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ANALYSIS OF THE MACRO-FISCAL IMPACTS ASSOCIATED WITH THE PERSISTENT FOREIGN CURRENCY SHORTAGE AND THE EXCHANGE RATE:

THE CASE OF MOZAMBIQUE (1990-2024)

TECHNICAL SHEET:

Title: Analysis of the Macro-Fiscal Impacts Associated with the Persistent Foreign Currency Shortage and the Exchange Rate: The Case of Mozambique (1990-2024)

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ABBREVIATIONS/ACRONYMS

AJE - External Aid

BdM - Bank of Mozambique

CAP - Physical Capital

COR - Corruption Control

DEP - Public Expenditure

DEF - Fiscal Deficit

DES - Unemployment

DFA - Enhanced Dickey-Fuller Index

DPIB - GDP Deflator

DPT - Public Debt

EEIC - External Loans and Capital Contributions

ENE - Energy Utilization

EPD - Persistent Shortage of Foreign Exchange

ETP - Political Stability and Absence of Violence/Terrorism

EXP - Exports of Goods and Services

GAE - Degree of Openness of the Economy to the Outside World

IED - Foreign Direct Investment

IMF/IMF - International Monetary Fund

IMP - Imports of Goods and Services

ln - Natural Logarithm

MCI - Months of Import Coverage

MQO - Ordinary Least Squares

MRLM - Model of Multiple Linear Regression

MZN – Meticais

OFM - Money Supply

GDP - Gross Domestic Product

GDPr - Real Gross Domestic Product

POP - Population Size

RCF - Tax Revenues

RCN - Natural Resources

RESET - Regression Equation Specification Error Test (Regression Equation Specification Error Test)

RGL - Rule of Law

SDT - Total Debt Service

TAR - Import Tariffs

TCO - Official Exchange Rate

TOT - Terms of Trade

TRB - Labor

USD - US Dollars

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Summary

Mozambique has been facing a persistent shortage of foreign currency, with a significant accumulated backlog in external payments, particularly since 2024. However, official data show that, since 2021, the exchange rate has been relatively stable, a state that appears to be both unnatural and unrelated to current market conditions. The foreign exchange shortage and the unnatural stability of the exchange rate may have had negative macro-fiscal effects. These include a decline in economic activity, import restrictions on goods and services, rising prices, worsening fiscal deficits and increased public debt.

In this context, this paper seeks to empirically analyse the relevant macro-fiscal impacts associated with persistent foreign exchange shortage and the exchange rate, using Mozambique as a case study. More specifically, this study determines the trends of its main variables (persistent foreign exchange shortages, the official exchange rate, gross domestic product, goods and services imports, inflation, the fiscal deficit, and overall public debt). The correlation between persistent foreign exchange shortages and the official exchange rate on the one hand, and the relevant macro-fiscal variables (imports of goods and services, economic growth, inflation, the fiscal deficit, and total public debt) on the other, is estimated using empirical methods. The impact of persistent foreign exchange shortages on private sector activities and household living standards is measured.

In order to achieve the first and second specific objectives of the study, a regression analysis-based econometric method is carried out. For the first, exponential trend models are estimated for each of the seven main variables in this study. For the second, separate regressions are estimated for economic growth, imports of goods and services, inflation, fiscal deficit and total public debt against the persistent foreign exchange shortage (measured by months of import coverage), the official exchange rate and other relevant control variables. To achieve the third and final specific objective of the study, a survey is conducted based on direct interviews with business managers and representatives of business associations operating in the food, health, construction and e-commerce sectors. These sectors are heavily dependent on raw materials and imported goods (foodstuffs, medicines, medical equipment, construction materials, vehicles, machinery, among others).

The aforementioned econometric models are estimated using annual time-series data collected from the World Bank website and covering the period from 1990 to 2024. In turn, the measurement of the impact of persistent foreign exchange shortages on private sector activities and household living standards uses cross-sectional data extracted from the aforementioned survey.

The study found that from 1990 to 2024, Mozambique's gross domestic product (GDP), fiscal deficit and months of import coverage (a measure of foreign exchange scarcity) all showed a downward trend. In contrast, inflation and the official exchange rate exhibited an upward trend. The main results also show that during the same period, there was no statistically significant relations between economic growth and persistent foreign exchange scarcity; exchange rate depreciation had a negative impact on real *GDP*; there was no statistically significant relations between imports of goods and services and persistent foreign exchange scarcity; imports were not significantly sensitive to changes in the official exchange rate; imports of goods and services declined due to a combination of foreign exchange shortages and depreciation of the official exchange rate; there was no statistically significant relations between inflation and the persistent foreign exchange shortage; a 1% increase in the official exchange rate led to an increase in the general price level (i.e. inflation) of around 0.31%, persistent foreign exchange shortages did not significantly affect the fiscal deficit; there was no statistically significant relations between the fiscal deficit and the official exchange rate; persistent foreign exchange shortages did not have a significant impact on the fiscal deficit; there was no statistically significant relations between

the fiscal deficit and the official exchange rate; there was no statistically significant relations between the persistent shortage of foreign exchange and total public debt; the depreciation of the official exchange rate led to a significant increase in total public debt (elasticity = 0.13); and the interaction between the shortage of foreign exchange and the depreciation of the exchange rate also led to a significant increase in total public debt. The main results also suggest that the ongoing shortage of foreign currency negatively impacted businesses, resulting in some firms closing, increased unemployment, and reduced social welfare.

The main results reported above suggest that macroeconomic instability in Mozambique is predominantly caused by vulnerabilities in the external sector and exposure to exchange rates. Thus, the main policy priorities include strengthening the coordination of macroeconomic policies between fiscal, monetary and exchange rate authorities, improving exchange rate stability and the management of international reserves, reducing the exposure of public debt to exchange rate risk through greater reliance on domestic currency borrowing, expanding export capacity and diversifying the economic base to increase foreign exchange earnings, improving transparency and efficiency in the allocation of foreign exchange to support private sector activity, and strengthening macro-fiscal risk management through *stress* tests and early warning systems.

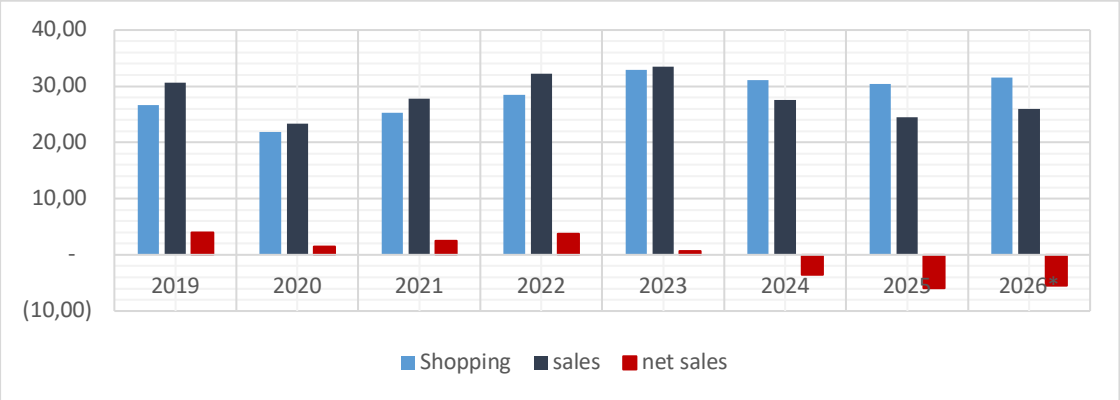
Overall, the study concludes that the Mozambican economy is structurally vulnerable to persistent foreign exchange shortages and exchange rate fluctuations. These external pressures have a significant impact on macroeconomic stability, public debt dynamics, inflation and private sector performance. To address these challenges, a policy approach that focuses on macroeconomic stability, structural transformation, and strengthening the resilience of the external sector is required.

Keywords: Fiscal risks, macro-fiscal variables, persistent foreign exchange shortage, official exchange rate, economic growth, imports of goods and services, inflation, fiscal deficit and public debt.

1. Introduction

Mozambique has been experiencing a persistent shortage of foreign currency, a circumstance that has worsened significantly since 2023. That year, the Bank of Mozambique (BdM) tightened foreign currency liquidity conditions, notably by increasing the foreign currency reserve requirement ratio by 28% between January and May (BdM, 2023), as well as suspending its co-financing of fuel import invoices (Diário Económico, 2023). Figure 1 illustrates the foreign exchange shortage, characterised by commercial banks' inability to meet public demand for foreign currency.

Figure 1: Trends in Foreign Exchange Purchases, Sales and Net Sales (10^6USD), 2019–2026



Source: Author's calculations based on data from the Bank of Mozambique (various years)
Note: * Up to April

The figure above illustrates the trend in daily averages for foreign exchange purchases, sales, and net sales in the official foreign exchange market from 2019 to April 2026. It should be noted that the figure highlights a significant change in the behaviour of the foreign exchange market. Between 2019 and 2023, daily foreign exchange sales by commercial banks to their customers consistently exceeded purchases. This led to positive net sales balances. For instance, net sales amounted to approximately USD 3.98 million in 2019 and USD 3.78 million in 2022. In 2023, they remained positive, albeit slowing significantly to around USD 614,000 as a result of the Bank of Mozambique withdrawing its co-financing of fuel import payments. However, this trend reversed from 2024 onwards. Foreign exchange purchases by commercial banks began to exceed sales, resulting in negative net sales balances (highlighting a clear retention of foreign exchange by commercial banks). In 2024, the negative balance was around USD -3.56 million, worsening significantly in 2025 to around USD -5.89 million. Until April 2026, the daily average remained at high deficit levels, standing at around USD -5.52 million. With eight months still to go before the end of the year, this figure is very close to that recorded in the previous year (USD -5.89 million).

It should also be noted that the developments referred to in the previous paragraph occurred despite various measures adopted by the Bank of Mozambique. These included increasing the minimum conversion threshold for export revenues from 30% to 50% and amending the regime governing the repatriation and conversion of revenues from the re-export of petroleum products to allow for their full conversion (Diário Económico, 2025). In theory, these measures should have increased the availability of

foreign exchange within the banking system and consequently its supply to the public. However, available data indicate that this effect has not materialised. Conversely, the recent trend points to an increase in the net sales deficit, reflecting the shortage of foreign exchange in the foreign exchange market.

The available data also suggests that the official exchange rate has exhibited a certain degree of unnatural stability since 2021 (contrary to market conditions). These foreign exchange restrictions and the artificially stable exchange rate may be having negative macro-fiscal effects, including a decline in economic activity, import restrictions, a rise in the general price level, worsening of the fiscal deficit and increased public debt.

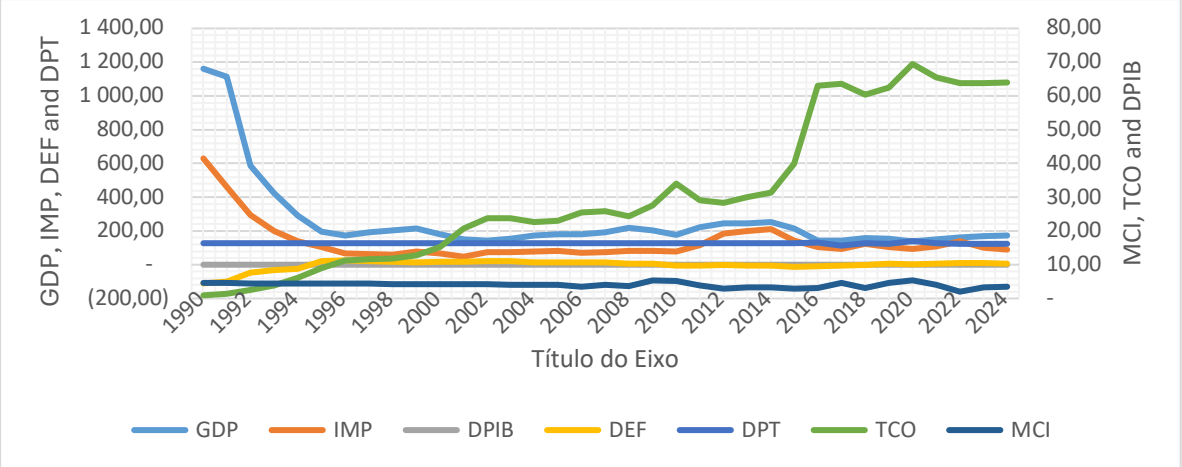
In recent years, the Mozambican economy has shown a macroeconomic trajectory marked by a recovery in economic growth following shocks caused by the hidden debt crisis, the COVID-19 pandemic, and more recently, post-election protests. These events reflect internal challenges and external vulnerabilities. Import levels of goods and services have remained historically high, consistently exceeding the country's export capacity. This has reinforced dependence on external flows and put pressure on the balance of payments. At the same time, inflation has been volatile, reflecting the country's vulnerability to fluctuations in international prices and exchange rates. From a public finance perspective, the fiscal deficit has shown a persistently positive trend, albeit with intermittent consolidation efforts, against a backdrop of limited tax revenue mobilisation and increasing public expenditure rigidity. Consequently, public debt levels have remained high in recent years, particularly with regard to the domestic component. In turn, this exposes the country to heightened risks regarding the sustainability of its finances due to the higher costs associated with public debt.

As described in the preceding paragraphs, the context reveals the coexistence of structural weaknesses and cyclical pressures, which in turn constrain the scope for manoeuvre of economic policies and accentuate the country's macroeconomic vulnerability.

The figure below illustrates trends in persistent foreign exchange shortages (measured by months of import coverage), the official exchange rate between the metical and the US dollar[1] , real gross domestic product (GDP) (2019 = 100), imports of goods and services, inflation, the fiscal deficit and total public debt. It also shows the correlation between the first two variables and the last five over the period 1990 to 2024.

[1] In Mozambique, the official exchange rate is measured in units of the national currency, the metical (MZN), for each unit of foreign currency. In this study, the foreign currency is the US dollar. (USD).

Figure 2: Trends in *MCI* (months), *TCO* (MZN/USD), *PIBr* (10^6USD), *IMP* (10^6USD), *INF* (%), *DEF* (10^6USD) and *DPT* (10^6USD), 1990–2024



Source: Author's calculations based on World Bank data (2026)
Notes: *MCI* = months of import coverage, *TCO* = official exchange rate, *GDP* = real gross domestic product, *IMP* = imports of goods and services, DPIB = inflation, measured by the GDP deflator, *DEF* = fiscal deficit and *DPT* = total public debt.

