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The Sustainability of Public Debt in Egypt: An Analysis Using The DIGNAR Model

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تم النشر لأول مرة في عام 2024 بواسطة معهد التخطيط القومي.

سلسلة أوراق عمل معهد التخطيط القومي: تستهدف هذه السلسلة عرض بعض النتائج الأولية للبحوث التي يجريها معهد التخطيط القومي بقصد مناقشتها من جانب المعنيين من داخل المعهد وخارجه تمهيدا لتطوير هذه النتائج والارتقاء بمستوي البحث العلمي بالمعهد، وأعادة نشر الورقة في وعاء نشر محكم محلياً أو إقليمياً أو دولياً.

سلسلة أوراق عمل - معهد التخطيط القومي

The Sustainability of Public Debt in Egypt: An Analysis Using The DIGNAR Model

استدامة الدين في مصر: تحليل باستخدام نموذج DIGNAR

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المستخلص:

على مدى العقد الماضي، ازداد قلق الحكومة المصرية بشأن استدامة دينها العام. وتبحث هذه الدراسة في استدامة الدين العام المصري باستخدام مؤشرات مختلفة، كما أظهرت مؤشرات DSF نتائج متناقضة، حيث أوضحت مؤشرات معظم الديون العامة الخارجية تصنيفات ضعيفة تسمح بمزيد من القدرة على الاقتراض، الا ان خدمة الدين الخارجي للصادرات كانت بالفعل مرتفعة في عامي 2022 و 2023.علاوة على ذلك، تطبق الدراسة نموذج الديون والاستثمار والنمو والموارد الطبيعية (DIGNAR)، الذي يعتمد على توقعات صندوق النقد الدولي لتحديد تأثير التغيرات في الصادرات والتحويلات الخاصة من 2019 الى 2026على الدين العام لمصر، وذلك بافتراض أن جميع المتغيرات الخارجية الأخرى تظل ثابتة. وتكشف النتائج عن تأثير كبير للتغيرات في الصادرات على التغيرات في إجمالي الدين والديون المحلية والديون التجارية الخارجية. ونظرًا لأن توقعات صندوق النقد الدولي تظهر تغييرات طفيفة في التحويلات الخاصة، فقد عزا الباحثون التغيير في الدين العام إلى التغيير في الصادرات. ووفقًا لنتائج DIGNAR، من المتوقع أن ينخفض التغيير في إجمالي الدين العام إلى الناتج المحلي الإجمالي، والديون المحلية إلى الناتج المحلي الإجمالي، والديون التجارية الخارجية إلى الناتج المحلي الإجمالي بنسبة 2.6٪ و1.6٪ و1٪ على التوالي. وبالتالي، تقترح الدراسة عدة توصيات سياسية لتعزيز استدامة الدين العام لمصر. ويشمل ذلك تخفيض خدمات الديون من خلال إعادة هيكلة الديون ومقايضة الديون، التقليل إلى أدنى حد من عمليات فوق الخط، والحد من التضخم، والتركيز على استثمارات البنية التحتية ذات العائدات المرتفعة، كما أكدت نتائج نموذج DIGNAR على أهمية تنمية الصادرات مما يستلزم تشجيع الصناعات واعتبار ذلك أولوية قصوى.

الكلمات المفتاحية: استدامة الدين، الدين العام، DIGNAR، تحليل الدين، الصادرات.

Abstract:

Over the past decade, the Egyptian government has grown increasingly concerned about the sustainability of its public debt. This study examines the sustainability of Egypt's public debt using various indicators. The DSF indicators showed contradictory results, as most external public debt showed weak ratings that allow more borrowing capacity. However, the debt service on external debt to exports was already high in 2022 and 2023. Moreover, the study applies the Debt, Investment, Growth, and Natural Resources (DIGNAR) model, which relies on the IMF projections to quantify the impact of changes in exports and private remittances from 2019 to 2026 on Egypt's public debt, assuming all other exogenous variables remain constant. The findings reveal a significant effect of changes in exports on changes in total public debt, domestic debt, and external commercial debt. Since the projections of the IMF show slight changes in private remittance, the researchers attributed the change in public debt to the change in exports. According to the DIGNAR results, the change in total public debt to GDP, domestic debt to GDP, and external commercial debt to GDP are expected to decrease by 2.6%, 1.6%, and 1%, respectively. Consequently, the study proposes several policy recommendations to enhance the sustainability of Egypt's public debt. These include reducing debt services through debt restructuring and debt swaps, minimizing stock-flow adjustments, curbing inflation, and focusing on infrastructure investments with high returns. The findings of the DIGNAR model also confirmed the importance of promoting exports, which necessitates encouraging industries as the highest priority.

Keywords:

Debt Sustainability, Public debt, DIGNAR, Debt decomposition, Exports

Introduction:

Public debt sustainability has brought significant attention in recent decades, becoming a keystone of macroeconomic analysis and fiscal policy assessments (Kim et al., 2017; Vidal and Marshall, 2021). The main concern arose when it became evident that the burdened countries could not pay their financial obligations (Ogbeifun and Shobande, 2020). This concern is particularly relevant nowadays, given the rising government debt in developed and emerging economies. The global economy has witnessed a substantial rise in public debt in recent years, driven by developmental initiatives and responses to crises impacting advanced and emerging economies, such as COVID-19 pandemic. Moreover, the escalating geopolitical tensions caused by the Russian-Ukrainian war have tightened global financial conditions, driven high inflation, reduced economic growth, and increased pressure on government budgets. In response to rising inflation, particularly in major advanced economies, central banks have implemented tighter monetary policies, leading to significant increases in borrowing costs, raising concerns about the sustainability of the debt of some economies and the stability of the world economy (IMF, 2023b).

Given that most countries have a significant budget imbalance, governments rely heavily on public debt to handle these fiscal imbalances created by revenue and spending mismatches. This unsustainable debt accumulation can generate serious economic problems for current and future generations if not managed efficiently (Ogbeifun and Shobande, 2020). However, many in the global financial community still believe that the current debt surge has

not yet turned into a "systemic" crisis and is less serious than previous global debt crises. This is due to two reasons: first, a relatively small number of countries (especially among the largest debtors) have defaulted on their external debts in recent years; and second, debt-to-GDP ratios are lower than they were before and during the Latin American debt crisis in the 1980s, or the debt crisis of low-income countries in the 1990s (Holloway, 2023). However, even if it has not yet turned into a systemic crisis or a less serious than previous global debt crises, the continuation of the current situation will undoubtedly lead to a loss of control if all efforts do not come together.

Egypt's debt situation closely mirrors the global trend of rising public debt in recent years. The COVID-19 pandemic has severely affected the tourism industry and the surge in food import costs following the war in Ukraine. The persistent budget deficit and the commitment to a fixed exchange rate have created substantial financing needs, partially met by short-term capital inflows. According to the IMF's Fiscal Monitor report of April 2023, Egypt's total financing requirements for 2023 amounted to 35% of its GDP, rendering the country highly vulnerable to interest rate hikes (Mazarei, 2023).

The situation of public debt in Egypt questions its sustainability: Is Egypt's public debt sustainable? Many studies have tried to analyze the sustainability of public debt in Egypt using several methods and indicators with contradictory findings. However, our study applied the DIGNAR model (The Debt, Investment, Growth, and Natural Resources), an updated tool developed by the IMF, to analyze debt sustainability in Egypt. The model

employs the linkage between public investment, growth, debt, and the private sector response in addition to fiscal reaction functions. Moreover, it quantifies the macro-effects of different variables such as exports and remittances which can help the policymakers (Gurara,2019). Therefore, the study is divided into several sections; following the introduction, the second section deals with the concept of public debt sustainability, followed by a theoretical and literature review of debt sustainability, subsequently followed by a view of the current global debt in advanced, emerging, and developing economies. The study then addresses the debt in Egypt in the fourth section, which addresses some of the debt sustainability indicators used by international financial institutions, after identifying the debt composition methodology using the Finance for Development tool (FDL) - debt decomposition tool- to clarify the complex relationships between public debt and various economic variables such as primary balance and growth. It is crucial to identify the factors contributing to the increase and decrease of public debt, and the intricate interplay among these variables as it may help strengthen financial recommendations. In addition, the study applied some indicators and the Debt, Investment, Growth and Natural Resources (DIGNAR) model to analyze debt sustainability in Egypt. Furthermore, the study illustrates strategies that may contribute to debt sustainability, such as the role of fiscal consolidation in reducing the severity of debt, debt restructuring if other measures are insufficient, as well as the implications of debt swaps.

