a better result over the second-decade data since the average difference between the actuals and forecast decreased to 1.7% over the period from 2011 to 2019. Also, the highest difference decreased to 5.5% in 2019, and the lowest difference was in 2015.



Source: International Moneatry Fund, World Economic Outlook, IMF, October 2019
Author Calculations

Figure (6): Egypt general government debt to GDP forecast 2020 to 2024

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The model is also used to forecast the government debt as a percentage of GDP for the period from 2020 to 2024, under different scenarios. Table (5) shows the assumption for these scenarios.

Table (6): Description of various scenarios for debt forecasting from 2020 to 2024

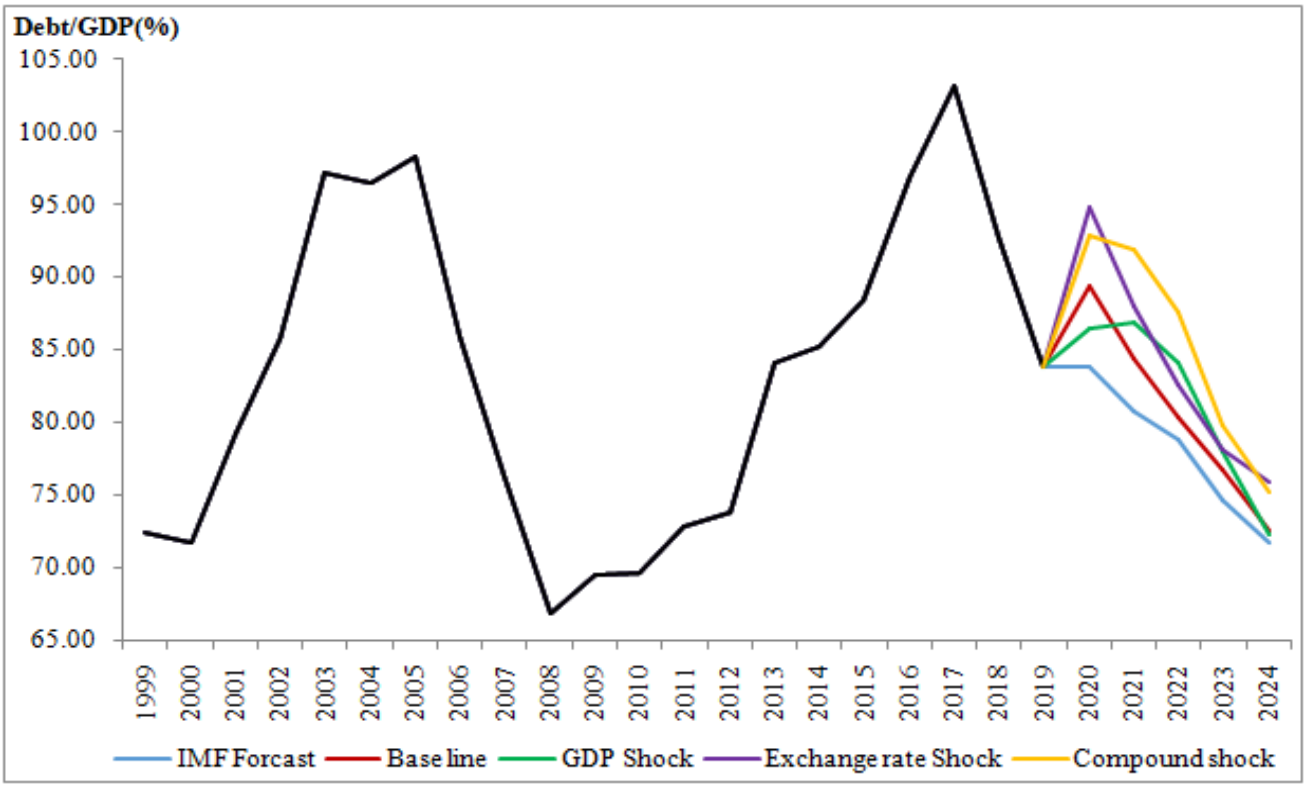
Scenario	Description
IMF Forecast	Represents the IMF forecast presented in world economic outlook (WEO) for October 2019.
Baseline	Represents the forecast based on the previously mentioned model specification.
GDP Shock	Represents the forecast under GDP shock scenario. The scenario assumes that the GDP growth will slow down to only 2% in 2020, and recover gradually to be 2.8%, 3.7%, 4.6%, and 5.5%, respectively, from 2021 to 2024.
Exchange rate Shock	Represents the forecast under Exchange rate shock scenario. The scenario assumes that the Exchange rate will depreciate by 70% in 2020 and recover gradually by 5% from 2021 to 2024.
Compound Shock	Represents the forecast under a compound shock; the GDP shock and Exchange rate shock.