The chart shows that the persistent foreign exchange shortage (measured by months of import coverage)[2] followed a downward trend between 1900 and 2024. However, the relatively comfortable levels in the early years were followed by a gradual decline, with fluctuations in between. This deterioration in the months of import coverage worsened in the final years of the period in question, dropping significantly from 5.31 months in 2020 to around 2.01 months in 2022. Although this variable recovered slightly in subsequent years, this improvement did not alleviate the restriction on access to foreign currency in the foreign exchange market. Conversely, the most tangible evidence of the shortage of foreign exchange materialised in the form of a contraction in goods and services imports.

The figure also shows a growing depreciation of the national currency, the metical, against the US dollar. This trend was particularly evident between 2014 and 2016, a period marked by the hidden debt crisis which triggered significant exchange rate instability. Further depreciatory pressures were caused by the 2020 COVD-19 pandemic. However, from 2021 onwards, the official exchange rate appeared to stabilise, remaining at relatively consistent levels. Nevertheless, this stability does not appear to have fully reflected market conditions. It coexisted with restrictions on access to foreign exchange and a significant differential in exchange rates between the official and parallel markets (around 15%, according to Mann and Meyer-Cirkel, 2024; CIP, 2025). According to Gray (2021), in open economies, the exchange rate

[2]One measure of persistent foreign exchange scarcity is the months of import coverage. Other commonly used measures include the level of gross and net international reserves, the ratio of international reserves to short-term external debt, the difference in exchange rates between official and parallel markets, import compression, arrears on external payments, and where available, indicators of bank foreign exchange rationing, such as waiting times or the proportion of foreign exchange demand that goes unmet (IMF, 2000; IMF, 2013; World Bank, 2026). In developing economies such as Mozambique, it is generally accepted that liquid reserves should be maintained to cover at least three months' worth of imports of goods and services. (IMF, 2011).

is the price that balances the foreign exchange market. When it is kept below its equilibrium level, adjustment ceases to occur via the price channel and instead occurs via the quantity channel, resulting in rationing and scarcity. In practice, apparent and administrative exchange rate stability can coexist with delays to external payments, expansion of the parallel foreign exchange market, and foreign exchange restrictions. This occurs when the official exchange rate does not accurately reflect changes in the supply and demand for foreign currencies in the foreign exchange market.

The same figure shows that, after contracting significantly between 1990 and 1996, real gross domestic product grew steadily, albeit non-linearly. This trend was interrupted by episodes of deceleration linked to internal and external shocks. Notably, there was a slowdown following the hidden debt crisis in 2016, as well as an adverse impact from the subsequent COVID-19 pandemic.

The figure also shows that imports of goods and services initially followed a similar trend to real gross domestic product, with a sharp decline recorded until 1996. This was followed by a growth trajectory marked by fluctuations over the subsequent decades. However, from 2022 onwards, a divergence between these two variables emerged. While real gross domestic product continued to grow, imports contracted significantly. This decoupling can be seen as evidence of a worsening foreign exchange shortage, which has restricted import capacity. Therefore, it could be hypothesised that the reduction in imports was not the result of lower domestic demand, but rather a direct consequence of constraints on access to foreign exchange, thereby reinforcing the idea of adjustment via a compression of external demand.

Figure 2 shows that inflation was highly volatile throughout the period in question. It rose sharply between 1990 and 1995, reaching levels above 50%. This occurred against a backdrop of severe macroeconomic instability, and coincided with the contraction of real GDP and imports. Thereafter, inflation rapidly decelerated, standing at levels close to 6% in 1998. From that year onwards, inflation fluctuated within more moderate ranges, though it remained sensitive to exchange rate shocks and external price pressures. This may have reflected structural vulnerabilities in the economy.

Figure 2 also shows that the fiscal deficit worsened during the period in question, albeit with some variability from year to year. In certain years, efforts were made to consolidate the fiscal position, leading to relative stabilisation. However, the trajectory of the fiscal deficit reflected persistent pressures on public finances, associated with both economic shocks and structural constraints on revenue mobilisation.

The same figure (Figure 2) shows that total public debt increased steadily, particularly from the mid-2010s onwards. This increase was particularly acute in the period following the hidden debt crisis, reflecting the need to finance the fiscal deficit and the depreciation of the exchange rate. This, in turn, led to an increase in the value of external debt denominated in the national currency.

Finally, the figure in question shows that the relations between the number of months of import coverage and the official exchange rate on the one hand, and each of the five macro-fiscal variables referred to in the preceding paragraphs on the other, were unclear over the period from 1900 to 2024. More specifically, it shows that reductions in import coverage months (which correspond to persistent foreign exchange shortages) were associated with a contraction in imports of goods and services. This is consistent

with the external constraint adjustment mechanism, albeit with some lag in certain sub-periods. Furthermore, the lowest import coverage months (corresponding to the highest foreign exchange scarcity) coincided with inflationary pressures and exacerbated the fiscal deficit in certain years. However, this correlation was not stable throughout the entire period, reflecting the influence of exogenous shocks and structural factors. Regarding the official exchange rate, this variable's depreciation trend reflected a positive correlation with inflation and public debt, particularly during periods of greater exchange rate instability. This, in turn, suggests exchange rate transmission effects and an increase in the value of external debt denominated in the national currency. However, the correlation between import coverage months and the official exchange rate, and between the official exchange rate and gross domestic product, was unclear due to evidence of episodes of exchange rate depreciation and economic growth coexisting. Figure 1 generally shows that, although the correlations between the two groups of variables were economically plausible, they were neither uniform nor sufficiently clear over time. In some years, the direction of the correlation between the two groups of variables was inconsistent with the expected behaviour.

In short, the numerical evidence from Figure 2 suggests that the trend described by each of the seven analysed variables was not clear enough between 1990 and 2024. Furthermore, the direction of the relations between import coverage and the official exchange rate, and the five macro-fiscal indicators (real gross domestic product, imports of goods and services, inflation, fiscal deficit and total public debt) was unclear. In cases where the direction of the relations appears to be inconsistent with economic theory, economic intuition and common sense, it should be noted that the fiscal risks associated with persistent foreign exchange shortages and fluctuations in the official exchange rate have an impact on macro-fiscal variables. This finding highlights the need for an in-depth empirical analysis to provide a clear understanding of the macro-fiscal impacts of fiscal risks associated with persistent foreign exchange shortages and fluctuations in the official exchange rate. This appears to be a task that has not previously been undertaken using data from the Mozambican economy.

Against this backdrop, the paper addresses the following fundamental research question:

- What trends can be observed in the persistent foreign exchange shortage, the official exchange rate, gross domestic product, imports of goods and services, inflation, the fiscal deficit and total public debt, and how are the first two variables related to each of the last five macro-fiscal variables?

This study covers the period from 1990 to 2024. The selection of this timeframe is primarily due to the availability of data on the seven key variables examined in this study, as previously mentioned.

The persistent shortage of foreign exchange is not just a balance of payments issue. It also limits the productive sector by driving up the prices of imported inputs, disrupting supply chains for imported goods, and reducing the predictability of production costs. Furthermore, the shortage of foreign exchange undermines the country’s competitiveness, has a negative impact on investment and employment, and reduces tax revenues. To illustrate the severity of the operational impact of the phenomenon in question,

the national press recently reported on commercial banks' trial of a total block on websites and online payment and shopping platforms, citing a shortage of foreign exchange (O País newspaper, Evidências newspaper, both 2026). By restricting payment and consumption channels linked to the digital economy and tradable services, this measure may further exacerbate low levels of social welfare, reduce economic activity and worsen the informalisation of the national economy. It is in this context that the subject of this study requires further research. It demonstrates that foreign exchange shortages simultaneously act as a negative macroeconomic shock and a source of fiscal risk through multiple mechanisms that are often underestimated in strictly monetary or external analyses. Therefore, it is necessary to not only describe the phenomenon in question, but also to provide an integrated analysis of its effects on economic growth, imports of goods and services, inflation, the fiscal deficit and public debt. This analysis should distinguish between the structural and operational dimensions of the foreign exchange restriction and discuss its implications for the country's economic performance.

A literature review conducted as part of this study revealed that no one had previously attempted to empirically investigate the subject of this research using data from the Mozambican economy. The review also revealed that, with the exception of foreign exchange shortages, the Ministry of Finance has conducted studies on the fiscal risks arising from various economic events or phenomena. Nevertheless, existing studies are merely descriptive and are presented in the form of reports published on the Ministry's website. In this context, this study is important because it provides reliable empirical evidence on the macroeconomic impact of persistent foreign exchange shortages - a subject of great interest to the Government of Mozambique, the business sector, academics, researchers, and society in general. Based on the implications of these results for Mozambique's economic performance, particularly with regard to the fiscal deficit and public debt, this study provides economic policy recommendations that will be useful to policymakers in the country. Furthermore, this study will serve as a reference for future research on the topic.

Having presented the research problem and formulated the fundamental research question, this paper aims to: **To empirically analyse the macro-fiscal impacts associated with persistent foreign currency shortages and official exchange rates between 1900 and 2024, using Mozambique as a case study.**

The specific objectives of the research are as follows:

- To determine the trend of the main variables in this study, namely persistent foreign exchange shortages, the official exchange rate, real GDP, imports of goods and services, inflation, the fiscal deficit and total public debt;
- To empirically estimate the relations between the fiscal risks associated with persistent foreign exchange shortages and fluctuations in the official exchange rate, on the one hand, and, on the other, macro-fiscal variables such as imports of goods and services, economic growth, inflation, the fiscal deficit and total public debt; and
- To measure the impact of persistent foreign exchange shortages on private sector activities and household living standards.

The following sections review the relevant literature, present the methodology and describe the data used for the analysis, including its sources. They also analyse the empirical results and draw conclusions from the study.

2. LITERATURE REVIEW

The following subsections define the basic concepts used in this study and describe the relations between fiscal risks (in the form of persistent currency and foreign exchange shortages) and the fiscal framework variables referred to in the previous section, as well as modelling these relations. Some related empirical studies are presented, and the reviewed empirical literature is critically assessed.

2.1 Definition of Basic Concepts

The following paragraphs define the basic concepts used in this study: fiscal risks, macro-fiscal variables, persistent foreign exchange scarcity, the official exchange rate, imports of goods and services, economic growth, inflation, the fiscal deficit, and public debt.

Over the years, various authors have attempted to define the concept of fiscal risk. Noteworthy definitions include those developed by the International Monetary Fund (IMF) in 2012 and the Ministry of Economy and Finance of Mozambique (MEF) in 2023. The IMF defines fiscal risks as 'factors that may cause budgetary outcomes and the debt trajectory to deviate from projections, as a result of either macroeconomic shocks or the materialisation of explicit or implicit liabilities and contingencies'. In turn, the MEF (2023, p. 3) defines the concept as "factors likely to cause deviations in fiscal outcomes from initially established expectations or projections', further emphasising that their materialisation may lead to unexpected increases in public debt and trigger very high fiscal costs". Both definitions converge in that they both view fiscal risks as factors capable of causing deviations in public accounts from what was forecast. The main difference between the two definitions lies in the emphasis placed on the concept. The MEF adopts a more operational formulation, centred on deviations in fiscal outcomes and their consequences, whilst the IMF presents a more analytical definition by highlighting the sources of these deviations, namely macroeconomic shocks and contingent liabilities. This study adopts the IMF's definition as it is more comprehensive and useful for identifying the origins and transmission mechanisms of fiscal risks. The study focuses particularly on the potential macro-fiscal impacts of fiscal risks.

Macro-fiscal variables are the set of interdependent macroeconomic and fiscal indicators used to analyse economic performance, fiscal trajectories and public debt sustainability. These variables include economic growth, fiscal balances, public expenditure, tax revenue and public debt. While the term does not generally appear as a rigidly defined classical concept in traditional macroeconomic literature, it is frequently used in literature on macro-fiscal analysis, debt sustainability, budgetary planning and fiscal risk management. This is particularly the case in applied studies and frameworks, where it is used to designate the variables relevant to assessing fiscal positions and the consistency of macroeconomic frameworks (Yaker & Lienert, 2018; Riscado, Stančík & Välilä, 2011; Burns et al., 2019).

Out of all the existing definitions of the concept of **persistent foreign exchange scarcity**, the ones that stand out are the ones developed by Loscher (2020) and Thirlwall (1979). Loscher defines foreign exchange scarcity as a structural constraint characterised by a persistent shortage of foreign currency to finance imports and external obligations. This constrains economic growth and limits the capacity for

structural transformation in developing economies. Thirlwall, on the other hand, interprets foreign exchange scarcity as a structural constraint on economic growth resulting from an inability to generate sufficient foreign exchange to sustain the level of imports required for growth. It should be noted that both definitions converge in recognising that the scarcity of foreign exchange stems from an imbalance between the capacity to generate foreign exchange and the economy's external needs. However, they differ in their analytical emphasis. Loscher favours an approach centred on the structural and systemic nature of the external constraint, whilst Thirlwall highlights the role of foreign exchange scarcity as a macroeconomic constraint on long-term growth.

Noteworthy definitions of the **official exchange rate** concept have been developed by Kroth (2013) and Blanchard (2017). Kroth defines the exchange rate as the price of a unit of foreign currency in domestic currency. In turn, Blanchard defines the exchange rate as the relative price of one currency against another, reflecting the amount of one currency required to purchase one unit of another. He adds that it is determined by shifts in supply and demand in the foreign exchange market. Both definitions agree that the exchange rate represents the relative price of one currency against another and is a key factor in the relations between a country's domestic economy and the rest of the world. For the purposes of this study, the definition developed by Blanchard is adopted, since it considers foreign exchange market conditions to be a key factor in determining the exchange rate.

The definitions developed by Blanchard (2017) and Wang (2009) are used to define the concept of **imports of goods and services**. According to Blanchard, imports are defined as the proportion of domestic expenditure incurred on goods and services produced abroad. This directly influences the external balance and the level of domestic economic activity. In turn, Wang defines imports of goods and services as the value of goods and services purchased by residents of an economy from non-residents within the scope of transactions recorded in the balance of payments. Both definitions recognise that imports correspond to real flows from abroad that form part of domestic economic activity. However, their analytical approaches differ. While Blanchard favours a theoretical approach that incorporates imports into the functioning of the macroeconomic model and the determination of aggregate income, Wang adopts an accounting and statistical perspective that is focused on measuring external transactions. In this study, these two approaches complement each other, enabling a theoretical and empirical analysis of the role of imports in the economy to be conducted simultaneously.