I. The scope of public debt and its sustainability:

Firstly, it is vital to identify the scope of public debt in studying debt sustainability since limited public debt scope may underestimate the actual debt burden, making it difficult to determine debt sustainability. Secondly, it is essential to highlight the various aspects of public debt sustainability to understand it.

1- Public Debt Scope:

Presenting a comprehensive and coherent image of public debt stocks and public contingent liabilities should be the first step toward achieving sustainability (IMF,2023g). Public debt scope varies from wide to limited, depending on which government agencies and sectors' obligations are included in the total public debt (De Matos et al., 2015). Therefore, the public debt may include (IMF, 2022b):

a- The Central Government: which consists of a state's institutional units at the national level, as well as non-market non-profit firms that are under its authority.

b- The General Government: which includes all government units, and any non-market non-profit organizations overseen by these authorities.

c- The non-financial public sector: consists of government-controlled businesses that manufacture goods such as state-owned enterprises.

d- The consolidated public sector: consists of the non-financial public sector and public financial firms, in addition to the Central Bank.

For Egypt, although there is no legally binding definition of public debt components, the Ministry of Finance defines public debt as encompassing three main components:(Zaki, et al.,2022)

a- Central Government Debt: This includes the debt of the local administration and public service entities.
b- General Government Debt: This encompasses, in addition to the debt of budgetary agencies, the debt of the Investment Bank and pension funds after removing the inter-debt between general government units.
c- Total Public Debt: This includes, in addition to general government debt, the debt of public economic entities, after removing the inter-debt between all these public units.

The debts of public financial and non-financial firms, whether public business companies or public sector companies are excluded. Furthermore, it excludes the obligations of holding companies and other public companies.

2- Definition of Debt Sustainability:

While a single, universally accepted definition of debt sustainability remains difficult, various approaches emphasize various aspects of this crucial concept. One prominent approach focuses on fiscal sustainability, which emphasizes maintaining a government surplus that gradually reduces the debt-to-GDP ratio over time (D'Erasmo et al., 2016; Deheri and Nag, 2023). It ensures that the government can meet its financial obligations without relying on extraordinary measures (Pamies and Reut, 2020). Another debt sustainability approach is found in the study of Hakura and others (Hakura, 2020; Abdelgany and Al-deen, 2023). In this approach, sustainability rests

on the government's ability to meet current and future debt obligations through policies without jeopardizing economic growth or defaulting. This approach focuses on ensuring manageable debt levels compared to the government's revenue-generating capacity. It is important to recognize that fiscal sustainability (solvency) and debt sustainability (debt servicing) are crucial aspects of debt sustainability. A fiscal policy that maintains a manageable debt-to-GDP ratio ensures that the government can service its debt in the long term. Conversely, maintaining manageable debt service levels prevents excessive debt accumulation that could strain the government's finances and hinder growth (Nathaniel and Olalekan, 2018). Therefore, a comprehensive understanding of debt sustainability requires considering both aspects.

Theoretical and Literature Review:

Debt sustainability analysis is common in literature (Nathaniel and Olalekan, 2018). In this section, we will delve into different public debt sustainability studies to identify the literature gap by reviewing studies in many countries as well as Egypt.

3- Debt and Fiscal Sustainability Approaches and Methods:

Different approaches for measuring fiscal and debt sustainability have been revealed in studies, such as the study of Pradhan (2019), which demonstrated different approaches to sustainability, including the Domar stability approach, Solvency approach, Fiscal Gap approach, Forward-looking approach, Generational Accounts, Ricardian Equivalence approach, and Balance Sheet approach. In 1944, Domar contributed to the initial

investigation and explanation of why fiscal policy should be sustainable by comparing the interest rates on government bonds to economic growth. Any deficit might lead to an unsustainable fiscal policy if borrowing costs are more than the production growth rate (Yoshino and Miyamoto, 2020; Pradhan, 2019). Domar's approach assists in figuring out the primary surplus or deficit required for various growth-interest rates to maintain the debt-to-GDP ratio at a particular level (Pradhan, 2019). According to the solvency approach, also referred to as the Present Value Constraint approach (PVC), fiscal policy is sustainable if the government can meet all its current obligations by producing a primary surplus from future budgetary projections, meaning that the total present value of these surpluses will either equal or surpass the current balance of public debt. (Nathaniel and Olalekan, 2018; Pradhan, 2019). To calculate how much primary deficits need to be decreased over time by implementing policies like raising revenue or cutting spending, the fiscal gap technique estimates the growth in the primary surplus required to reach a specific debt-to-GDP ratio in the future. The forward-looking approach addresses the difficulties in understanding the financial gap and evaluating sustainability by using debt-to-GDP ratio. Generational approach states that future tax payments for coming generations must, at any given moment, be adequate in current value to cover the government's debt and future consumption expenditures (Pradhan, 2019). It has long been evident, according to the work of Buchanan (1958) and Modigliani (1961), that raising taxes to meet today's budgetary responsibilities will cause intergenerational redistribution and burden certain economic actors with public debt. (Bonin and Patxot, 2004). If taxes and debt

financing have a non-neutral impact on current and future generations, then fiscal policy is unsustainable. Conversely, fiscal policy is sustainable if the method of funding government expenditures does not affect intergenerational well-being neutrality. This neutrality of well-being is the cornerstone of the Ricardian approach to financial sustainability. Furthermore, the balance sheet method is an analytical framework that may be used to identify weaknesses and imbalances in the macroeconomic sectors of the country (Pradhan, 2019).

Public debt sustainability literature has been molded by three major techniques (Beqiraj et al., 2018): the cointegration test, the unit root test, and the Bohn sustainability model. The unit root validates the debt variable's stationarity. For cointegration, once government revenue and expenditures are cointegrated, debt is considered sustainable. The Bohn approach is the most often used method for assessing the sustainability of governmental debt (Joy and Panda, 2021; Can, 2023; Renjith and Shanmugam, 2018). It proposes determining if the primary surplus as a percentage of GDP is a linear function of the debt-to-GDP ratio; if so, the public debt is considered sustainable (Ari and Koc, 2018; Beqiraj et al., 2018). The Bohn sustainability test relies on estimating the fiscal reaction function to evaluate the government's response to debt levels and seeks to analyze the fiscal policy response to debt accumulation. The function estimates the fiscal remediation required to sustain the debt (Abdelgany, 2022).

Research has attempted to use many approaches to assess sustainability. Deheri and Nag (2023) assessed India's debt sustainability using a variety of

methods. Initially, they evaluated the function response equation and assessed the sustainability of the debt using the Autoregressive Distributed Lag model (ARDL). The primary surplus was compatible with real interest rates, government spending, economic growth, and debt from the prior period, according to the findings of the ARDL-bounds test. Further, evidence that fiscal policy follows debt-stabilizing guidelines and complies with budgetary restrictions across periods comes from the primary surplus's remarkable and short- and long-term response to the preceding period's debt. A structural break cointegration test was also utilized to examine the long-term relationship between total revenue and total spending. The findings demonstrated a cointegration, meaning fiscal deficit was sustainable.