Figure (6) and table (6) show the forecast of the different scenarios over the period from 2020 to 2024. The level of general government debt as a percentage of GDP is expected to exceed the IMF forecast over the whole forecasted period and under the different scenarios.

Table (7): Egypt general government debt to GDP forecast (2020 - 2024)

Year	IMF Forecast	Base line	GDP Shock	Exchange rate Shock	Compound Shock
2020	83.80	89.39	86.42	94.82	92.83
2021	80.68	84.35	86.88	87.91	91.82
2022	78.73	80.28	84.08	82.51	87.49
2023	74.59	76.74	78.02	78.03	79.82
2024	71.65	72.56	72.25	75.90	75.18

Source: Author Calculations



Source: International Moneatry Fund, World Economic Outlook, IMF, October 2019
Author Calculations

Figure (7): Egypt general government debt to GDP forecast from 2020 to 2024

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Even though the general government debt as a percentage of GDP is expected to spike in 2020 under different scenarios, it's also expected to decrease gradually over the following four years to return to its down turn pass.

The compound shock scenario is expected to have the most severe effect on the general government debt as a percentage of GDP, followed by the Exchange rate shock and the GDP shock, respectively.

VII. Conclusion and Policy Recommendations

The paper used two approaches to identify the main drivers that influence Egypt's general government debt level as a percentage of GDP. The first approach is the IMF tool for debt sustainability analysis that is applied over the period from 2005 to 2018. The results indicate that the factors that lead to an increase in the debt level are primary balance, the residuals, the change in the exchange rate, and other debt creating flows, respectively. On the other hand, the factors that lead to a descending in the debt level are real GDP growth and interest rate, respectively.

The second approach is a multiple regression model that estimates the effect of these factors on the level of general government debt level as a percentage of GDP over the period from 1999 to 2019. The model results indicate that the stock of debt is the most important factor that elevates the debt level as a percentage of GDP, followed by the exchange rate. Moreover, the factors that scale down the debt level as a percentage of GDP are real GDP growth, interest rate, and primary balance, respectively. These findings correspond to the results of (Alnashar, 2019) study.

Additionally, the paper introduces a forecast for the general government debt level as a percentage of GDP over the medium term for the period from 2020 to 2024. The forecasting model expects that the general government debt as a percentage of GDP is going to spike in 2020 and then decrease gradually in the following four years. The forecast shows that the exchange rate scenario will lead to the highest increase in the debt level, followed by the compound shock. However, compound shock has the most severe effect on the medium term.

This means that Egypt general government debt is still subject to several significant risks, including the exchange rate risk, since the external component of debt is continuing to rise since the launching of the economic reform program in 2016 (WB, 2019), in addition to the rollover risk, as the short term component has grown steadily over the study period (Mossallem, 2017). Furthermore, debt service is still very high and has put a high burden on the budget, in addition to the risk of contingent liabilities, the slowdown of the momentum of reforms, and the decline of economic growth. (IMF, 2018)

Based on the factors that affect Egypt general government debt, the study introduces the following recommendations to policy makers:

1- The government securities market is under developed and needs to be improved to reduce the cost and risk of refinancing. (Mosler et al., 2017)
2- Keeping the momentum of fiscal consolidation through further improvements in tax collection, more control over the increase in the compensations of employees, in addition to keeping the subsidy at the minimum.
3- Initiating negotiations with financial institutions and development partners to consider debt relief arrangements and swapping part of the debt to development projects. (Massoud, 2014)
4- Since a considerable part of government, debt is held by the central bank, applying a zero interest on this debt may have a positive impact on the government's fiscal position.
5- Reducing public sector debt through swapping governments' equity in some public enterprises and state-owned companies with debt owed by social Insurance Fund, banking sector, and National investment bank. (Abdu, 2019)

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