Solow (1956) defines **economic growth** as a sustainable increase in an economy's real aggregate output over time. This increase is determined by capital accumulation, labour force growth, and technological progress. Kuznets (1971), on the other hand, defines economic growth as the long-term increase in an economy's capacity to provide goods and services to its population based on institutional and technological advances. While both definitions agree on the sustainable increase in real aggregate output, they differ in terms of their emphasis. Solow prioritises quantitative determinants and formal modelling, whereas Kuznets takes a more structural and institutional approach.

Tanzi (1993) and De Clerck & Wickens (2019) introduce the concept of the **fiscal deficit**. Tanzi

defines the fiscal deficit from the perspective of the government's current accounts as the difference between public revenue and the state's current expenditure. This alternative measure excludes investment components and allows for the assessment of fiscal sustainability in the short term. De Clerck and Wickens, in turn, define the fiscal deficit as a situation in which total government expenditure exceeds revenue over a given period. They adopt a comprehensive, accounting-based approach that includes both current and capital expenditure. Tanzi's approach introduces a relevant analytical distinction by focusing on the current account deficit, enabling a more nuanced interpretation of the fiscal position. In contrast, De Clerck & Wickens provide a standardised, operational definition that is essential for international comparability and macroeconomic analysis.

Noteworthy definitions of **public debt** include those developed by Reinhart & Rogoff (2010) and the World Bank (2020). Reinhart and Rogoff define public debt as the accumulated stock of government liabilities that can impact economic growth and macroeconomic stability, particularly when it reaches high levels. The World Bank, on the other hand, defines public debt as the total value of financial obligations incurred by the government over time, including both domestic and external debt. It should be noted that these definitions differ. Reinhart and Rogoff emphasise the macroeconomic implications and risks associated with high levels of indebtedness, whereas the World Bank provides a purely descriptive definition.

2.2 Relations between Fiscal Risks Associated with Persistent Foreign Exchange Shortages and Macro-Fiscal Variables

Several authors have attempted to develop theoretical explanations for the relations between fiscal risks associated with persistent foreign exchange shortages and macro-fiscal variables over the years. Among the existing explanations, those developed by Dervis et al. (1981), Calvo (1998), Crispolti et al. (2013), Rodrik (2008), Loscher (2020) and MEF (2023) stand out.

Dervis et al. argue that persistent foreign exchange shortages constitute one of the main macroeconomic constraints in developing economies, particularly in those characterised by high import dependency and limited diversification of the export base. According to the authors, this issue is frequently addressed within the theoretical framework in the context of exchange rate crises, external constraints, and macroeconomic sustainability. There is a widespread acceptance that low levels of international reserves are a significant factor of macroeconomic vulnerability, with direct implications for the performance of macro-fiscal variables. The structuralist approach developed by these authors supports this interpretation, arguing that a shortage of foreign exchange can impose almost absolute constraints on economic growth. Furthermore, the same authors claim that, even in the presence of sufficient domestic savings, the absence of the foreign exchange required to finance imports of capital goods and productive inputs renders the expansion of investment and production unviable. Although the neoclassical perspective advocates exchange rate adjustment as a means of correcting external imbalances, empirical evidence suggests that this adjustment

is often limited by structural and institutional constraints in many developing countries, thereby prolonging the adverse effects of foreign exchange shortages. Following Dervis et al. and Crispolti et al., inadequate levels of international reserves compromise the capacity to finance imports, increasing exposure to external shocks and undermining macroeconomic stability. The same authors argue that foreign exchange shortages tend to result in a reduction in imports of goods and services. This has a negative impact on productive sectors that depend on imported inputs and directly affects economic growth.

Within the framework of the so-called sudden stops theory[3], Calvo (1998) demonstrates that abrupt interruptions in foreign capital flows lead to a reduction in international reserves, forcing significant macroeconomic adjustments. According to this author, such adjustments typically manifest as a contraction in imports, a slowdown in economic growth, and increased inflationary pressures, particularly in economies with high exchange rate vulnerability. In this sense, the scarcity of foreign exchange acts as a transmission channel for external shocks to the domestic economy, affecting both the real sector and the general price level simultaneously.

Rodrik argues that the availability of foreign exchange is crucial for the structural transformation of economies. A shortage of foreign currency restricts the ability to import capital goods and technologies, which limits industrialisation and consequently long-term economic growth. According to Rodrik, this constraint is particularly relevant in developing economies, where dependence on imports of intermediate and capital goods is high. Rodrik argues that a shortage of foreign exchange has significant implications for public finances. A reduction in economic activity due to external constraints tends to decrease tax revenue collection whilst increasing pressure on public expenditure, which contributes to an increase in the fiscal deficit. This imbalance can lead to an increase in public debt, particularly when the state borrows to finance external and internal needs. Following the line of thought of Dervis et al., Loscher argues that the availability of foreign exchange is fundamental to sustaining processes of structural transformation, as well as ensuring the effective implementation of macroeconomic policies. A shortage of foreign currency, particularly in economies that depend on exporting raw materials, tends to exacerbate external imbalances and limit long-term growth potential. Furthermore, when a trade deficit is financed through external borrowing, the sustainability of public debt becomes a risk, particularly in contexts of exchange rate volatility.

Finally, the MEF argues that rising inflation and slowing economic growth are the key ways in which fiscal risks materialise. On the one hand, inflation raises the cost of public expenditure on goods and services, jeopardising the implementation of public investment. On the other hand, a slowdown in economic growth leads to a decline in income and profits, resulting in a contraction in tax revenues. In this context, fiscal risks arise from macroeconomic imbalances and external constraints. They may be exacerbated by factors such as rising public debt, persistent budget deficits, weaknesses in financial

[3] This concept was developed by Calvo (1998) to describe sudden and abrupt disruptions in international capital flows to emerging economies. According to the theory, such external shocks cause a sharp contraction in economic activity, downward pressure on the exchange rate and a reduction in international reserves, necessitating an adjustment via a contraction in imports. This is often accompanied by external liquidity crises and macroeconomic instability.

management, and adverse external shocks. These factors can significantly impact the sustainability of public finances. Thus, a persistent shortage of foreign exchange can adversely affect inflation and economic growth, indirectly amplifying fiscal risks.

2.3 Relations between Fiscal Risks Associated with Changes in the TCO and Macro-Fiscal Variables

Over the years, various authors have attempted to provide a theoretical explanation for the relations between exchange rate fluctuations and the behaviour of macro-fiscal variables. Notable approaches include those developed by Dornbusch (1976), Calvo (2001), and Reinhart and Rogoff (2009).

Dornbusch (1976) shows that sudden changes in exchange rates, especially in systems with complete capital mobility, can cause excessive adjustments in the short term, resulting in significant macroeconomic volatility. The same author also suggests that exchange rate depreciation tends to result in an increase in domestic prices due to the rising cost of imported goods, thereby triggering inflationary pressures. This effect is particularly relevant in open, import-dependent economies, where the exchange rate *pass-through*[4] is high, directly affecting purchasing power, production costs and macroeconomic stability.

Following Dornbusch's line of thought, Calvo (2001) argues that, in these contexts, exchange rate depreciation not only accelerates inflation, but also worsens the financial conditions of the public sector, particularly when it is highly exposed to foreign currency-denominated debt. Therefore, exchange rate movements are an important channel through which external shocks can affect public finances.

Reinhart & Rogoff (2009) demonstrate that episodes of currency depreciation are often linked to sovereign debt crises, especially in economies with high levels of external debt. The same authors argue that depreciation of the national currency automatically increases the value of external debt in domestic currency terms, thereby worsening debt ratios and undermining fiscal sustainability. This mechanism is particularly critical in developing countries such as Mozambique, where the capacity to generate foreign currency revenue is limited.

Within this theoretical framework, fluctuations in the official exchange rate are a significant fiscal risk factor because they influence economic growth, imports of goods and services, inflation, the fiscal deficit and public debt simultaneously. In economies characterised by high import dependency, significant external debt and structural weaknesses - such as Mozambique - exchange rate fluctuations can exacerbate macro-fiscal imbalances and undermine the sustainability of public finances.

[4] This refers to the extent to which exchange rate movements are reflected in domestic prices, particularly in the prices of imported goods and goods whose production uses imported inputs.

2.4 Empirical Studies

Over the years, several authors have attempted to analyse the relations between fiscal risks associated with persistent foreign exchange shortages and selected macro-fiscal variables using empirical methods. Notable studies in this area include those by Edwards (1989), Sachs (1985), Rodrik (2008), Prasad et al. (2003) and Wosowei (2013).

Edwards analysed external imbalances and balance of payments crises in developing economies. Employing an econometric approach based on panel data models, he examined a set of countries in Latin America and Africa, primarily focusing on the 1970s and 1980s. The study incorporated the current account balance, international reserves, the exchange rate, and the fiscal deficit as key variables. His results suggest that persistent imbalances in the external sector, coupled with high fiscal deficits, tend to reduce international reserves and exacerbate foreign exchange shortages. Based on these findings, Edwards concludes that fiscal fragility is a key factor in external vulnerability, contributing to exchange rate crises and constraints on external financing.

For his part, Sachs analysed the relations between external debt, foreign exchange shortages, and macroeconomic imbalances in developing countries, focusing particularly on the Latin American debt crisis. He employed an empirical approach based on comparative macroeconomic analysis and structural models, using aggregate data from a number of countries. The study considered variables such as external debt, exports, imports, the budget deficit, and economic growth. The results suggest that a combination of high levels of external debt and a weak capacity to generate foreign exchange leads to severe constraints on import capacity and an exacerbation of fiscal deficits. Based on these findings, Sachs concludes that foreign exchange shortages are a key factor in the transmission of external crises to the fiscal sector.

In order to analyse the impact of external constraints on macroeconomic performance, Rodrik developed an empirical approach based on panel data covering a wide range of developing countries. The study incorporated variables such as GDP growth, real exchange rates, exports, investment, and institutional indicators. The results indicate that economies with limited foreign exchange-earning capacity experience growth constraints and greater macroeconomic instability, which puts additional pressure on public finances. Based on these findings, Rodrik concludes that foreign exchange shortages not only hinder economic growth, but also exacerbate fiscal risks, particularly in economies with fragile productive structures.

In their study, Prasad et al. analysed the role of international financial integration and its relations with external vulnerability and macroeconomic stability. They used panel data covering variables such as capital flows, international reserves, economic growth and fiscal indicators for advanced and developing economies. The econometric model was estimated using this same data. The results suggest that countries with low reserve accumulation and high dependence on external flows are more vulnerable to foreign exchange shortages, which may jeopardise fiscal sustainability. The same authors also conclude that prudent management of international reserves and fiscal policies is essential for mitigating the risks associated with foreign exchange shortages.

Finally, Wosowei conducted a study to determine the relations between the fiscal deficit and macroeconomic performance in Nigeria between 1980 and 2010. Specifically, the study aimed to identify the nature of the relations between fiscal deficits and macroeconomic aggregates in Nigeria, including government expenditure, inflation, GDP, taxes, and unemployment. To achieve this specific objective of her study, she used an econometric method based on regression analysis. More specifically, she regressed the fiscal deficit against each of those five macroeconomic aggregates. The econometric model was estimated using data from secondary sources and the ordinary least squares (OLS) method. The main empirical results indicate that, during the study period, an increase in government expenditure was accompanied by an increase in the fiscal deficit. Rising inflation, rising GDP and rising taxes all led to a reduction in the fiscal deficit, while unemployment had a significant positive impact on it. Based on these results, Wosowei concluded that the first finding is consistent with the trend observed in some developing countries, where an excess of expenditure over revenue is typically seen due to the economic and social problems they face.

With regard to the impact of the exchange rates on macro-fiscal variables, the empirical studies conducted by Frankel (2005) and Aizenman et al. (2010) are particularly noteworthy.

Frankel conducted a study aimed at analysing the role of exchange rate regimes and exchange rate fluctuations in the macroeconomic performance of developing economies. The study was based on the identification of episodes of major currency devaluations, using quantitative and historical criteria to select the most relevant events. The analysis followed an event-based empirical approach, combining descriptive statistics, probability comparisons and historical evidence on the impact of exchange rate crises on macroeconomic performance, including economic growth, inflation and fiscal stability. The results suggest that economies subject to greater exchange rate volatility tend to have higher inflation rates and greater macroeconomic instability, which translates into greater fiscal uncertainty. They also show that sharp exchange rate depreciation tends to worsen fiscal balances in economies with high external debt exposure due to the increased cost of servicing that debt. Based on these findings, Frankel concludes that exchange rate instability poses a significant macro-fiscal risk, especially in countries with fragile economic structures.

Aizenman et al. then conducted an empirical analysis of the relations between exchange rate regimes, financial openness and macroeconomic stability. The study considered variables such as international reserves, exchange rates, economic growth, inflation, and fiscal indicators. The econometric model was estimated using panel data for both developed and developing economies. The results indicate that economies with greater exchange rate volatility and lower international reserve accumulation face greater difficulties in managing macroeconomic policy, including fiscal policy. The results also suggest that exchange rate depreciation increases external debt burdens, puts pressure on fiscal deficits and contributes to higher inflation and slower economic growth. Based on these findings, the authors conclude that, alongside prudent macroeconomic policies, effective exchange rate management is essential for mitigating fiscal risks and ensuring macroeconomic stability.

2.5 Critical Review of the Revised Literature

Several studies have sought to analyse the relations between persistent foreign exchange shortages and exchange rate fluctuations, on the one hand, and macro-fiscal variables, on the other. The literature reviewed in the previous subsections of this section allows us to identify both convergences and gaps in existing research.

Generally speaking, there is a consensus among authors that a shortage of foreign currency constitutes a significant structural constraint on the functioning of the economy, and is often accompanied by pressure on the exchange rate. Empirical studies such as those by Dervis et al. (1981), Calvo (1998), Rodrik (2008) and Loscher (2020) highlight that a shortage of foreign exchange compromises the ability to finance imports of capital goods and essential inputs, directly limiting domestic production, investment and, consequently, economic growth. In this context, foreign exchange shortages tend to exert downward pressure on the exchange rate, exacerbating macroeconomic imbalances. This dynamic highlights the strong interdependence between external constraints, exchange rate instability and fiscal imbalances, given that the reduction in economic activity associated with foreign exchange shortages tends to reduce tax revenue collection and increase upward pressure on public expenditure.