Unit root and cointegration approaches were employed by Canofari et al. (2020) to evaluate the financial sustainability of the United States. To analyze the sustainability of public finances comprehensively, the study highlighted the need to utilize indicators and tests to offer a thorough analysis. However, when results are inconsistent, indicators might point to a shift in fiscal policy.

Unlike previous studies, International financial institutions (World Bank and the International Monetary Fund (IMF)) quantify the risk of public debt distress to evaluate shocks and prospective scenarios. Some studies have examined this approach (Laskaridis, 2020) and distinguished between economies with extensive access to international financial markets and low-income economies that largely rely on concessional support to cover their external finance needs. The Debt Sustainability Assessment Framework

(DSA) attempted to give a basic technique that can be used in any country. This approach consists of two components: first, aggregate public debt sustainability analysis, and second, total external debt analysis. This framework has been used in numerous studies, including Were and Mollel (2020), who examined Tanzania's debt sustainability by looking at medium-term forecasts of macroeconomic variables (such as GDP growth rate, interest rate, exchange rate, and inflation) and making assumptions about how the initial balance would change. These projections are then utilized to determine the baseline and stress testing. Debt burden indicators are compared to indicated criteria during the forecast time to assess debt sustainability. The risk assessment of foreign public debt distress is divided into four categories: low risk, medium risk, high risk, and distress. The danger of external and total distress is assessed using debt burden thresholds and criteria. Despite adopting this tool, it has been criticized for being overly optimistic in terms of growth estimates and budgetary adjustments. However, the Fund's borrowing arrangements are contingent on the outcome of that framework, implying that the government is still borrowing on an erroneous foundation. Furthermore, it was demonstrated that simulations did not account for uncertainty in macroeconomic predictions, despite the tumultuous global environment faced by low-income and developing market countries. Furthermore, it draws no distinction between unsustainability induced by misuse of public resources and financial institution insolvency and that associated with enormous but relatively more feasible infrastructure projects (Mustapha, 2015). To mitigate this concern, the IMF created two models: The Debt, Investment, and Growth model (DIG), and the updated

version, the Debt Investment, Growth and Natural Resources model (DIGNAR) which was introduced by Melina et al. (2016) to analyze the effects of macroeconomic variables on debt sustainability.

4- Public debt sustainability indicators:

Several studies used selected indicators to assess debt sustainability. Some focus on a single indicator, such as the public debt-to-GDP ratio, (the well-known indicator for measuring sustainability), however, its usage has lately been disputed as the sole method for evaluating sustainability. According to Amegashie (2023), debt is paid and serviced by generating revenue, thus governments should focus on what increases their debt-servicing capabilities. The study also emphasized that revenue and the country's overall financial and economic management contribute to sustainability. Therefore, substantial economic growth in certain economies did not help strengthen their sovereign classification. Since government borrowing rates are assumed to be permanently lower than the GDP growth rate, some studies relied on surplus as a sustainability indicator. Werding (2022) used a commonly used index called S2-indicator to assess the long-term financial sustainability of EU public finances. The indicator is based on the government's budgetary constraints, which require all future public revenues to be high enough to cover all future public expenditures in addition to the public debt that has accumulated to date. Other studies calculated a composite sustainability index using several indicators such as the study of Barykin et al., (2022), where debt sustainability indicators were chosen using correlation analysis to study the relationship between debt sustainability and

public debt risk in Russia from 2010 to 2020. Consequently, six debt sustainability indicators were chosen: the public debt/GDP ratio, debt/per capita ratio, debt/export ratio, public debt/total budget revenue ratio, debt/budget spending ratio, and debt/revenue cost ratio. The six indicators were chosen since they are derived using variables that have a substantial link with the amount of public debt while also being free of multicollinearity. The findings demonstrated that the amount of the Russian Federation's domestic government debt tended to increase moderately (7.4%).

The study of Kaur et al., (2018) also evaluated the debt sustainability of several states in India using index-based methodology along with other methods. Credit rating indicators were used: the debt stock to the current income ratio; the current value of debt servicing to the current income ratio; and liquidity indicators: The ratios of debt servicing to current revenue and interest payments to current revenue are used to assess the government's ability to service interest payments and repay debts as they become due using current and regular sources of revenue, except temporary or incidental income such as grants or capital revenues from asset sales. The study also used the reaction function approach. Both the indicators and the methodology's results demonstrated that the current state-level debt situation was long-term sustainable. Another study by Cahyadin (2019) assessed external debt sustainability indicators in seven ASEAN countries from 1996 to 2017, using an indicator-based model and a cointegration test to study the impact of macroeconomic indicators and institutions on external debt sustainability. The study included two indicators of external debt sustainability; external debt growth which should be lower than GDP

growth, and GDP growth which should be larger than the real interest rate. The results showed that macroeconomic indicators and some institutional indicators had a significant impact on the first indicator while macroeconomic indicators such as GDP growth, inflation, FDI flows, and an indicator of government effectiveness had a significant impact on the second indicator in the short-term and had a rapid adjustment effect on external debt sustainability in the short term. Furthermore, cointegration demonstrated that institutions and long-term macroeconomic indicators—aside from the exchange rate—have a major influence on the sustainability of external debt.

5- Debt sustainability in Egypt:

Many studies have examined the sustainability of debt in Egypt, addressing the issue in various ways and suggesting numerous recommendations. Ibrahim et al., (2023) relied on the use of indicators approach to characterize fiscal sustainability and analyzed the performance of certain indicators in the Egyptian economy, using mainly the public debt-GDP ratio index. Other studies, such as Al Sayed, et al., (2021), aimed to assess Egypt's financial sustainability from 1990 to 2018 using the deficit method as the initial deficit index, the tax gap index, the Dickey-Fuller stabilization test, and the Johansen cointegration revenue and expenditure test. The analysis revealed that Egypt had financial sustainability between 1990 and 2018. Abdelgany (2022) examined the reaction function of fiscal policies using annual data from 1990–to 2020. The study employed the ARDL cointegration test using two methodologies; the first approach looked at debt sustainability using the cointegration methodology of income reduction overspending; the second technique was used to examine the impact of debt on the budget and assess

the budget balance's response to output and spending variations. In addition to the influence of changes in oil prices and currency rates, the study also included dummy variables to evaluate the impact of political instability. The findings highlighted the negative association between oil prices and the budget balance; a 9.9% increase in global oil prices causes a 1% loss in the Primary balance, whereas the exchange rate has a positive relationship with the balance sheet.

Ramadan (2020) also used the financial reaction function, cointegration analysis using (ARDL), and vector autoregression (VAR). According to the results of ARDL and VAR, Egypt’s GDP growth affected the primary deficit, according to the results of both models. Rashied (2021) is another study that employed the financial reaction function and compared its approach to the IMF's debt sustainability analysis, and the findings of methods indicated Egypt's low level of public debt sustainability. The study used a quarterly dataset from 2005 to 2020, and it advocated for financial governance and public expenditure reforms. Another following research investigated the Structural Endogenous Long-term Response and the concept of Fiscal Fatigue when debt reaches high ceiling levels as the study of Abdelgany (2023). The ARDL model was utilized from 1981 to 2021, with Bohn's non-structural empirical framework approach used to estimate the financial response function between the primary balance and the stock of debt-to-GDP ratio. The findings revealed that the Egyptian government's fiscal policy was restricted, and when the previous period's debt-to-GDP ratio skyrockets, the government was unable to respond positively to the possibility of financial stress and default, emphasizing the need for serious

planned financial action to correct the long-term response. Furthermore, the adjustment of non-interest spending preserved the necessary level of the government's primary balance.

Some studies have focused only on the sustainability of Egypt's external debt, such as Saqr and Hegazy (2023), which sought to determine the extent to which the trade balance surplus can finance Egyptian external debt premiums, as well as the extent to which export growth covers the growth of import payments and foreign debt interest payments. The study conducted a cointegration analysis and determined that the total import variable and external debt interest had a positive influence on the total export variable, net remittance receipts, and reserve value at one lagged period. The model revealed a long-term relationship between the two variables, indicating the sustainability of Egypt's foreign public debt from 2013 to 2022. The trade balance also accounted for around 31% of fluctuations in net external debt, and there was no long-term relationship between the trade balance and Egypt's net foreign debt.

The preceding indicates that there are various methods for assessing debt sustainability, but there are no compelling reasons to choose one over another. Overall, the study of public debt sustainability is complex and cannot be easily identified using a single technique or a single indicator. In numerous scenarios, combining multiple techniques as complementing forms of evaluation is beneficial, Thus, some studies employ several approaches to assess the sustainability of public debt, offering a more complete picture of the situation. On the other hand, some countries rely on

one sustainability indicator, the debt-to-GDP ratio, which presents a misleading view; therefore, several sustainability indicators should be used when examining a country's debt sustainability. Moreover, unlike tests based on historical data, the indicators respond to a wide range of current and future predicted factors. Therefore, indicators react faster than tests to changes in fiscal policy systems (Canofari et al., 2020).

As mentioned, sustainability of debt has received considerable attention in the literature, with several contradictory findings in Egypt's studies. Furthermore, few studies used the DIG or DIGNAR model to analyze the sustainability of debt. However, no published studies have been found in Egypt. To address this challenge and fill a gap in the literature, our study uses the DIGNAR tool as it overcomes the main problems found in the DSA tool as mentioned before as well the study also uses common debt indicators generally used in assessing debt sustainability to employ several techniques in evaluating Egypt's debt sustainability. Since the study covers different periods and techniques, the results may oppose or contradict previous studies in Egypt.

II. An overview of global public debt:

Rising public debt represents a concern for policymakers, considering geopolitical problems, tighter global financial conditions, depressing economic growth prospects, and the strong US dollar, with the world average public debt-to-GDP ratio nearing 100% by 2020 (IMF, 2022a). Global debt-to-GDP ratios have been climbing for decades; between 1960 and 2022, private debt tripled to 146%, while global public debt tripled since the mid-

1970s, reaching 92% by the end of 2022. Global debt has increased to $235 trillion in 2022, representing 238% of GDP (Gaspar et al., 2023). In addition, debt ratios are predicted to increase by around 1.25 percentage points per year until 2028 (IMF, 2023c).

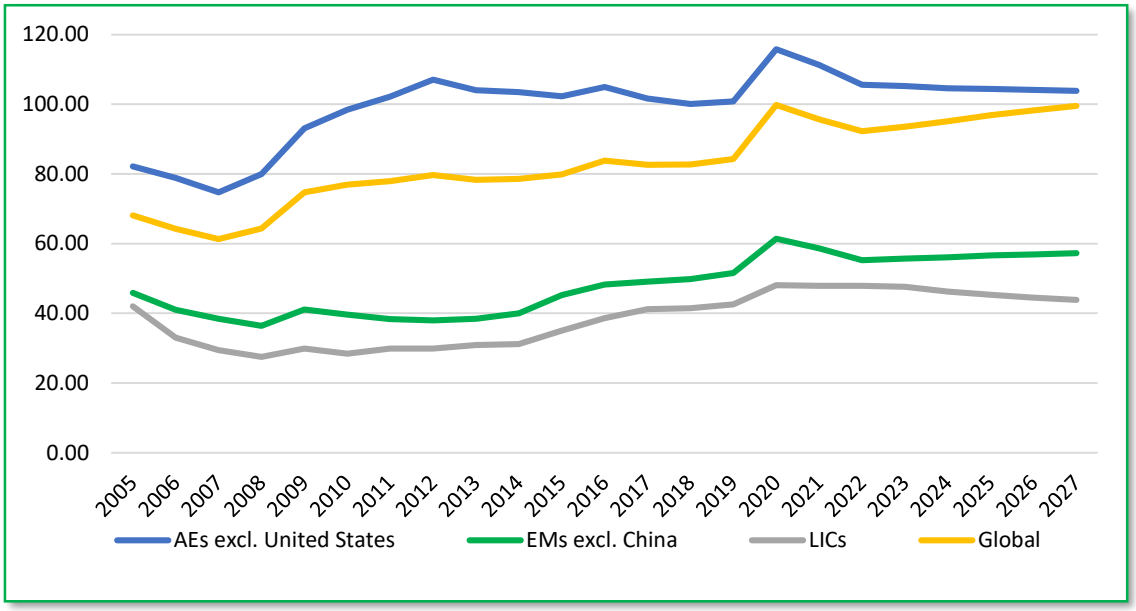

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Figure (1):
The trend of Global public debt/GDP ratio (2005-2027)

The average share of debt-to-GDP in advanced nations has climbed from 76.6% in 2005-09 to 119.6% in 2021, a 43% increase (Figure 2). Over the same period, emerging countries' public debt-to-GDP ratio increased by 26%, from 40.4% to 67%. (IMF, 2022a). The fiscal deficit contributed to high levels of public debt, with many governments increasing spending to stimulate the economy and adapt to rising food and energy costs even after pandemic-related fiscal support had been suspended (Gaspar et al., 2023). The fiscal deficit is not the only blameable, debt dynamics deteriorated in

emerging markets and low-income developing countries due to high levels of foreign currency debt due to devaluation, and higher interest rates (IMF, 2023b).