Despite the theoretical consensus referred to in the previous paragraph, existing empirical studies differ in their analysis of the mechanism and intensity of the effects. For example, Dervis et al. emphasise the structuralist approach, viewing foreign exchange scarcity as a near-absolute constraint on economic growth, regardless of the availability of domestic savings. In turn, Calvo focuses on the scale of abrupt capital crises, demonstrating that unexpected interruptions in foreign currency flows can result in severe macroeconomic adjustments, such as a reduction in imports and inflationary pressures. Rodrik, for his part, highlights that foreign exchange constraints restrict long-term economic growth and amplify fiscal risks by leading to increased deficits and public debt. This effect is exacerbated when exchange rate depreciation increases the value of external debt in local currency, as Reinhart and Rogoff (2009) demonstrate. Similarly, Loscher emphasises that foreign exchange shortages, particularly in economies dependent on raw material exports, exacerbate external imbalances and limit the potential for structural transformation.

Thus, although the literature consistently indicates that foreign exchange shortages and exchange rate instability negatively impact economic growth and fiscal sustainability, the intensity and manner in which these effects manifest depend on institutional, structural, and governance factors specific to each country. In particular, the extent to which the exchange rate is passed through to inflation, the degree to which public debt is exposed to foreign currency, and the capacity to manage exchange rate and fiscal policies play a decisive role. Failing to consider these factors can result in a distorted understanding of the combined impact of foreign exchange shortages and fluctuations in the official exchange rate on a country's macro-fiscal dynamics and economic development.

3. METHODOLOGY

To determine the trends of the key variables in this study (persistent foreign exchange shortages, the official exchange rate, real GDP, imports of goods and services, inflation, the fiscal deficit and public debt), a statistical model that adequately captures the behaviour of these trends in the time series was adopted and estimated[5]. Following Wooldridge's (2020) reasoning, the model is specified as follows:

$$lny_t = \alpha_0 + \alpha_1 t + \varepsilon_t, \quad (1)$$

where, also following that author's reasoning, ln denotes the natural logarithm, y represents the time series under study (given by the variables referred to in the previous paragraph), the subscript t $(=1,...,n)$ is the time dimension representing years, t is the time trend variable, the α_j $(j = 0,\ 1)$ are the model parameters, and ε is an independent and identically distributed sequence with mean $E(e_t) = 0$ and variance $Var(e_t) = \sigma_\varepsilon^{\ 2}$.

Still following Wooldridge's reasoning, if y_t follows equation (1) and $\Delta\varepsilon_1 = 0$, then $\Delta log(y_t) = \alpha_1$ for all t. In other words, α_1 is approximately the average growth rate of y_t per period t. Still in the same equation, it is said that the time series $\{y_t\}$ has an upward (or downward) trend if and only if the estimated coefficient of the time trend variable (α_1) is positive (or negative) and statistically significant at a given significance level.

Following Wooldridge's reasoning in equation (1), it is said that the time series $\{y_t\}$ has an increasing (or decreasing) trend if and only if the estimated coefficient of the time trend variable (α_1) is positive (or negative) and statistically significant at a given significance level.

In order to empirically estimate the relations between the persistent shortage of foreign currency and the official exchange rate, on the one hand, and the aforementioned macro-fiscal variables, on the other, it is hypothesised that changes in the values of the first two variables must be accompanied by significant changes in economic growth, imports of goods and services, inflation, the fiscal deficit, and total public debt. As the primary focus of this study is the empirical analysis of the macro-fiscal impacts of fiscal risks associated with persistent foreign exchange shortages and exchange rate fluctuations, an econometric method based on regression analysis was employed. Specifically, the multiple linear regression model (MLRM) adopted and estimated by Wosowei (2013) was used.

[5] According to Woldridge (2020), many economic time series are better approximated by an exponential trend, which occurs when a series has the same average growth rate from one period to the next. In practice, an exponential trend in a time series is captured by modelling the natural logarithm of the series as a linear trend (assuming that, in the specified equation below, > 0).

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 EPD_t + \beta_3 TCO_t + \beta_4 \left(EPD_t \times TCO_t \right) + \beta_5 t + \sum_{j=1}^{m} \delta_j X_{tj} + u_t, \qquad (2)$$

where the dependent variable (Y_t) represents, separately, each of the macro-fiscal response variables mentioned above over time t; the subscript t $(=1,...,n)$ denotes the time dimension representing years; Y_{t-1} is the first lag of the dependent variable; EPD denotes persistent foreign exchange scarcity; TCO represents the official exchange rate; $EPD_t \times TCO_t$ is the interaction variable between persistent foreign exchange scarcity and the official exchange rate, t is the time trend variable[6], X_j $(j=1,...,m)$ is the set of control variables (i.e., other factors identified in the economic literature as also influencing each of the macro-fiscal response variables in question, represented by Y_t , β_j $(j=0,1,2,3)$ and δ_j $(1,...,m)$ are the parameters of the model to be estimated, the subscript j $(=1,...,m)$ denotes the number of elements in the set of control variables X_j and their respective coefficients δ_j and u , and is the error term.

It should be noted that, given the central objective of this study, the two variables on the right-hand side of the regression model given by equation (2), specifically EPD , TCO and $EPD_t \times TCO_t$, are test variables, with β_1 and β_2 being the most important parameters in this study. It should also be noted that the set of control variables X_j also includes elements that are macroeconomic variables driving fiscal behaviour.

The definition of the dependent variable (Y_t), given in the second paragraph of this section, required the estimation of five separate multiple linear regression models (MLRM), namely for economic growth, imports of goods and services, inflation, the fiscal deficit and total public debt. Thus, in the first, second, third, fourth and fifth regressions, the control variables included in the set X_j are other factors, identified in the literature on the relations under consideration here, which also affect each of the regressions under consideration here.

In this context, following the reasoning of Solow (1956) and applying the natural logarithm to both

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[6] Following Woldridge's (2020) reasoning, allowing for a trend in equation (2) explicitly acknowledges that Y_t may be increasing ($\beta_5 > 0$) or decreasing ($\beta_5 < 0$) over time, for reasons essentially unrelated to Y_{t-1}, EDP_t, TCO_t and X_{tj} . Following the same author's reasoning, if equation (2) satisfies the *MRLM* assumptions for time series regressions (linearity and weak dependence, perfect non-collinearity and a conditional mean of zero), then omitting t from the regression and regressing Y_t on Y_{t-1}, EDP_t, TCO_t and X_{tj} will generally produce biased estimators of β_1, β_2, β_3, β_4, β_5 and δ_j , because a relevant variable, t , has effectively been omitted from the regression.

sides of equation (2), the economic growth model is specified as follows.

$$lnPIB_t = \beta_0 + \beta_1 lnPIB_{t-1} + \beta_2 lnEPD_t + \beta_3 lnTCO_t + \beta_4 \left(lnEPD_t \times lnTCO_t \right) + \beta_5 t + \sum_{j=1}^{m} \delta_j lnX_{tj} + u_t, \quad (3)$$

where ln denotes the natural logarithm, PIB_t is the level of gross domestic product at time t , PIB_{t-1} represents the level of PIB in the immediately preceding year, and all other variables, parameters and subscripts have the definitions given below equation (2). It should be noted that equation (3) is a *log-log* model. This logarithmic functional form requires that the partial regression coefficients be interpreted as elasticities. Note also that the dependent variable ($lnPIB_t$) refers to the percentage change in real *GDP* over time t (i.e., economic growth). In this context, the relevant control variables included in the set X_j are other factors, identified in the literature on economic growth, which also affect economic growth (including macroeconomic variables that drive fiscal behaviour), namely physical capital (*CAP*), labour (*TRB*), energy use (*ENE*), inflation (*INF*), political stability (*ETP*)[7] , rule of law (*RGL*)[8] , degree of economic openness to the outside world (*GAE*), foreign aid (*AJE*), foreign direct investment (*FDI*), terms of trade (*TOT*) and public expenditure (*DEP*), as well as external shocks such as the hidden debt crisis (*DOC*) and the COVID-19 pandemic (*COV*).

In turn, and also applying the natural logarithm to both sides of equation (2), the model for imports of goods and services is specified as follows.

$$lnIMP_t = \beta_0 + \beta_1 lnIMP_{t-1} + \beta_2 lnEPD_t + \beta_3 lnTCO_t + \beta_4 \left(lnEPD_t \times lnTCO_t \right) + \beta_5 t + \sum_{j=1}^{m} \delta_j lnX_{tj} + u_t, \quad (4)$$

where IMP_t denotes imports of goods and services at time t , IMP_{t-1} represents the level of imports of goods and services in the immediately preceding year, and all other variables, symbols, parameters and subscripts are defined as previously, with the exception of the relevant control variables included in the set X_j . Here, these variables are other factors, identified in the literature on international trade, which also affect imports of goods and services, namely national income (measured by *GDP*), foreign aid (*AJE*), tariffs (*TAR*) and population size (*POP*), as well as external shocks such as the hidden debt crisis (*DOC*) and the COVID-19 pandemic (*COV*).

Similarly, the inflation model is specified as follows.

[7] According to the World Bank (2026), this global governance indicator reflects the perceived likelihood of a government being destabilised or overthrown by unconstitutional or violent means, including political violence, terrorism, armed conflict, and armed coups or regime change. Measured on a percentage scale (0–100), it essentially provides a relative ranking, showing how a country compares globally. A score of 0 = the country ranks very low globally and is perceived as less politically stable than almost all other countries in the database. A score of 100 indicates that the country ranks very highly globally and is perceived as being more politically stable than almost all other countries.

[8] The World Bank (2026) generally defines this global governance indicator as the extent to which people have confidence in societal rules and compliance, contract enforcement quality, property rights protection, judicial effectiveness, and the likelihood of crime and violence. It is measured on a percentage scale (0–100) and essentially shows how a country compares globally in terms of its relative ranking. 0 (zero) = among the worst-performing countries. 100 = among the best-performing countries.

$$lnDPIB_t = \beta_0 + \beta_1 lnDPIB_{t-1} + \beta_2 lnEPD_t + \beta_3 lnTCO_t + \beta_4 \left(lnEPD_t \times lnTCO_t \right) + \beta_5 t + \sum_{j=1}^{m} \delta_j lnX_{tj} + u_t, \quad (5)$$

where $lnDPIB_t$ denotes inflation at time t (measured by the natural logarithm of the *GDP* deflator at time t or, more precisely, by the percentage change in the *GDP* deflator over time t), $lnDPIB_{t-1}$ represents inflation in the immediately preceding year (measured by the natural logarithm of the *GDP* deflator at time $t-1$) and all other variables, parameter symbols and subscripts are defined as previously, with the exception of the relevant control variables included in the set X_j . In this context, these variables are additional factors identified in the literature on inflation, including macroeconomic variables that influence fiscal behaviour. These factors also affect inflation, including exports of goods and services (*EXP*), total public expenditure (*DEP*), total taxes (*IMT*), the money supply (*OFM*) and the fiscal deficit (*DEF*), as well as external shocks such as the hidden debt crisis (*DOC*) and the COVID-19 pandemic (*COV*).

In turn, the fiscal deficit model is specified as follows.

$$lnDEF_t = \beta_0 + \beta_1 lnDEF_{t-1} + \beta_2 EPD_t + \beta_3 TCO_t + \beta_4 \left(lnEPD_t \times lnTCO_t \right) + \sum_{j=1}^{m} \delta_j X_{tj} + u_t, \quad (6)$$

where DEF_t refers to the fiscal deficit (measured as the positive difference between public expenditure and tax revenue)[9] , DEF_{t-1} represents the level of the fiscal deficit in the immediately preceding year, and all other variables, symbols, parameters and subscripts are defined as previously, with the exception of the relevant control variables included in the set X_j . Here, these variables are other factors, identified in the literature on public finance, which also affect the fiscal deficit (including macroeconomic variables that drive fiscal behaviour), namely economic growth (*GDP*), public expenditure (*DEP)*, tax revenue (*RCF*), unemployment (*DES*) and total debt service (*SDT*), as well as external shocks such as the hidden debt crisis (*DOC*) and the COVID-19 pandemic (*COV*).

Finally, the total public debt model is specified as follows.

$$lnDPT_t = \beta_0 + \beta_1 lnDEF_{t-1} + \beta_2 EPD_t + \beta_3 TCO_t + \beta_4 \left(lnEPD_t \times lnTCO_t \right) + \sum_{j=1}^{m} \delta_j X_{tj} + u_t, \quad (7)$$

where DPT_t represents total public debt (measured by total central government debt) at time t ; DPT_{t-1} is the level of the fiscal deficit in the immediately preceding year and all other variables, symbols, parameters and subscripts are defined as previously, with the exception of the relevant control variables included in the set X_j . In this context, the variables are additional

[9] The available data indicate that Mozambique's economy is characterised by a chronic fiscal deficit, as public expenditure has consistently exceeded tax revenue throughout the country's economic history.

factors, identified in the literature on public finance, which also affect total public debt (including macroeconomic variables that drive fiscal behaviour), namely inflation (*INF*), economic growth (*GDP*), total public expenditure (*DEP*), total taxes (*IMT*), the fiscal deficit (*DEF)*, external borrowing and capital inflows (EEIC) and the control of corruption (*COR*)[10] , as well as external shocks such as the hidden debt crisis (*DOC*) and the COVID-19 pandemic (*COV*).

The table below provides a description of the variables included in the regression models specified in the preceding paragraphs of this section, as given by equations (1), (3), (4), (5), (6) and (7).