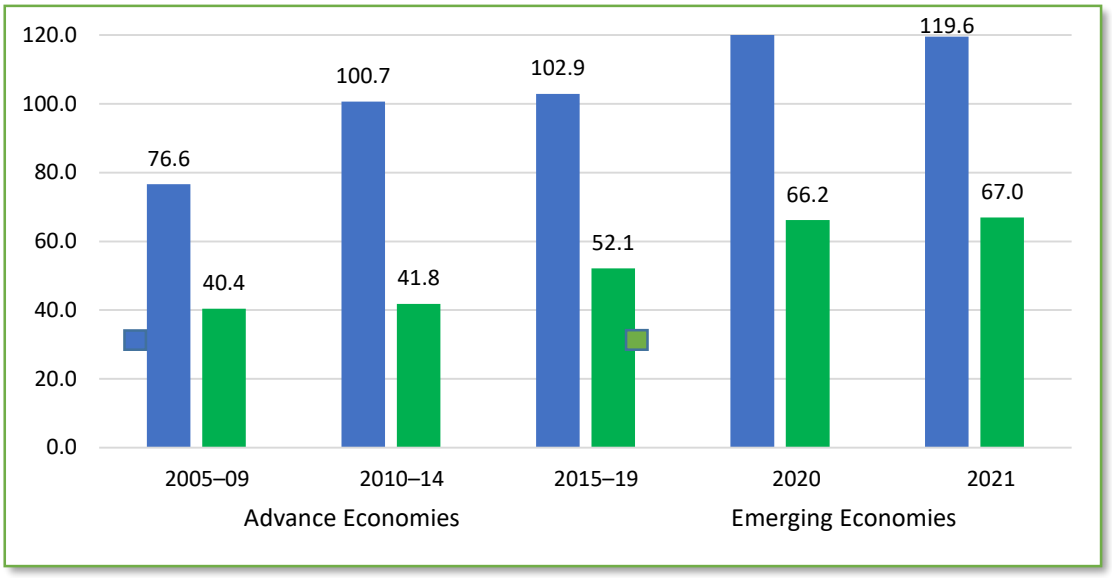

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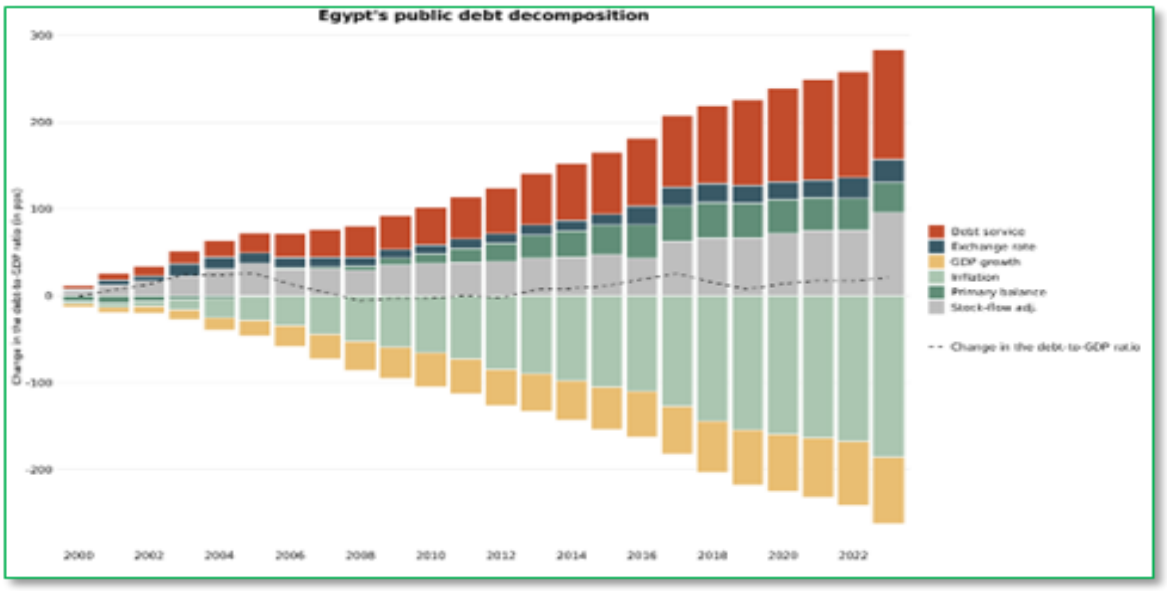
Figure (2)
Public debt /GDP ratio in advanced and emerging economies (2005-2021)

Furthermore, approximately 25% of sovereign bonds issued by emerging nations are trading at distressed levels, while over 50% of low-income developing nations are at highly hazardous or distressed levels (Gaspar et al., 2023). In addition to the preceding, numerous economies will face increasing spending pressures in the coming years, including infrastructure investment, climate change mitigation, and adaptation. This will increase spending, particularly in developing countries, to meet sustainable development goals while keeping debt manageable (Balasundharam et al., 2023).

III.Debt sustainability in Egypt:

1- Public Debt Decomposition Analysis:

To analyze debt sustainability in Egypt, a public debt decomposition analysis is required to detect and analyze the combined effects of the causing variables such as primary balance, debt service, exchange rate changes, and stock-flow adjustment. It would also consider factors that reduce debt, such as economic growth and inflation. Debt decomposition analysis was conducted using the FDL with annual data from 2000 to 2023, and it is shown cumulatively to minimize volatility and highlight long-term contributions from various causes.



Sources: Finance for Development Lab

Figure (3)

Egypt's Cumulative Public Debt Decomposition from 2000 to2023

The debt-to-GDP ratio has been altered from 2000 to 2023 by almost 126 percentage points of debt service, 95 percentage points of stock flow adjustments, 34 percentage points of primary balance, and 26 percentage points of exchange rate adjustments.

Debt service, as is shown, represents a critical component of borrowing. Countries that acquire additional debt agree to a payment plan, only to face bursting a few years later due to long-term debt (Drehmann, M., et al.,2017). Egypt has continuously issued debt, as a result, more borrowing was required to service the previous debt. Increasing debt service is one of the largest drivers of debt growth, particularly in recent years. The external debt service only increased from 13472 million dollars in 2019 to 26288 million dollars in 2022(CBE,2024).

The government may increase its commitments by funding government-owned enterprises without increasing the budgetary deficit. This allows the budget deficit and the annual change in the public debt to fluctuate endlessly throughout time. These differences, known as stock-flow adjustments, significantly affect the unforeseen rise in public debt. (Piątkowski, 2018). Stock-flow adjustment is considered the second major driver of increasing public debts and represents the highest driver in 2023.

The primary deficit represents the third main cause as its impact is less than debt services and stock-flow adjustment. The fourth cause is the exchange rate fluctuations that affect debt ratios by adjusting the value of foreign-denominated debt and interest payments (Humann, 2023).

On the other hand, some of the major metrics for fiscal sustainability tend to improve when inflation is high. Higher inflation can affect debt ratios through nominal GDP and interest rates. The neoclassical theory states that increasing wealth and decreasing capital when public debt rises encourages consumption but discourages investment. Consequently, this will hinder the expansion of capital accumulation and productivity (Phelps, 2022). According to the public debt decomposition graph, inflation is a beneficial factor in lowering the debt-to-GDP ratio by almost 185 cumulative percentage points, followed by GDP growth by 76 percentage points.

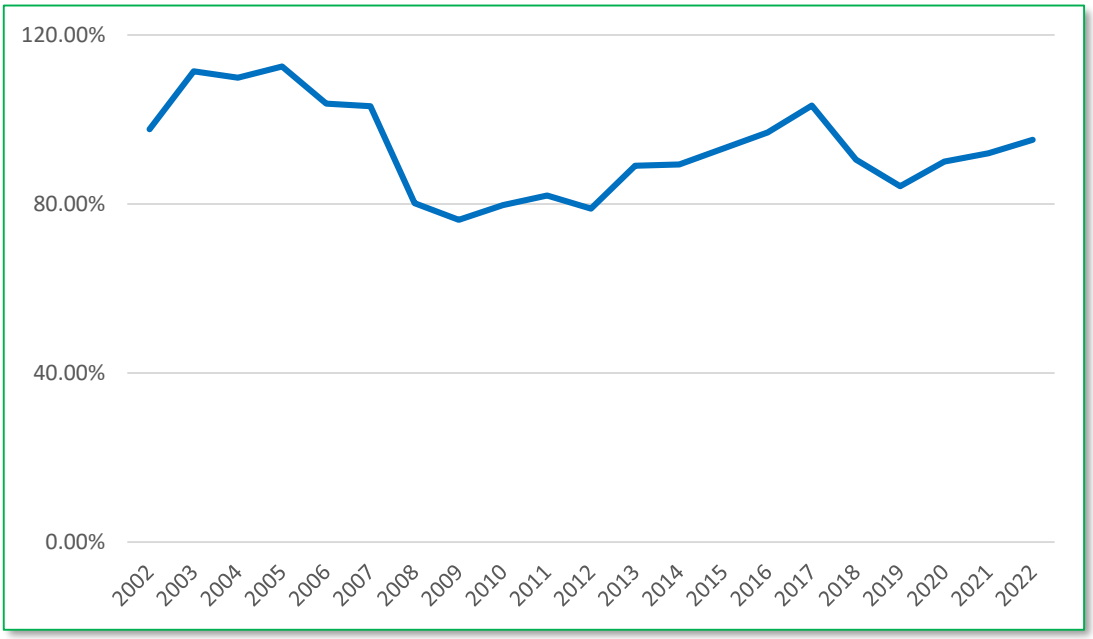
For the annual debt decomposition 2022, debt-to-GDP ratio percentage points have been altered by 7.5 percentage points of exchange rate depreciation and 5.9 percentage points of debt service. On the other hand, GDP growth helped decrease the debt-to-GDP ratio by 5.04 percentage points, inflation by 8.4 percentage points, and the primary balance by only 0.42 percentage points. However, in 2023 The debt-to-GDP ratio percentage points increased by 20.6 percentage points of stock flow adjustments which emphasizes the role of stock flow adjustments in the increasing of debt in this year, followed by almost 4 percentage points of debt service and 2 percentage points of exchange rate. On the other hand, inflation represents the main factor in decreasing the debt-to-GDP ratio percentage points by 18 percentage points, followed by GDP growth rate by 2.8 percentage points and primary balance by 2.3 percentage points.

As stated previously, we may conclude that indicators respond more quickly to modifications in fiscal policy frameworks, as seen by the shift in 2022 and

2023 drivers. As a result, to achieve debt sustainability, it is necessary to reduce the primary causes of the public debt, such as stock-flow adjustments, which are anticipated to be the largest driver in 2023, and debt service, which will be a significant financial burden on the general budget in 2023. Although inflation is a key driver in reducing the debt-to-GDP percentage point, it has a highly unfavorable long-term impact on different variables, so we shouldn't employ it as a strategy to lower debt.

2- Evaluating Egypt's debt sustainability using selected indicators and the DSF threshold:

Debt to GDP: The debt-to-GDP ratio is the ratio of a country's government debt (measured in currency units) to its annual GDP. A debt-to-GDP ratio of 60% is frequently cited as a prudential threshold for developed countries. For developing and emerging economies, the debt-to-GDP ratio should not exceed 40% in the long run (ESCAP, 2013). As depicted in Figure (4), Egypt's debt to GDP ratio fluctuated above 80% most of the time between 2002 and 2022.



Created by authors: based on data from the Ministry of Finance, selected Monthly Financial Reports

Figure (4)

Debt to GDP in Egypt from 2002 to 2022

The Launched economic reform program in 2016 resulted in many positive aspects, including lowering the budget deficit to GDP ratio from 12.5% in 2016 to 8% in 2020, as well as achieving a primary budget surplus of 1.8% of GDP in 2019/2020 compared to an initial deficit of 3.5% of GDP in the fiscal year 2015/2016, resulting in a public debt to GDP ratio of 98% in 2016. However, the ratio increased again until it reached 93.5% in 2020/2021 (Ibrahim et al., 2023).

Among several debt sustainability indicators, public external debt as a percentage of GDP, short-term debt as a percentage of total external debt and net international reserves are considered important debt indicators in Egypt since the country relies on external debt to finance its needs. Short-term debt

as a percentage of net international reserves has reached its maximum in 2022 while total external debt and public external debt as a percentage of GDP have reached high values in the same year (Figure 5). These indicators warn the government to take suitable economic policies to manage its public debt.

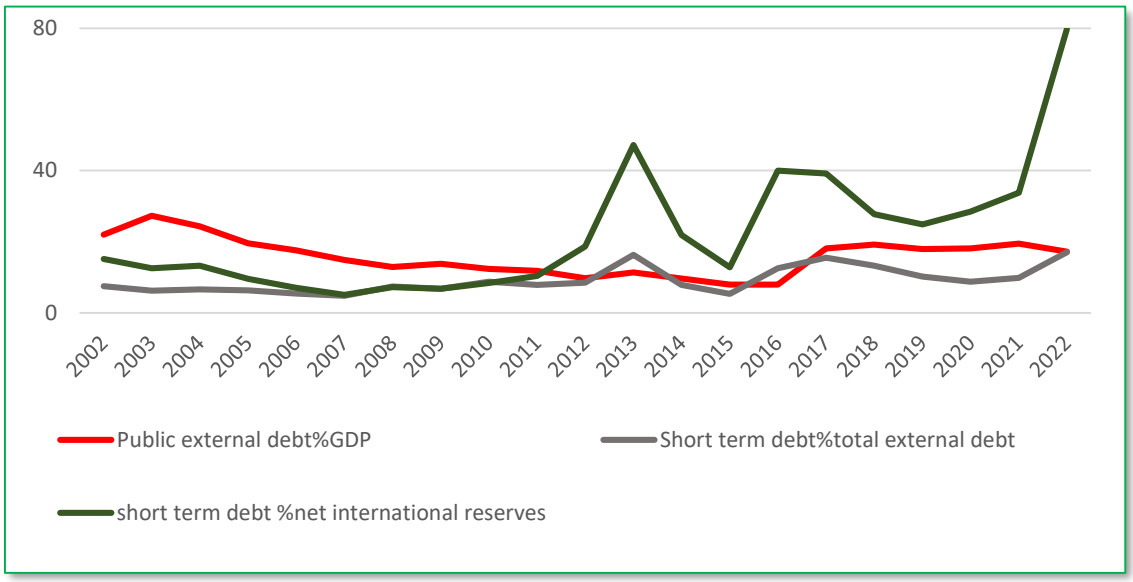


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Figure (5)
Public external debt as a percentage of GDP,
Short-term Debt in percentage of total external debt,
and Net International Reserves in Egypt (2002-2022)

Moreover, the Debt Sustainability Framework (DSF) indicators were used to compare Egypt's different debt indicators with the threshold in Table (1). The highest thresholds are associated with strong performers, suggesting that nations with sound macroeconomic policies and performance can typically tolerate higher levels of debt accumulation.

Table (1)

Debt Thresholds and Benchmarks in the DSF in Low-Income Countries

Indicators	Debt Burden Thresholds		
	Weak	Medium	High
PV (Present value) of external debt/GDP	30%	40%	50%
PV of external debt/exports	140%	180%	240%
Debt service/exports	10%	15%	21%
PV of external debt /budget revenue	200%	250%	300%
Debt service/budget revenue	14%	18%	23%

Sources: IMF (2023f), official website

Using Egypt's data obtained from the World Bank and the Ministry of Finance, the DSF indicators for Egypt are depicted in Table (2). Due to the limitations of data on the PV of external debt, some indicators are calculated only for the year 2022.

Table (2)

Egypt's DSF external debt indicators in 2022 and 2023

Indicators	2022	2023
PV of external debt/GDP	20.5%	-
PV of external debt/exports	135.6%	-
Debt service on external debt /exports	34.6 %	32.6%
PV of external debt /budget revenue	134.6%	-
Debt service on external debt /budget revenue	12.7%	14.9%

Created by authors: based on data from World Development Indicators and the Ministry of Finance selected Monthly Financial Reports

By comparing the results of Egypt's DSF external debt indicators with the thresholds, most indicators in 2022 and 2023 show that Egypt maintains a weak rating which allows more borrowing capacity if the country manages

its debt service effectively. However, debt service on external debt to exports was high in 2022 and 2023.

The DSF analysis assumes that increasing debt ratios indicate a country's macroeconomic prospects, improved policies, and institutional strength. However, this analysis ignores other important dimensions such as liquidity and solvency which affect the ability of these countries to repay debts. In addition, LICs with elevated levels of increased public debt and significant reliance on commercial loans are sensitive to interest rates, currency, and refinancing risks (Devarajan,2018). Moreover, it ignores the debt burden from the increasing debts to different indicators. In addition, in economies that need substantial infrastructure and human capital expenditures, the DSF ignores the persistent conflict between debt sustainability and development (Pinto, 2018).

Table (3)

Egypt's domestic and public debt indicators in 2022

Indicators	Domestic Debt	Public Debt
Debt service /exports	69.7%	82.4%
Debt service /budget revenue	79.3%	93.8%

Created by authors: based on data from the Ministry of Finance selected Monthly Financial Reports and WDI data

Although the DSF doesn't provide thresholds for domestic and public debt indicators, the domestic debt ratios represent exceptionally substantial burdens on the country's exports and budget income in 2022, 69.7% and 79.3% respectively. Moreover, public debt service to exports accounts for

82.4% and 93.8% of budget income, posing a significant strain on the country's debt sustainability.