Table 1: Description of Variables

Symbols	Variables	Units of Measurement	Measurement
lnPIB	Economic Growth	*%*	$\Delta\%$ of real GDP over time t
GDP	Gross Domestic Product	*USD*	Total value of final goods and services produced during the period t
IMP	Imports	*USD*	Imports of goods and services
INF	Inflation	*USD*	$\Delta\%$ of the GDP deflator over time t
DEF	Fiscal deficit	*USD*	Public expenditure - Tax revenue > 0
DPT	Total public debt	*USD*	Total central government debt
PIB_{t-1}	*GDP* level for the year $t-1$	*USD*	First lag of PIB_t
IMP_{t-1}	*GNI* level for the year $t-1$	*USD*	First lag of IMP_t
INF_{t-1}	*INF* level for the year $t-1$	*USD*	First lag of INF_t
DEF_{t-1}	*DEF* level for the year $t-1$	*USD*	First lag of DEF_t
DPT_{t-1}	*DPT* level for the year $t-1$	*USD*	First lag of DPT_t
EPD	Persistent Foreign Exchange Shortages	*Months*	Months of Import Coverage
TCO	Official Exchange Rate	*MZN/USD*	Units of *MZN* per unit of USD
*EPD*TC(*	Interaction between *TCO and EPD*		$EPD(=MCI)\times TCO$
t	Time Trend	Years	Ascending order of years for the period 1990–2024
CAP	Physical Capital	*USD*	Gross capital formation
TRB	Labour	Units	Total labour force
ENE	Energy use	kg	Kg of oil equivalent *per capita*
RCN	Natural Resources	%	Total revenue from natural resources (% of GDP)
ETP	Political Stability	%	(0–100)
RGL	Rule of Law	%	(0–100)
GAE	Degree of Economic Openness to the Outside World	Ratio	$(EXP+IMP)/PIB$
AJE	Foreign Aid	*USD*	Official development assistance and official aid received
IDE	Foreign Direct Investment	*USD*	FDI inflows
TOT	Net terms of trade	Index	Ratio "EXP value index – IMP value index
TAR	Import Tariffs	%	Simple average applied to all products
POP	Population size	Units	Total population
EXP	Exports	*USD*	Exports of goods and services

[10] According to the World Bank (2026), this global governance indicator measures the extent to which public power is exploited for personal gain. It encompasses bribery, embezzlement, state capture by elites, and corruption within the public administration system. It is measured on a percentage scale (0–100) and essentially provides a relative ranking, showing how a country compares globally. A score of 0 (zero) indicates that a country ranks very low globally and has weaker control over corruption than almost all other countries. A score of 100 indicates that the country ranks very highly globally, has stronger control over corruption than almost all other countries, and is interpreted as having very low perceived corruption.

DEP	Public expenditure	*USD*	General government final consumption expenditure
RCF	Tax revenue	*USD*	Total taxes
IMT	Total taxes	*USD*	Taxes less subsidies on products
OFM	Money supply	*USD*	Total money supply in the economy (M_2)
EEIC	External loans	*USD*	Use of International Monetary Fund credit
COR	Corruption Control	(%)	(0–100)
DES	Unemployment	%	Unemployment rate
SDT	Total debt service	*USD*	Debt service as a percentage of total external debt
DPIB	GDP deflator	Ratio	"Nominal GDP – Real GDP" ratio
DOC	Hidden Debt Crisis	*Dummy*	(0-1)
COV	COVID-19 Pandemic	*Dummy*	(0 – 1)

Notes: *MCI* = Months of import cover (= Total reserves in months of imports = Total reserves/Imports of goods and services), *RT* = Total reserves, *USD* = US dollars, *MZN* = Meticais, Δ = Difference operator, $\Delta\%$ = Percentage change, *DPIB* = *GDP* deflator, *RCF* (= Revenue excluding grants), *ODA and ORA* = Official Development Assistance and Official Aid Received, and *IVEXP/IVEXP* (= Export value index/Import value index), *EPD* TCO* = interaction variable between *EPD* and *TCO*; $t-1$ = first lag of this variable (i.e., the immediately preceding year). *ETP* = Political stability and absence of violence/terrorism. *EEIC* = External borrowing and capital inflows. $M_2 = M1 + DP = C + DO + DP$ (where M_2 = broad money definition, M_2 = narrow money definition, DP = time deposits, C = banknotes and coins in circulation, and DO = demand deposits. *TOT* = terms of trade (measured by the net terms of trade index (2015=100) = ratio of "export value index – import value index").

The first, second, third and last columns of the above table show the symbols of the variables in the models referred to above, their definitions, their units of measurement and the methods used to measure them, respectively.

The table also shows that all of the variables in question are expressed in monetary terms - specifically, USD - with the following exceptions: persistent foreign exchange shortage, official exchange rate, inflation, time trend, labour, energy use, natural resources, political stability, rule of law, degree of economic openness to the outside world, terms of trade, import tariffs, population, control of corruption, unemployment, hidden debt and the *COVID-19* pandemic.

It should be noted that the variable "energy use" was included in the growth model as *a proxy* (i.e., a representative variable) for infrastructure, and that the variables "political stability" and "rule of law" were included in the same model as *proxies* for institutions and governance. It should also be noted that the "hidden debt crisis", included in all five MRLMs specified in this section, is a *dummy* (or binary) variable that takes the value 1 from the year in which the debts in question were discovered (2016) and 0 otherwise. It should also be noted that the "*COVID*-19 pandemic", also included in the five MRLMs, is likewise a *dummy* (or binary) variable that takes the value 1 from the year in which the pandemic struck the country and the entire world (2019) and 0 otherwise.

The table below presents the expected signs of the partial regression coefficients.

Table 2: Expected Signs of Partial Regression Coefficients

Explanatory Variables	Model I	Model II	Model III	Model IV	Model V
$lnPIB_{t-1}$	$\beta_1 > 0$				
$lnIMP_{t-1}$		$\beta_1 > 0$			
$lnDPIB_{t-1}$			$\beta_1 > 0$		
$lnMCI_{t-1}$				$\beta_1 > 0$	
$lnDPT_{t-1}$					$\beta_1 > 0$
$lnMCI_t$	$\beta_2 > 0$	$\beta_2 > 0$	$\beta_2 < 0$	$\beta_2 < 0$	$\beta_2 < 0$
$lnTCO_t$	$\beta_3 > 0$	$\beta_3 < 0$	$\beta_3 > 0$	$\beta_3 > 0$	$\beta_3 > 0$
$ln(MCI_t \times TCO_t)$	$\beta_4 > 0$	β_4 (a)	β_4 (a)	β_4 (a)	β_4 (a)
t	β_5 (a)	β_5 (a)	β_5 (a)	β_5 (a)	β_5 (a)
$lnCAP_t$	$\delta_1 > 0$				
$lnTRB_t$	$\delta_2 > 0$				
$lnENE_t$	$\delta_3 > 0$				
RCN_t	$\delta_4 > 0$				
INF_t	$\delta_5 < 0$				$\delta_1 > 0$
ETP_t	$\delta_6 > 0$				
RGL_t	$\delta_7 > 0$				
$lnGAE_t$	$\delta_8 > 0$				
$lnPIB_t$		$\delta_1 > 0$		$\delta_1 < 0$	$\delta_2 < 0$
$lnAJE_t$	$\delta_9 > 0$	$\delta_2 > 0$			
$lnIDE_t$	$\delta_{10} > 0$				
$lnTOT_t$	$\delta_{11} > 0$				
$lnTAR_t$		$\delta_3 < 0$			
$lnPOP_t$		$\delta_4 > 0$			
$lnEXP_t$			$\delta_1 > 0$		
$lnDEP_t$	$\delta_{12} > 0$		$\delta_2 > 0$	$\delta_2 > 0$	$\delta_3 > 0$
$lnRCF_t$				$\delta_3 < 0$	
$lnIMT_t$			$\delta_3 > 0$		$\delta_4 < 0$
$lnOFM_t$			$\delta_4 > 0$		
$lnDEF_t$			$\delta_5 > 0$		$\delta_5 > 0$
$lnEEIC_t$					$\delta_6 > 0$
$lnCOR_t$					$\delta_7 < 0$
DES_t				$\delta_4 > 0$	
$lnSDT_t$				$\delta_5 > 0$	
DOC_t	$\delta_{13} < 0$	$\delta_5 < 0$	$\delta_6 > 0$	$\delta_6 > 0$	$\delta_8 < 0$
COV_t	$\delta_{14} < 0$	$\delta_6 < 0$	$\delta_7 > 0$	$\beta_7 > 0$	$\delta_9 > 0$

Notes: Model I = Economic growth regression, Model II = Regression of imports of goods and services, Model III = Inflation regression, Model IV = Fiscal deficit regression, Model V = Regression of total public debt. ln = natural logarithm. All variables have the definitions presented in Table 1. All model parameters have the definitions given below equations (3)–(7). (a) The signs of the estimated coefficients of the explanatory variables in question cannot be determined a priori.

The second column of the table presents Model I (economic growth regression) and shows the following: (i) According to the generally accepted view among economists, the level of gross domestic product at time t is positively influenced by its level in the immediately preceding year (t-1). In this context, the sign of the estimated coefficient of the lagged dependent variable in equation (3) is expected to be positive; (ii) According to the structuralist perspective developed by Thirlwall (1979), Rodrik (2008) and Loscher (2020), persistent foreign exchange shortages constrain investment and industrialisation, thereby negatively affecting the economy's productive capacity. In this context, and taking into account that the variable in question is measured by the variable 'months of import coverage', it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of that *proxy* variable (i.e. representative variable) (β_2) will be positive; (iii) According to the elasticity approach to the trade balance, improvements in a country's trade balance through exchange rate depreciation stimulate the production of goods and services and, consequently, income rises in that country. In this context, it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of the 'official exchange rate' variable (β_3) will be positive; (iv) The combination of the predictions from the structuralist perspective and the elasticity approach to the trade balance, referred to in parts (i) and (ii) of this paragraph, suggests that in the equation in question, the expected sign of the estimated coefficient of the logarithm of the interaction variable between persistent foreign exchange scarcity and the official exchange rate (β_4), which measures the combined effect of the variation in these two test variables on economic growth, is positive; (v) The sign of the estimated coefficient of the time trend variable (β_5) cannot be determined a priori; (vi) According to Solow (1956), the marginal products of the factors of production 'capital' and 'labour' are always positive. Thus, it is expected that in the equation in question, the signs of the estimated coefficients of the natural logarithm of the 'capital' and 'labour' variables (δ_1 and δ_2, respectively) will be positive; (vii) Another view generally accepted by economists is that having more infrastructure implies higher productivity and, consequently, faster growth. Thus, it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of the 'energy use' variable (δ_3) will be positive; (viii) According to Sachs & Warner (1997), countries rich in natural resources can grow rapidly if these resources are well managed. Given this, it is expected that in the same equation, the sign of the estimated coefficient of the natural logarithm of the 'natural resources' variable (δ_4) will be positive; (ix) Inflation creates uncertainty regarding the future, a fact which, in turn, discourages investors, with negative implications for the growth rate of aggregate output. Thus, it is expected that in the same equation, the sign of the estimated coefficient of the 'inflation' variable (δ_5) will be negative; (x) Strong institutions encourage investment and economic growth. Thus, it is expected that in the equation in question, the signs of the estimated coefficients of the 'political stability' and 'rule of law' variables (δ_6 and δ_7, respectively)

will be positive; (xi) According to Grossman & Helpman (1990: p. 88), "casual observations and more systematic empirical research suggest that countries that have adopted an outward-oriented development strategy have grown more rapidly and achieved a higher level of economic well-being than those that have chosen a more protectionist trade stance" and that "less developed countries have potentially more to gain from their international relations, as they can draw on *the* vast *stock* of knowledge and capital already accumulated in the industrialised world". In this context, it is expected that in the equation in question the signs of the estimated coefficients of the natural logarithm of the variables "degree of openness of the economy to the outside world", "foreign aid" and "foreign direct investment" (δ_8 , δ_9 and δ_{10}, respectively) will be positive. (xi) According to the Prebisch-Singer hypothesis, the external sector is bound to hold back domestic growth, partly due to insufficient demand for primary products from less developed countries by industrialised nations (UNECLA, 1950). However, as the 'terms of trade' variable is defined as the ratio 'export value index – import value index', its natural logarithm (*lnTOT*) represents the average annual growth of that ratio. In this context, it is expected that in the equation in question, the sign of the respective estimated coefficient (δ_{11}) will be positive; (xii) According to Keynesian theory, expansionary fiscal policy leads to an increase in income. In this context, it is expected that in the equation in question, the estimated coefficient of the 'public expenditure' variable (δ_{12}) will have a positive sign. (xiii) The various potential irregularities relating to the management of the Mozambican companies ProIndicus, EMATUM and MAM (identified by Kroll) and the suspension of international aid that followed the discovery of hidden debts (illegally incurred by the three companies) have negatively affected the country's economic performance. Thus, it is expected that in the equation in question, the estimated coefficient of the 'hidden debt crisis' *dummy* variable (δ_{13}) will have a negative sign; (xiii) In a system where there are crises involving both epidemics and pandemics, economic activity is negatively affected due to the effects on the population and health. These impacts, in turn, negatively affect the productivity of the workforce and the healthcare system. These effects, in turn, have a negative impact on employment, production, income, etc. In this context, it is expected that in the same equation the sign of the estimated coefficient of the *"COVID-19* pandemic" variable (δ_{14}) will be negative.

The third column, which presents Model II (regression of imports of goods and services), shows the following: (i) According to the view generally accepted by economists, the level of imports at time *t* is positively influenced by its level in the immediately preceding year (*t-1*). In this context, it is expected that in equation (4) the sign of the estimated coefficient of the lagged dependent variable (β_1) will be positive; (ii) According to the economic theory on external constraints, developed by Dervis et al. (1981), Rodrik (2008) and Crispolti et al. (2013), a shortage of foreign exchange limits the capacity to finance imports of

goods and services, negatively impacting foreign trade. Thus, and taking into account the fact that the variable in question is measured by the variable "months of import coverage", it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of that *proxy* variable (β_2) will be positive; (iii) In line with the elasticity approach to the trade balance, higher exchange rates are expected to lead to lower demand for imports. This negative relation between the two variables is explained by the fact that increases in the exchange rate (i.e. currency depreciation) cause a fall in imports by raising their prices in terms of the domestic currency (i.e. imports become more expensive). Thus, in the same equation, the sign of the estimated coefficient of the natural logarithm of the 'official exchange rate' variable (β_3) is expected to be negative; (iv) The combination of the forecasts from the structuralist perspective and the elasticity approach to the trade balance, referred to in parts (i) and (ii) of the previous paragraph, suggests that in equation (4) the expected sign of the estimated coefficient of the interaction variable between persistent foreign exchange scarcity and the official exchange rate (β_4), which measures the combined effect of the variation in these two test variables on imports, cannot be determined a priori (it depends on whether the effect of the variation in the first of the two interaction variables is greater or lesser than that of the variation in the second variable); (v) The sign of the estimated coefficient of the time trend variable (β_5) cannot be determined a priori; (vi) Economic theory predicts that a rise in real domestic income allows the economy to increase its demand for imported goods and services. Thus, in the model given by equation (4), a higher level of gross domestic product is expected to lead to higher demand for imports by Mozambique. Given that domestic income is expected to be positively related to imports, it is expected that in the equation in question δ_1 will be positive; (vii) According to Brochmman & Ofstad (1990), one area where the Economic Rehabilitation Programme, launched in 1987 by the Government of Mozambique, appeared to have been successful was the increase in the flow of external resources to Mozambique, which has enabled a spectacular rise in imports. This implies that a higher level of foreign aid leads to higher demand for imports by the country and, therefore, it is expected that in the same equation δ_2 will be positive; (viii) Import tariffs are one of the trade policy instruments through which the government can negatively influence imports of goods and services. Thus, a higher level of tariffs leads to lower demand for imports by the country and, therefore, it is expected that in the same equation the sign of the estimated coefficient of the variable "import tariffs" (δ_3) will be negative; (viii) Larger populations tend to consume more, a fact that implies more imports of goods and services (but also depends on levels of domestic income). Thus, in the same equation, the sign of the estimated coefficient of the natural logarithm of the 'population size' variable (δ_4) is expected to be positive; (ix) Economic shocks and crises that may afflict a country can influence imports of goods and services. Thus, the various potential irregularities related to the management of the Mozambican companies ProIndicus, EMATUM and MAM (identified by Kroll) and the suspension of international aid that followed the discovery of hidden

debts (illegally incurred by the three companies) certainly led to a decrease in the country's imports. Similarly, a system characterised by crises such as epidemics and pandemics leads to a reduction in the level of economic activity and, consequently, to a decrease in imports of goods and services. In this context, it is expected that in the equation in question, the estimated coefficients of the variables 'hidden debt crisis' and *'COVID-19* pandemic' (δ_5 and δ_6 , respectively) will have a positive sign.