3- Projecting Egypt's debt sustainability using the DIGNAR model:

a- A non-technical overview of the DIGNAR model:

The IMF created two structural model-based frameworks to examine how public investment plans affect debt sustainability and growth in developing nations, while also addressing some of the critiques directed towards the DSF. The Debt, Investment, and Growth (DIG) model, as well as its updated version to account for Natural Resources (DIGNAR), have offered significant insights into program and surveillance activities through quantitative analysis (Res et al.). Both models have a dynamic-stochastic-general-equilibrium (DSGE) structure to facilitate the effect of different policy scenarios on debt sustainability analysis. They also use the linkage between public investment, growth, debt, and the private sector response, in addition to fiscal reaction functions. They are dynamic open economy models with distinct prices for imports and exports as well as traded and non-traded sectors (Gurara et al., 2019). To differentiate between the resource sector and the non-resource traded good sector, the DIGNAR model adds a natural resource sector, which sets it apart from the DIG model. It is also different from the DIG model in that it incorporates a range of debt instruments, such as domestic debt, external commercial debt, and concessional debt (Melina et al., 2016).

Before discussing the variables and the calibration of the model, we will briefly provide an overview of the DIGNAR model description.

b- Description of the model:

To conduct a debt sustainability analysis in low-income countries (LICs), the DIG and DIGNAR models integrate several essential components, particularly those related to the relationships between public investment, growth, and debt. These important pieces are the investment-growth sector, the fiscal adjustment, and the private sector response (Gurara et al., 2019).

- **The investment-growth sector:** To reflect the relationship between growth and investment, the models include a neoclassical production function that employs labour, and private and public capital in each sector as productive inputs. The technologies are supposed to be Cobb-Douglas type, as follows:

$$y_t = A_t(k^g_t)^{\psi}(k^t)^{\alpha}(l_t)^{1-\alpha}$$

where yt is output, At is total factor productivity, ktg is public capital, kt is private capital, lt is labour, ψ is the rate of return on installed public capital. As mentioned in the study of Pritchett (2000), spending on public investment does not necessarily lead to an increase in the stock public capital due to inefficiencies in public investment. Therefore, the public capital accumulation equation is as follows:

$$k_g{}^t = (1-\delta)\, k^{\,g}{}_{t-1} + \epsilon^{ig}{}_t$$

As itg is public investment, δ is the depreciation rate, and ϵ is the efficiency parameter.

- **The fiscal adjustment:**

The models consider various government funding choices and explicitly indicate the fiscal policy reactions to various tax (and transfer) tools

aimed at ensuring debt sustainability. Following is the budget constraint of the government:

Borrowing – Resource fund accumulation = Interest Payments – Interest Earnings on the fund + Government Spending on public investment and transfers/consumption spending – Grants – Resource revenues – Taxes on consumption and/or factor incomes

Where Borrowing includes external concessional, external commercial, and domestic borrowing and their real interest rates.

- **iii. The private sector response:**

  The DIGNAR models additionally account for the private sector's response to policy initiatives. This is mostly tied to private investment and private consumption. Private investment responds to changes in fiscal policy and increases in public investment which can be characterized by crowding in and out effects. The models are solved using a completely non-linear perfect foresight solution approach (Gurara,2019).

c- Variables and calibration of the DIGNAR model:

Although Egypt is characterized by numerous and distinct natural features and resources, including land, water resources, (Bakr and Bahnassy, 2019) and Gas, the authors set the natural resources sector constant through the model scenarios to capture the impact of other variables. The DIGNAR model is considered an extension of the DIG model and includes important new debt instruments that should be considered while analyzing the sustainability of Egyptian public debt. The DIGNAR model may not reflect the real complexities of the macroeconomic mechanism of the Egyptian

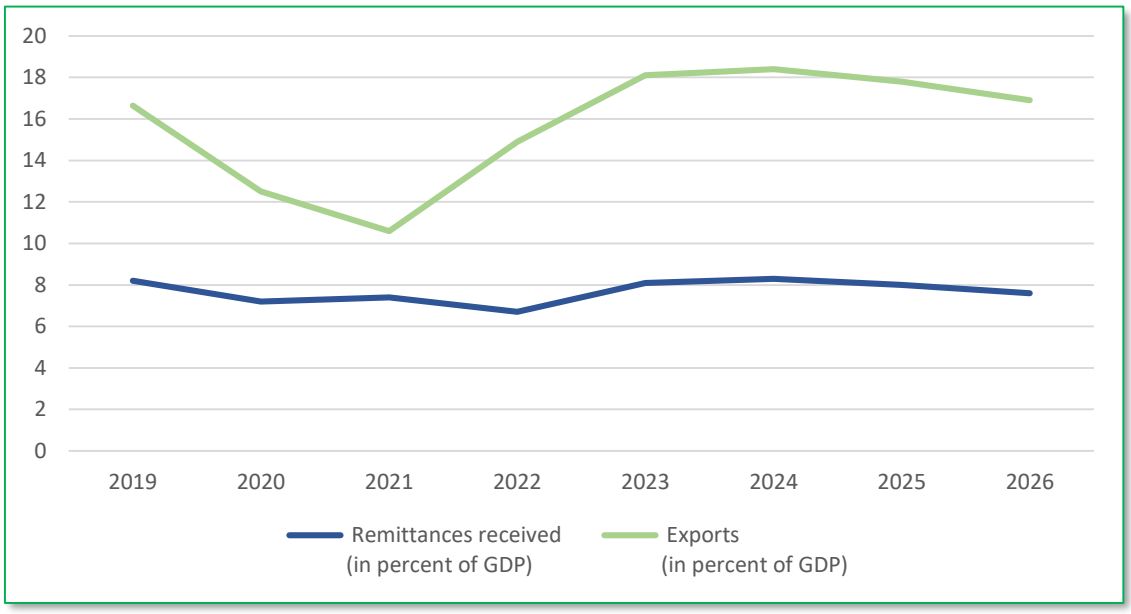
economy; however, it may help policymakers quantify different macroeconomic effects (Zamid Aligishiev, 2023).

The model includes 18 variables related to National Accounting, 4 related to interest rates, 20 structural parameters variables, one natural resource variable, and 16 Fiscal policy variables. These variables are country-specific parameters calibrated using Egypt's data from the Ministry of Finance, the Ministry of Planning, the Central Bank of Egypt, World Bank Development Indicators, and the IMF. The model also calibrated some estimated averages of LIC (Lower income countries) (See the DIGNAR toolkit 2019 (IMF) for more details on the variables).

In addition, some indicators are set as exogenous variables in the model including; natural resources (natural resource output growth and price), fiscal instruments (public investment in percent of GDP, efficiency of public investment, public consumption in percent of GDP, public transfers in percent of GDP, change in consumption tax rate, change in labor tax rate), financing (grants, concessional debt, sovereign risk premium), the balance of payments (private remittance, exports), and labor market supply. The authors chose 2019 as the base year for the analysis and used the IMF projections up to 2026.

This paper concentrates on the impact of the balance of payments on the sustainability of debt. The DIGNAR model considers exports and private remittances as the two main balance of payments variables affecting the debt path. This paper uses the IMF projection of exports and private remittances growth to analyze the effect on public debt in Egypt while keeping the rest

of the variable's constant throughout the simulation horizon. The authors conducted the simulation results depending on the projections of the growth of exports in percentage to GDP and the growth of private remittance in percentage to GDP from 2019 to 2026 (These projections were quoted from the IMF country report, January 2023e).