The fourth column of the same table, which presents Model II (inflation regression), shows the following: (i) According to the view generally accepted by economists, the level of inflation at time *t* is positively influenced by its level in the immediately preceding year (*t-1*). In this context, it is expected that in equation (5), the sign of the estimated coefficient of the lagged dependent variable (β_1) will be positive; (ii) According to the International Monetary Fund (2023), persistent foreign exchange shortages lead to increased pressure on domestic prices by limiting the supply of essential goods and services, and thus have a positive impact on inflation. Thus, taking into account the fact that the variable in question is measured by the months of import coverage, it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of that *proxy* variable (β_2) will be negative; (iii) As mentioned in the previous paragraph, according to the elasticity approach to the trade balance, currency depreciation makes imports more expensive, a fact which, in turn, causes domestic costs and prices to rise. Thus, and taking into account that Mozambique's economy is heavily dependent on imports, it is expected that in the same equation, the sign of the estimated coefficient of the natural logarithm of the variable "official exchange rate" (β_3) will be positive; (iv) The combination of the forecasts from the structuralist perspective and the elasticity approach to the trade balance, referred to in parts (i) and (ii) of the previous paragraph, suggests that in equation (5) the expected sign of the estimated coefficient of the interaction variable between persistent foreign exchange scarcity and the official exchange rate (β_4), which measures the combined effect of the variation in these two test variables on inflation, cannot be determined a priori (it depends on whether the effect of the variation in the first of the two interaction variables is greater or lesser than that of the variation in the second variable); (v) The sign of the estimated coefficient of the time trend variable (β_5) cannot be determined a priori; (vi) An expansion of exports in the economy may lead to a situation where there is too much money chasing too few goods. Thus, according to Keynesian theory, inflation can occur when total expenditure exceeds the economy's capacity to produce goods and services, due to aggregate demand exceeding aggregate supply. Thus, in the model given by equation (5), a higher level of exports of goods and services is expected to lead to an increase in inflation and, consequently, the sign of the natural logarithm of the variable (exports of goods and services) (δ_1) is expected to be positive; (vii) An expansion of public expenditure in the economy can lead to a situation where there is too much money chasing too few goods. According to Keynesian theory, inflation can occur when total expenditure exceeds

the economy's capacity to produce goods and services due to aggregate demand exceeding aggregate supply. Thus, in the model given by equation (5), a higher level of public expenditure is expected to lead to an increase in inflation and, therefore, the sign of the natural logarithm of the variable "total public expenditure" (δ_2) is expected to be positive; (viii) According to Keynesian theory, inflation can also occur as a result of rising production costs in the economy. One of the causes of rising production costs is an increase in taxes on production. However, companies end up passing on higher costs to consumers, a fact which, in turn, leads to higher prices. Thus, in the model given by equation (5), a higher level of taxes is expected to lead to increased inflation and, consequently, it is expected that in the equation in question the sign of the natural logarithm of the variable 'total taxes' (δ_3) will be positive; (ix) According to the quantity theory of money, developed by (Friedman, 1956), inflation is always, and everywhere, a monetary phenomenon, and monetary growth always leads to inflation. Thus, if the money supply grows faster than aggregate output, inflation will rise. In this context, in the model given by equation (5), a higher level of the money supply is expected to lead to an increase in inflation. Thus, it is expected that in the equation in question the estimated coefficient of the natural logarithm of the 'money supply' variable (δ_4) will be positive; (ix) A higher fiscal deficit indicates an excess of public expenditure over tax revenue. According to Keynesian theory, an increase in public expenditure, in turn, leads to inflation. Thus, high levels of the fiscal deficit are also expected to lead to higher inflation. In this context, in the model given by equation (5), a higher level of the fiscal deficit is expected to lead to higher inflation. Thus, it is expected that in the equation in question, the sign of the estimated coefficient of the natural logarithm of the 'fiscal deficit' variable (δ_5) will be positive; (x) Economic shocks and crises that may afflict a country can influence inflation. Thus, the various potential irregularities relating to the management of the Mozambican companies ProIndicus, EMATUM and MAM (identified by Kroll) and the suspension of international aid following the discovery of hidden debts (illegally incurred by the three companies) certainly led to an increase in inflation in the country. Similarly, a system characterised by crises involving both epidemics and pandemics leads to increased public spending and reduced tax revenues. These factors necessitate further borrowing and consequently lead to higher inflation. In this context, it is expected that the estimated coefficients of the variables 'hidden debt crisis' and "Covid-19 pandemic" will have a positive sign in the equation in question.

The fifth column of the same table, which presents Model IV (fiscal deficit regression), shows the following: (i) According to the view generally accepted by economists, the level of the fiscal deficit at time *t* is positively influenced by its level in the immediately preceding year (*t-1*). In this context, it is expected that in equation (6), the sign of the estimated coefficient of the lagged dependent variable (β_1) will be positive; (ii) The persistent shortage of foreign exchange leads to an increase in total debt servicing costs and restricts the government's borrowing capacity. Thus, and taking into account the fact that the

variable in question is measured by months of import coverage, it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of that *proxy* variable (β_2) will be negative; (iii) Exchange rate movements, characterised by depreciation, lead to an increase in external debt service costs, which in turn leads to an increase in public expenditure and, consequently, to an increase in the fiscal deficit. Thus, it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of the 'official exchange rate' variable (β_3) will be positive; (iv) The combination of the forecasts from the structuralist perspective and the elasticity approach to the trade balance, referred to in parts (i) and (ii) of the previous paragraph, suggests that in equation (6) the expected sign of the estimated coefficient of the interaction variable between persistent foreign exchange scarcity and the official exchange rate (β_4), which measures the combined effect of the change in these two test variables on the fiscal deficit, cannot be determined a priori (it depends on whether the effect of the change in the first of the two interaction variables is greater or smaller than that of the change in the second variable); (v) The sign of the estimated coefficient of the time trend variable (β_5) cannot be determined a priori; (vi) When the economy grows, tax revenues increase and welfare expenditure may fall. This implies that higher growth leads to a smaller fiscal deficit. In this context, it is expected that in equation (6) the sign of the estimated coefficient of the natural logarithm of the 'gross domestic product' variable (δ_1) will be negative; (vii) Expansionary fiscal policy leads to an increase in the fiscal deficit. Thus, high levels of spending on infrastructure, education, health, defence, subsidies, etc. imply higher public expenditure, which in turn implies a larger fiscal deficit. In this context, it is expected that in the equation in question the sign of the estimated coefficient of the natural logarithm of the variable "public expenditure" (δ_2) will be positive; (viii) Tax revenues are the main sources of fiscal revenue with which governments finance their expenditure. Thus, high levels of fiscal revenue imply a lower fiscal deficit. In this context, it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of the 'tax revenue' variable (δ_3) will be positive; (ix) High levels of unemployment imply higher government spending, whilst at the same time tax revenue falls. In this context, it is expected that in the equation in question the sign of the estimated coefficient of the 'unemployment' variable (δ_4) will be positive; (x) Governments must pay interest on the total existing debt. Higher debt implies higher interest payments, which in turn imply a higher fiscal deficit. In this context, it is expected that in the equation in question the sign of the estimated coefficient of the 'total debt service' variable (δ_5) will be positive; (xi) Economic shocks and crises that may afflict a country can influence the fiscal deficit. Thus, the various potential irregularities relating to the management of the Mozambican companies ProIndicus, EMATUM and MAM (identified by Kroll) and the suspension of international aid following the discovery of hidden debts (illegally incurred by the three companies) certainly led to an increase in the fiscal deficit. Similarly, a system characterised by crises involving both epidemics and pandemics leads to increased public expenditure and reduced tax revenues, factors

which, in turn, necessitate the taking on of further loans and, consequently, an increase in the fiscal deficit. In this context, it is expected that in the equation in question, the estimated coefficients of the variables 'hidden debt crisis' and *'COVID-19* pandemic' (δ_6 and δ_7 , respectively) will have positive signs.

The last column of the table in question, which presents Model V (regression of total public debt), shows the following: (i) According to the view generally accepted by economists, the level of total public debt at time *t* is positively influenced by its level in the immediately preceding year (*t-1*). In this context, it is expected that in equation (7) the sign of the estimated coefficient of the lagged dependent variable (β_1) will be positive; (ii) Persistent foreign exchange shortages lead to increased total debt service costs and limit the government's ability to finance external commitments with foreign currency revenues, factors which, in turn, lead to increased recourse to borrowing. Empirical evidence from developing economies suggests that external constraints are associated with increased debt vulnerability (Loscher, 2020). Thus, and taking into account the fact that the variable 'persistent foreign exchange shortage' is measured by the variable 'months of import cover', it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of that *proxy* variable (β_2) will be negative; (iii) If a country has foreign currency debt, as is the case with Mozambique, then currency depreciation can make that debt more expensive. Thus, exchange rate movements characterised by the depreciation of the national currency can lead to an increase in external debt. This, in turn, exacerbates total public debt. Existing empirical studies show that exchange rate shocks are significant determinants of debt dynamics in emerging economies (Panizza et al., 2009). In this context, it is expected that in the same equation, the sign of the estimated coefficient of the natural logarithm of the 'official exchange rate' variable (β_3) will be positive; (iv) The combination of the predictions from the structuralist perspective and the trade balance elasticity approach, referred to in parts (i) and (ii) of the previous paragraph, suggests that in equation (7), the expected sign of the estimated coefficient of the interaction variable between persistent foreign exchange scarcity and the official exchange rate (β_4), which measures the combined effect of the change in these two test variables on total public debt, cannot be determined a priori (it depends on whether the effect of the change in the first of the two interaction variables is greater or smaller than that of the change in the second variable); (v) The sign of the estimated coefficient of the time trend variable (β_5) cannot be determined a priori; (vi) Moderate inflation may reduce the real value of the debt, whilst very high inflation may lead to an increase in borrowing costs. Thus, according to Blanchard (2017), inflation can affect public debt by eroding its real value in national currency, as well as leading to higher financing costs if it results in higher interest rates. In this context, it is expected that in equation (7) the sign of the estimated coefficient of the natural logarithm of the 'total public debt' variable (δ_1) will be positive; (vii) Strong economic growth leads

to increased tax revenues and a reduction in the debt-to-GDP ratio, which in turn leads to reduced reliance on borrowing. Furthermore, strong economic growth leads to an expansion of the tax base and an improvement in the government's ability to pay, which in turn reduces the need for borrowing. Existing empirical studies indicate that economies with higher growth tend to exhibit more sustainable debt dynamics (Asteriou et al., 2021). In this context, it is expected that in the equation in question, the sign of the estimated coefficient of the natural logarithm of the 'gross domestic product' variable (δ_2) will be negative; (viii) Government policies, which consist of increases in public expenditure, imply higher debt. Furthermore, higher levels of public expenditure, when not accompanied by equivalent revenue, lead to increased indebtedness. Existing empirical evidence confirms that fiscal expansions are associated with debt growth (Alesina & Perotti, 1995). In this context, it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of the 'public expenditure' variable (δ_3) will be positive; (ix) Government policies consisting of tax cuts without reducing expenditure imply higher borrowing. In this context, it is expected that in the equation in question, the sign of the estimated coefficient of the natural logarithm of the 'total taxes' variable (δ_4) will be negative; (x) Persistent fiscal deficits lead to higher borrowing. Thus, each year's fiscal deficit is added to the total debt and, as a result, today's debt is equal to past debt plus the current fiscal deficit. In this context, it is expected that in the equation in question the sign of the estimated coefficient of the natural logarithm of the "fiscal deficit" variable (δ_5) will be positive; (xi) Access to international loans (through the International Monetary Fund, the World Bank and markets) facilitates their contraction, a fact which, in turn, has the potential to lead to higher debt. In this context, it is expected that in the same equation the sign of the estimated coefficient of the natural logarithm of the variable "external borrowing and capital inflows" (δ_6) will be positive; (xii) Institutional and governance factors such as fiscal discipline, transparency and levels of corruption can influence a country's indebtedness. Thus, weak institutions often lead to rising indebtedness. Furthermore, corruption is associated with poor fiscal management and the inefficient use of public resources, thereby contributing to higher indebtedness. Existing empirical studies indicate that high levels of corruption are correlated with higher levels of public debt (Mauro, 1995). In this context, and taking into account the way in which the variable in question is measured[11], it is expected that in the equation in question the sign of the estimated coefficient of the 'corruption control' variable (δ_7) will be negative; (xiii) Economic shocks and crises that may afflict a country can influence total public debt. Thus, the various potential irregularities relating to the management of the Mozambican companies ProIndicus, EMATUM and MAM (identified by Kroll) and the suspension of international aid following the discovery of hidden debts (illegally incurred by the three companies) certainly led to an increase in the country's debt. Similarly, a system characterised by crises involving

[11] See the explanation of this measure in footnote 10.

both epidemics and pandemics leads to increased public expenditure and reduced tax revenues, factors which, in turn, necessitate the taking out of further loans. In this context, it is expected that in the equation in question, the estimated coefficients of the variables 'hidden debt crisis' and *'COVID-19* pandemic' (δ_8 and δ_9 , respectively) will have positive signs.

The regression models given by equations (1) and (3)–(7) were estimated using the ordinary least squares (OLS) method, with the aid of appropriate commands in STATA 17. As this study is a time series analysis, the estimation of these econometric models was preceded by a unit root (or stationarity) test, with the aim of determining whether the series included in them are stationary or not. To this end, the Augmented Dickey-Fuller (*ADF*) stationarity test, developed by Dickey and Fuller (1979), was performed. More specifically, and following the reasoning of Wooldridge (2020), the following *ADF* regression was estimated.

$$\Delta y_t = \alpha + \delta t + \theta \Delta y_{t-1} + \gamma \Delta y_{t-1} + e_t, \quad (8)$$

where, following the author's reasoning, Δ is the difference operator, y represents each of the time series analysed in this study, the subscript t $(=1,...,n)$ denotes the time dimension representing years, α is the trend term, t is the time trend variable, y_{t-1} refers to the first lag of each of the time series analysed in this study, and e is the random noise. Thus, the null hypothesis that in equation (8), the time series $\{y_t\}$ is of order 1 [I(1)] (i.e. it has a unit root or is non-stationary) was tested against the alternative hypothesis that it is of order 0 [I(0)] (i.e. it has no unit root or is stationary). Still following Wooldridge's reasoning, the null hypothesis is rejected in favour of the alternative hypothesis if and only if, in equation (8), the observed value of the statistic $t_\theta < c$, where c , is one of the critical negative values. Continuing with the author's reasoning, the inclusion of a lag in the series $\{y_t\}$ on the right-hand side of equation (8) is explained by the fact that the extent of the lag is dictated by the frequency of the data and the sample size; for annual data, as is the case with the data used in this study, one or two lags are generally sufficient.

Diagnostic regression tests were carried out to detect the presence, in the regression models given by equations (3)–(7), of econometric problems that typically arise from MRLM estimation, namely heteroscedasticity, serial correlation, multicollinearity, non-normality of errors and model specification errors. Thus, to detect the presence of heteroscedasticity, the White heteroscedasticity test, developed by White (1980), was performed. To detect the presence of serial correlation, the Breusch-Godfrey serial correlation test, developed by Breusch (1978) and Godfrey (1979), was performed. To determine the presence of multicollinearity in the models in question, diagnostic procedures involving the calculation of the variance inflation factor were used (VIF_j), where the subscript j indicates the

regressions.[12] To test for non-normality of the errors in the same models, the Shapiro-Wilk *W* numerical normality test, developed by Shapiro and Wilk (1965), was performed.[13] Finally, to detect model mis-specification, the *RESET* test[14], developed by Ramsey (1969), was performed.

To carry out all the regression diagnostic tests mentioned in the previous paragraph, special *STATA* commands were used to obtain the *p-values*[15] of the statistics corresponding to each of them. All tests were conducted at a significance level of 10 percent. The choice of this significance level is explained by the fact that "in general, in economics, we are prepared to accept a *p-value* of less than 0.10 (= 10 percent) as indicating that the variable is significant" (Davies: 2010: p 5).[16]

Finally, to assess the impact of the persistent foreign exchange shortage on private sector activities and household living standards, the Centre for Public Integrity (*CIP*) carried out fieldwork between February and April 2026. The work consisted of conducting a survey based on face-to-face interviews with managers of companies operating in the food, health, construction and e-commerce sectors in Maputo City. The choice of interviewees was based on the fact that their activities rely heavily on imported raw materials and goods. The list of interviewees also included a representative from an association of small and medium-sized enterprises and a representative from the cross-border traders' association. The selection of the latter was intended to capture a broader perspective of the constraints faced by the national business community. The survey involved a sample of 10 companies (national and international) and two associations. The selection of the sample, which was random, was based primarily on the size of the companies (large, medium and small enterprises) and their respective sectors of activity. It was also influenced by the willingness of the entities to participate in the study. The interviews were semi-structured[17], which allowed a combination of pre-defined questions with some flexibility to explore aspects deemed relevant during the interactions. The questions focused primarily on the impact of persistent foreign exchange shortages on companies' operations, particularly with regard to import costs, access to external suppliers, production and commercial activity continuity, and workers' employment conditions and remuneration. Annex A presents the relevant questionnaire.

[12] Econometricians have developed so-called multicollinearity statistics. The most common statistic is the *Variance Inflation Factor* (*VIF*). Chen *et al*. (2003) suggest that, as a basic principle, a variable with *VIF* values greater than 10 may warrant further investigation, as it could be considered a linear combination of other independent variables.

[13] When testing for non-normality of errors, some researchers have used numerical tests. The most common test has been the Shapiro-Wilk W normality test. This test was used in this study because, according to Royston (1995), it is the most recommended normality test specifically for small and medium-sized samples (i.e., $n \leq 50$). Note that this is the case for the number of observations used in the analysis conducted in this study (n=35).

[14] *RESET* stands for *Regression Equation Specification Errors Test*.

[15] A *p-value* is the minimum probability of rejecting the null hypothesis if it is true.

[16] According to this author, "in other disciplines, this value is different; for example, in medical tests, the lowest acceptable level used to indicate that the variable is significant is 0.01 (= 1%)".

[17] According to Manzini (2004), the semi-structured interview focuses on a subject for which a script is drawn up containing key questions, supplemented by other questions arising from the circumstances of the interview at the time. It allows for further questions to be asked in an attempt to understand the information being provided that appears to be relevant to the subject under study.

4. DATA

The exponential trend models (given by equation (1)) and the MRLM models (given by equations (3)–(7)) were estimated using annual time series data for the period 1990–2024, which is presented in Annex B. These are secondary data for the model variables, as described in Table 1.

It should be noted that all current numerical data for all variables expressed in monetary terms were deflated by the *GDP* deflator (2019 = 100).

The table below presents the descriptive statistics, or more precisely, the statistical summary of the data used to estimate the regression models referred to above.

Table 3: Statistical Summary

Variables	Units of Measurement	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
PIB	*USD*	35	2.59e+08	2.35e+08	1.38e+08	1.16e+09
IMP	*USD*	35	1.35e+08	1.17e+08	4.73e+07	6.30e+08
INF	*%*	35	13.56	15.17	1.09	51.46
DEF	*USD*	35	2.70e+07	3.26e+07	4722882	1.44e+08
DPT	*USD*	35	1.26e+08	3559289	1.13e+08	1.40e+08
EPD	*Months*	35	4	1	2	5
TCO	*MZN/USD*	35	30.64	22.07	0.93	69.47
$EPD \times TCO$	-	35	-	-	-	-
t	*Years*	35	18	10.25	1	35
CAP	*USD*	35	9.00e+07	8.59e+07	3.05e+07	4.41e+08
TRB	*Units*	35	9971069	2511231	5981740	1.51e+07
ENE	*kg*	35	384.47	31.54	317.88	443.81
RCN	*%*	35	11.76	3.48	5.94	19.49
ETP	*%*	35	38.92	17.39	10.85	68.72
RGL	*%*	35	23.81	7.249	12.86	36.97
GAE	*Ratio*	35	0.79	0.26	0.39	1.35
AJE	*USD*	35	6.46e+07	9.87e+07	1.80e+07	4.64e+08
IDE	*USD*	35	2.21e+07	2.40e+07	2504533	9.54e+07
TOT	*Ratio*	35	126.75	28.70	96.5	202.31
TAR	*%*	35	12.29	3.93	7.16	19.66
POP	*Units*	35	2.23e+07	6,251,595	1.31e+07	3.46e+07
EXP	*USD*	35	5.22e+07	2.17e+07	1.89e+07	9.31e+07
DEP	*USD*	35	4.40e+07	3.19e+07	1.92e+07	1.58e+08
RCF	*USD*	35	1.70e+07	3981075	8945431	3.02e+07
IMT	*USD*	35	3.63e+07	1.56e+07	6149668	7.30e+07
OFM	*USD*	35	4.09e+09	3.57e+09	5.96e+08	1.18e+10
EEIC	*USD*	35	2.94e+10	3.88e+10	1.58e+08	1.54e+11
COR	*%*	35	34.52	9.47	17.14	50.62
DES	*%*	35	3.56	1.17	2.64	6.79
SDT	*USD*	35	1.48e+07	1.35e+07	2932468	6.49e+07
DPIB	*Ratio*	35	57.15	36.48087	2.15	131.73
DOC	-	35			0	1
COV	-	35			0	1

Notes: $EPD\ (= MCI\ )$; $EPD \times TCO\ \ (= MCI \times TCO)$; All variables have the definitions shown in Table 1.

The figures in Table 3 show that the analysis dataset contains 35 observations. They also illustrate the mean, standard deviation, minimum and maximum values for each of the 33 variables incorporated into the aforementioned models.

The figures in the table also reveal some interesting patterns in the data used in this study. For instance, none of the quantitative variables appear to be skewed to the left or right, as their means are not close to the minimum or maximum limits of the data range. Therefore, the descriptive statistics presented suggest that there are no outliers or extreme values in the data. We can therefore proceed with the analysis set out in the following sections.

The data for all variables included in the econometric models specified in the previous section of this study were collected from the World Bank database (2026). These are secondary data suitable for achieving the objectives of this study, as defined in the first section of this study. It is reliable because its source (the World Bank) is a multilateral institution and, therefore, reputable. It should be noted that the data for the variables *"DEF* = fiscal deficit" and *"GAE* = degree of economic openness to the outside world" were obtained using calculations we performed using the following formulas: *DEF = DEP-RCF* and *GAE* = (*EXP+IMP)/GDP*, respectively. It should also be noted that the data for all lagged variables (PIB_{t-1} , IMP_{t-1} , INF_{t-1} , DEF_{t-1} and DPT_{t-1}), the interaction variable "$EPD \times TCO$ $(= MCI \times TCO)$" and all logarithmic variables were generated using the special STATA command *"generate"*.

Some of the data presented in Annexes A and B were imputed using the method for imputing missing values developed by Gąsior & Skowron (2016). This method was used because the time series data collected from the World Bank website contained missing numerical data for certain years within the period covered by the study (1990–2024). The missing data relate to the following variables: *GDP* (1990), *IMP* (1990), *INF* (1990 and 1991), *DPT* (1990–2015), *MCI* (1990–2004), *CAP* (1990), *ENE* (2024), *RCN* (1990, and 2022–2024), *ETP* (1990–1995, 1997, 1999, 2001, and 2024), *RGL* (1990–1995, 1997, 1999, 2001, and 2024), *AJE* (2024), *TOT* (2024), *TAR* (1990–2000, 2004, 2015, 2017, 2019 and 2022–2024), *EXP* (1990), *DEP* (1990), *RCF* (1990–2009), *IMP* (1990), *OFM* (2023 and 2024), *EEIC* (2024), *COR* (1990–1995, 1997, 1999, 2001 and 2024), *DES* (1990) and *SDT* (2024).

Finally, the measurement of the impact of persistent foreign exchange shortages on private sector activities and household living standards used primary data drawn from fieldwork and a survey based on direct interviews with managers of firms operating in the food sectors, conducted by *CIP,* and described in the last paragraph of the previous section of this paper. Annex B presents this data.

5. RESULTS

The following subsections present, interpret and analyse the results of the estimation of the five exponential trend models, as given by equation (1), the *DFA* unit root or stationarity test, the estimation of the five *MRLMs,* as given by equations (3)-(7), the measurement of the impact of persistent foreign exchange shortages on private sector activities and household living standards, and the assessment of the impact of a possible realignment of the official exchange rate on inflation and the cost of servicing external debt denominated in the national currency.

5.1 Results of the exponential trend model estimation

The estimation of the seven exponential trend models for the seven variables of greatest interest in this study (*GDP, IMP, INF, DEF, DPT, EPD = MCI and TCO*) produced the results presented in Annex C and summarised in the table below.

Table 4: Results of the exponential trend model estimation

Explanatory Variables	Model I α_1	Model II α_1	Model III α_1	Model IV α_1	Model V α_1	Model VI α_1	Model VII α_1
t	-0.030	-0.011	0.092	-0.030	-0.0005	-0.009	0.097
	(0.000)	(0.268)	(0.000)	(0.031)	(0.280)	(0.003)	(0.000)
Constant	19.724	18.710	2.048	17.234	18.663	1.540	1.284
	(0.000)	(0.195)	(0.156)	(0.274)	(0.010)	(0.000)	(0.000)
n	35	35	35	35	35	35	35
$p-value\ de\ F$	0.000	0.268	0.000	0.031	0.280	0.003	0.000
R^2	0.357	0.037	0.818	0.134	0.035	0.231	0.828

Notes: Model I = Regression of the natural logarithm of *GDP;* Model II = Regression of the natural logarithm of *IMP*; Model III = Regression of the natural logarithm of *the GDP* deflator (= *INF*); Model IV = Regression of the natural logarithm of *DEF;* Model V = Regression of the natural logarithm of *DPT*; Model VI = Regression of the natural logarithm of *EPD (= MCI);* Model VII = Regression of the natural logarithm of *TOC*; t = linear trend variable; n = number of observations; F = *F-statistic*; R^2 = coefficient of determination; The numbers in brackets are the *p-values* of the statistics t_{α_j} $(j = 0,\ 1)$.

The figures in the above table show that only five of the seven estimated exponential trend models are statistically significant because the *p-values* of their *F-statistics* are lower than the significance level chosen and referred to in the penultimate paragraph of Section (3) of this paper (10%), namely Model I (regression of the natural logarithm of *GDP,* Model III (regression of the natural logarithm of *the GDP* deflator = 'inflation'), Model IV (regression of the natural logarithm of *DEF*), Model VI (regression of the natural logarithm of *EPD = 'MCI')* and Model VII (regression of the natural logarithm of *TOC*).