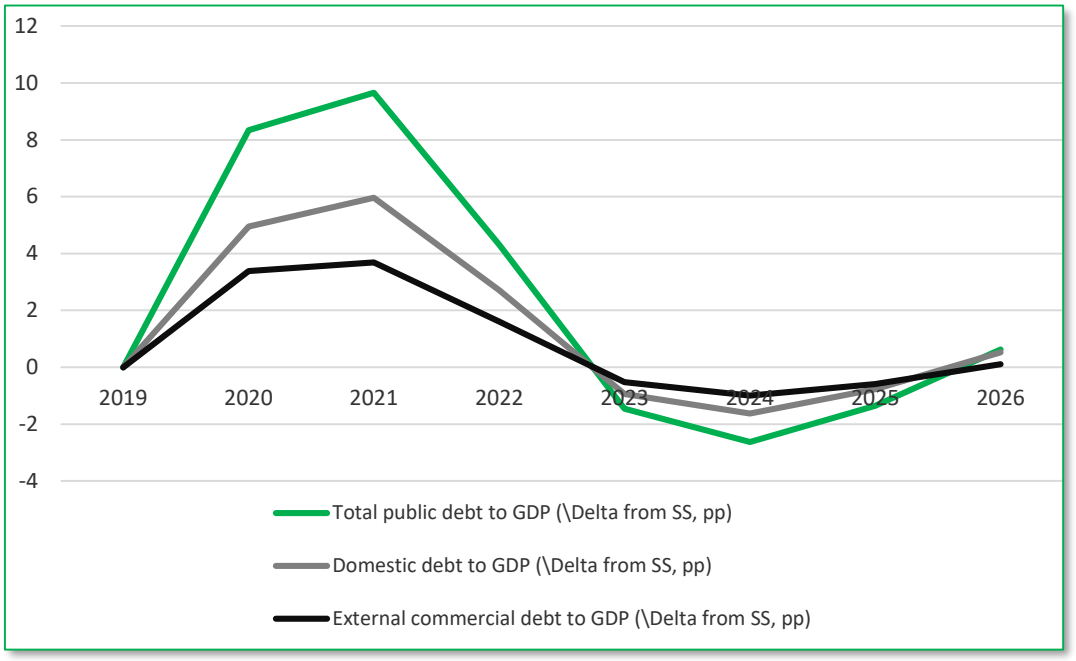
Created by authors: based on data from IMF country report, January 2023

Figure (6)
IMF projections of exports and private remittances received in percentage of GDP 2019 - 2026

Figure (6) shows that private remittances in percentage to GDP are expected to follow a stagnant trend, while the trend of exports in percentage to GDP has decreased significantly since 2019 to reach its minimum point in 2021 (10.6% of GDP). However, it follows an obvious increase from 2021 to 2023. From 2023 to 2026, the percentage of exports to GDP is expected to

follow a stationary trend reaching its maximum point of 18.4% in 2024 and then decreasing to 16.9% in 2026.

Depending on the IMF projections of exports and private remittances in percentage of GDP from 2019 to 2026, the significant decrease in exports in the percentage of GDP in 2021 along with small fluctuations of private remittances, the DIGNAR results show a noticeable increase in total public debt to GDP by 9%, domestic debt to GDP by 6%, and the external commercial debt to GDP by 3.7%. From 2021 to 2026. As noticed, when exports reached their lowest in 2021, the change in total public debt to GDP, domestic debt to GDP, and external commercial debt to GDP reached their maximum levels. On the other hand, exports are expected to increase in 2024. Hence the change in total public debt to GDP, domestic debt to GDP, and external commercial debt to GDP are expected to decrease by 2.6%, 1.6%, and 1%, respectively, assuming other exogenous variables are constant. Even though the results depend on changes in exports and private remittances, the analysis of the effect of changes in private remittances is neglectable due to the stagnant trend depicted in Figure (6).



Created by author: based on DIGNAR results.

Figure (7)
The effects of exports and private remittances in percentage of GDP on total debt, domestic debt, and external commercial debt in percentage of GDP 2019-2026

Conclusion and Policy Recommendations:

Egypt's public debt is a significant concern for policymakers since it impedes growth objectives by limiting investment possibilities and leading to deteriorating financial circumstances (Abdelgany, and Al-deen, 2023). As mentioned, the sustainability of public debt differs according to the approaches applied. The DSF indicators showed contradictory results as most external public debt exhibited weak ratings allowing more borrowing capacity in case of efficient debt service management. Conversely, debt service on external debt to exports was high in 2022 and 2023. On the other hand, according to the IMF country report in 2023, Egypt’s Public debt is assessed as sustainable, although not with a high likelihood based on the hazards associated with high debt and high funding requirements; however, it also considers the country's track record of satisfying these high demands, which is supported by consistent funding from banks, as a mitigating factor. Although the findings support debt sustainability, the escalating debt challenges and fiscal imbalances indicate that sustainability may not be maintained in future (IMF, 2023e). Nevertheless, applying different indicators and approaches helps policymakers identify various sources of growing public debt and build future scenarios using various debt sustainability models, such as the DIGNAR model, to mitigate the problem. The DIGNAR model confirms the substantial role of promoting exports in achieving debt sustainability. Without promoting exports, the country may suffer from future debt unsustainability.

This study identifies some key challenges that Egypt needs to address to achieve debt sustainability, including:

1- **Reducing debt services:** As shown by the debt decomposition tool, the debt service lately represents the main driver of the change in the debt to GDP ratio, therefore we should concentrate on reducing the debt services using the following techniques:

a. Debt Restructuring:

For economies with high debt levels, fiscal constraint, growth, and inflation may not be sufficient to lower debt ratios. In these circumstances, debt restructuring may be essential. Renegotiating the conditions of contractual payments for some outstanding government debt instruments is known as public debt restructuring, and it's a complicated procedure. The restructuring happens either after default or in a protective manner before any payments are missed. The process of implementing debt restructuring can take several forms, including restructuring by decreasing the debt's nominal value or restructuring by decreasing cash flow without decreasing the debt's nominal value (by extending the maturity term or lowering instalment payments, for example) (IMF, 2023c).

b. Debt Swaps:

Debt swaps, which involve releasing the debtor in exchange for a certain quantity of local currency funding to be used for designated development initiatives, is one of the debt relief strategies that is growing in popularity. Notably, debt swaps have been viewed to

provide developing economies with extra funding for their development initiatives in addition to helping reduce their debt (Ito, et al., 2018). Debt-for-climate swaps, or debt swaps to combat climate change, are among the most significant contemporary debt-swapping schemes (Chamon, et al., 2023). However, since they help liberalize resources for sustainable development, such creative financing tools benefit economies with restricted fiscal space but not yet unsustainable debt burdens. Early and extensive restructurings are required for such economies (UNDESA, 2023). Many nations beleaguered by foreign debt can exchange their debt for locally financed development initiatives, which lessens the weight of debt and debt servicing obligations and decreases unsustainability. The Egyptian government has already done that with Italy and Germany, but it should be applied on a larger scale.

2- **Stock-flow adjustment:** Over the previous ten years, stock-flow adjustment has contributed considerably to Egypt's Public debt. Therefore, reducing stock-flow adjustment is one of the main strategies that can help in debt sustainability.

3- **Reducing the budget deficit:** This is one of the important challenges facing Egypt, as it is one of the main sources of debt accumulation. Egypt needs to implement a comprehensive fiscal consolidation program, which the government has started to apply in 2023, to reduce the budget deficit to a sustainable level. However, the

program should consider supporting production not just decreasing imports.

4- **Decreasing inflation:** Although inflation is one of the main drivers to decrease the debt-to-GDP ratio, it may have negative macroeconomic implications, as inflation and all internal and external variables are linked. However, lowering Egypt's inflation rate may assist in alleviating future inflationary pressures (Ghaly, 2023).

5- **Infrastructure Investment with high returns:** Egypt’s government should prioritize projects with strong economic benefits to promote sustainable growth through debt accumulation.

6- **Export promotion:** A key element of Egypt's plan to mitigate and achieve debt sustainability is export promotion, as the DIGNAR model's findings indicate. The country should encourage exports from its primary economic sectors as one of the primary sources of foreign exchange. Therefore, encouraging trade in consulting, education, and healthcare is equally important as it is with traditional exports. Moreover, the government should have strategies to cope with the possibility that exports would fall below expectations, this might include broadening the export base.

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