It should be noted that in all five statistically significant models referred to in the previous paragraph, all estimated coefficients of the time trend variable (*t)* are also statistically significant because the *p-values* of their statistics t_{α_1} are smaller than that significance level. These results indicate the following for the period under study (1990–2024):

- Mozambique's *GDP* showed a downward trend, with an average annual growth rate of around -3% *ceteris paribus* (i.e. holding all other factors constant). This persistent negative trend in *GDP* suggests that the country's economy has failed to achieve sustainable long-term expansion and may have faced structural weaknesses, repeated shocks or a decline in productive capacity;
- Inflation in Mozambique has shown an upward trend, with an average annual growth rate of around 9%, *ceteris paribus*. This result indicates that the country's inflation has risen over time or that the rate of increase in the general price level (*GDP* deflator) has become more pronounced in the long term;
- The fiscal deficit showed a downward trend, with an average annual decline of around 3%, *ceteris paribus*. This result suggests that the fiscal deficit has narrowed over time. In other words, the gap between public expenditure and tax revenue has gradually narrowed in the long term;
- The months of import coverage (the measure of persistent foreign exchange scarcity) showed a downward trend, with an average annual decline of around 1%, *ceteris paribus*. This result implies that Mozambique's foreign exchange position deteriorated over time, meaning that the country became gradually more constrained in terms of the external liquidity required to pay for imports; and
- The official exchange rate showed an upward trend, with an average annual growth of around 9.7%, *ceteris paribus*. As the exchange rate in Mozambique is defined in terms of units of local currency per unit of foreign currency, this result suggests that the national currency (MZN) has depreciated over time relative to foreign currencies, (i.e. more units of the national currency are now required to purchase one unit of foreign currency).

The results in the same table also show that two of the seven estimated exponential trend models are statistically insignificant because the *p-values* of their *F-statistics* are greater than the significance level mentioned above, namely Model II (regression of the natural logarithm of *IMP*) and Model V (regression of the natural logarithm of *DPT*). It should be noted that in these two models, all the estimated coefficients of the time trend variable (*t)* are also statistically insignificant because the *p-values* of their statistics t_{α_1} are smaller than the same significance level. In this context, no inference can be drawn from these results.

5.2 Results of the *DFA* Unit Root or Stationarity Test

The *DFA* unit root or stationarity test, as described in Section 3, delivered the results presented in Appendix D and summarised in the following table.

Table 4: Results of the DFA Unit Root or Stationarity Test

Time Series at Levels	*P-value* *Z(t)* statistic	Order of Integration
GDP	0.000	I(0)
IMP	0.000	I(0)
INF	0.268	I(1)
DEF	0.000	I(0)
DPT	0.001	I(0)
EPD (= MCI)	0.008	I(0)
TCO	0.854	I(1)
CAP	0.000	I(0)
TRB	0.995	I(1)
ENE	0.232	I(1)
RCN	0.292	I(1)
ETP	0.857	I(1)
RGL	0.691	I(1)
GAE	0.645	I(1)
AJE	0.000	I(0)
IDE	0.211	I(1)
TOT	0.010	I(0)
TAR	0.328	I(1)
POP	0.998	I(1)
EXP	0.117	I(1)
DEP	0.000	I(0)
RCF	0.023	I(0)
IMT	0.009	I(0)
OFM	0.988	I(1)
EEIC	0.997	I(1)
COR	0.641	I(1)
DES	0.999	I(1)
SDT	0.204	I(1)
DPIB	0.998	I(1)

Notes: *GDP* = gross domestic product, *IMP* = imports of goods and services, *INF* = inflation, *DEF* = fiscal deficit, *DPT* = total public debt, *EPD* (= *MCI*) = persistent foreign exchange shortage (= months of import coverage), *TCO* = official exchange rate, *CAP* = physical capital, *TRB* = labour, *ENE* = energy use, *RCN* = natural resources, *ETP* = political stability, *RGL* = rule of law, *GAE* = degree of economic openness to the outside world, *AJE* = foreign aid, *FDI* = foreign direct investment, *TOT* = terms of trade, *TAR* = import tariffs, *POP* = population size, *EXP* = exports of goods and services, DEP = public expenditure, *RCF* = tax revenue, *IMP* = total taxes, *OFM* = money supply, *EEIC* = external borrowing and capital inflows, *COR* = control of corruption, *DES* = unemployment, *SDT* = total debt service and *DPIB* = GDP deflator. I(0) = zero-order integrated time series and I(1) = first-order integrated time series. This test does not include the time series {*DOC*} and {*COV*}, as these are *dummy* or binary variables.

The figures in the table above show that the *p-values* of the *Z(t)* statistics for the time series *{GDP}, {IMP}, {DEF}, {DPT}, {EPD = MCI}, {CAP}, {AJE}, {TOT}, {DEP}, {RCF} and {IMT}* are smaller than the 10% significance level. These results indicate that the null hypothesis (H_0) that the 11 time series are integrated of order *I(1)* (i.e. they have a unit root or are non-stationary), in favour of the alternative hypothesis (H_1)

that they are integrated of *order I(0)* (i.e. they do not have a unit root or are stationary), at the[18] level, meaning that the data in question provide strong evidence against the H_0 .

The figures in the same table also show that the *p-values* of the *Z(t)* statistics for the remaining time series *{INF}, {TCO}, {TRB}, {ENE}, {RCN}, {ETP}, {RGL}, {GAE}, {IDE}, {TAR}, {POP}, {EXP}, {OFM}, {EEIC}, {COR}, {DES}, {SDT}* and *{DPIB}* are greater than the 10% significance level. These results indicate that the h H_0 s that the 18 time series are integrated of order *I(1)* (i.e. they have a unit root or are non-stationary) are not rejected at the 10% significance level, meaning that the data in question do not provide strong evidence against the h H_0. Following the reasoning of Wooldridge (2020), these results imply that the following asymptotic approximations hold: (i) the Central Limit Theorem, which defines the standard asymptotic normal distribution for the *t-statistic*, does not apply; and (ii) the *t-statistic* does not have a standard normal approximation even for large sample sizes. To resolve this problem, the first difference of each of those 17 stochastic processes was used. The transformation to the first difference was performed using the special STATA command *"generate*".

5.3 Results of the MRLM Estimation

The MRLMs estimated using equations (3)–(7) delivered the results presented in Appendices E–I and summarised in the table below.

Table 5: Results of the MRLM Estimation Dependent Variables: $lnPIB_t$, $lnIMP_t$, $\Delta lnDPIB_t$, $lnDEF_t$ *and* $lnDPT_t$

Explanatory Variables	Model I ($lnPIB_t$) Est. Coef.	Model II ($lnIMP_t$) Est. Coef.	Model III ($\Delta lnDPIB_t$) Est. Coef.	Model IV ($lnDEF_t$) Est. Coef.	Model V ($lnDPT_t$) Est. Coef.
$lnPIB_{t-1}$	0.595 (0.001)				
$lnIMP_{t-1}$		0.667 (0.000)			
$\Delta lnDPIB_{t-1}$			0.485 (0.000)		
$lnDEF_{t-1}$				0.089 (0.294)	
$lnDPT_{t-1}$					-0.565 (0.005)
$lnMCI_t$	-0.039 (0.648)	0.043 (0.828)	-0.018 (0.779)	0.106 (0.647)	0.061 (0.164)
$\Delta lnTCO_t$	-0.650 (0.003)	-0.352 (0.275)	0.306 (0.011)	-0.225 (0.601)	0.130 (0.052)
$lnMCI_t \times \Delta lnTCO_t$	0.044 (0.568)	-0.330 (0.035)	-0.044 (0.369)	-0.085 (0.673)	-0.054 (0.085)

[18] According to Wooldridge (2020), *I(0)* is a stationary time series process which, when used in regression analysis, satisfies the law of large numbers and the central limit theorem. Furthermore, according to the same author, *I(1)* is a time series process that needs to be first-differentiated in order to produce an *I(0)* process.

t		0.021 (0.006)		0.004 (0.619)	
$lnCAP_t$	0.117 (0.032)				
$\Delta lnTRB_t$	-3.709 (0.027)				
$\Delta lnENE_t$	0.114 (0.649)				
ΔRCN_t	-0.003 (0.551)				
ΔINF_t	-0.001 (0.707)				-0.001 (0.260)
ΔETP_t	0.001 (0.698)				
ΔRGL_t	0.002 (0.804)				
$\Delta lnGAE_t$	-0.172 (0.128)				
$lnPIB_t$		0.187 (0.427)		-0.481 (0.051)	-0.034 (0.201)
$lnAJE_t$	0.039 (0.522)	0.222 (0.075)			
$ln\Delta IDE_t$	0.020 (0.358)				
$lnTOT_t$	0.387 (0.017)				
$lnDEP_t$	0.149 (0.072)			1.937 (0.000)	-0.042 (0.495)
ΔTAR_t		-0.329 (0.245)			
$\Delta lnPOP_t$		1.201 (0.703)			
$lnDEP_t$			-0.010 (0.716)		
$lnRCF_t$				-0.809 (0.000)	
$lnIMT_t$			-0.039 (0.118)	0.039 (0.595)	0.011 (0.371)
$ln\Delta OFM_t$			0.041 (0.740)		
$lnDEF_t$				-0.075 (0.559)	0.036 (0.246)
$\Delta lnEEIC_t$					0.016 (0.538)
ΔCOR_t					-0.061 (0.243)
ΔDES_t					
$\Delta lnSDT_t$				-0.001 (0.985)	
$ln\Delta dPIB_{t-1}$					
DOC	-0.050 (0.102)			-0.097 (0.418)	-0.035 (0.080)
COV		-0.233 (0.023)		-0.125 (0.348)	0.056 (0.025)
$Constante$	0.787 (0.423)	-1.693 (0.334)	0.891 (0.190)	3.298 (0.406)	29.687 (0.000)
n	34	34	33	34	34
$P-value\ de\ F$	0.000	0.000	0.000	0.000	0.068
R^2	0.991	0.944	0.867	0.985	0.575

Notes: Est. Coef. = estimated coefficients; $lnPIB_t$ = natural logarithm of *GDP* = percentage change in real *GDP* (2019 = 100) over time = economic growth; $lnDPIB_t$ = natural logarithm of *the GDP* deflator = percentage change in *GDP deflator* over time = inflation; The numbers in brackets beneath the estimated coefficients are the *p-values* of the statistics $t_{\beta_j}\ (j=1,...,k)$ in equations (3) – (7); *ln* = natural logarithm; Δ = difference operator, n = number of observations; R^2 = coefficient of determination; *GDP* = gross domestic product, *IMP* = imports of goods and services, *INF* = inflation, *DEF* = fiscal deficit, *DPT* = total public debt, *EPD (= MCI)* = persistent foreign exchange shortage (= months of coverage of imports), *TCO* = official exchange rate, *CAP* = physical capital, *TRB* = labour, *ENE* = energy use, *RCN* = natural resources, *ETP* = political stability, *RGL* = rule of law, *GAE* = degree of economic openness to the outside world, *AJE* = foreign aid, *FDI* = foreign direct investment, *TOT* = terms of trade, *TAR* = import tariffs, *POP* = population size, *EXP* = exports of goods and services, *DEP* = public expenditure, *RCF* = tax revenue, *IMP* = total taxes, *OFM* = money supply, *EEIC* = external borrowing and capital inflows, *COR* = control of corruption, *DES* = unemployment and *SDT* = total debt service.

The figures in the table above show that, for all five estimated *MRLMs*, the *p-values* of their *F-statistics* are greater than the 10% significance level. These results suggest that all five models are statistically significant.

The figures in the table also show that the OLS models fit the data well, as measured by the coefficient of determination, approximately 99.1%, 94.4%, 86.7%, 98.5% and 57.5% of the variations in economic growth, imports of goods and services, inflation, the fiscal deficit and total public debt, respectively, are explained by the variations in the explanatory variables of the models in question, and that the remaining percentages (0.9%, 5.6%, 13.3%, 1.5% and 42.5%, respectively) are explained by other unobservable factors, captured by the error terms (in equations (3)–(7)), which also affect each of those dependent variables.

Regression diagnostic tests were carried out using special STATA commands in Models I, II, III, IV and V, as presented in the table in question, in order to detect the presence of econometric problems typically arising from MRLM estimation. These problems include multicollinearity, heteroscedasticity, serial correlation, non-normality of errors and model misspecification, as described in paragraphs 21 and 22 of Section 3 of this paper. In cases where such problems were detected, appropriate measures were taken to correct them. Appendix J presents the results of these tests. These indicate that the five regression models referred to above are therefore free from all such estimation problems. Thus, the OLS estimates presented in Table 5 are *BLUE*[19] since the results of the regression diagnostic tests indicate that there was no violation of the so-called Gauss-Markov assumptions.

The figures also show that, based on the *p-values of the t-statistics* for the estimated coefficients, Model I (regression of economic growth, measured by the percentage change in real *GDP* over time) produced more statistically significant explanatory variables than the other four equations. It should be noted that these explanatory variables are those for which *the p-values* of *the t-statistics* of their respective estimated coefficients are less than the 10% significance level. Thus, this model identifies six determinants of economic growth in Mozambique, namely the immediately preceding level of *GDP*, the official exchange rate, the 'capital' factor of production, the 'labour' factor of production, the terms of trade and public expenditure. The immediately preceding level of real *GDP* has a positive impact on the country's current level of *GDP* (as expected), the official exchange rate has a negative impact on the country's

[19] From the English *'Best Linear Unbiased Estimators*'. According to the Gaus-Markov Theorem, the violation of any Gaus-Markov assumption (linearity in the model parameters, perfect non-collinearity, conditional mean of zero, homoscedasticity (or constant variance of model errors) and serial correlation) leads to a situation in which the *OLS estimates* are not*BLUE* (Wooldridge, 2020).

economic growth (contrary to expectations), the 'capital' factor of production has a positive impact on the country's economic growth (as expected), the 'labour' factor of production has a negative impact on the country's economic growth (contrary to expectations), terms of trade have a positive impact on the country's economic growth (as expected) and public expenditure has a positive impact on the country (as expected). However, no inference can be drawn from the results associated with the remaining regressors, including the test variables 'persistent foreign exchange shortage (measured by months of import coverage)' and 'intercept between months of import coverage and the official exchange rate', as they are statistically insignificant.

The estimated coefficient of the first determinant of economic growth indicates that, during the period covered by this study, a 1% increase in the country's immediately preceding level of real *GDP* led to an increase in the current level of real GDP of around 0.6%, *ceteris paribus* (i.e. holding all other factors constant). The estimated coefficient of the second determinant of economic growth indicates that, during the period covered by this study, a 1% increase in the official exchange rate (i.e. a 1% depreciation of the metical) led to a reduction in real *GDP* of around 0.65%, *ceteris paribus*. The estimated coefficient of the third determinant of economic growth indicates that, during the period of this study, a 1% increase in the quantity of the 'capital' factor of production led to an increase in real *GDP* of around 0.11%, *ceteris paribus*. The estimated coefficient of the fourth determinant of economic growth indicates that, during the period covered by this study, a 1% increase in the quantity of the 'labour' factor of production led to a reduction in real *GDP* of around 3.71%, *ceteris paribus*. The estimated coefficient of the fifth determinant of economic growth indicates that a 1% increase in the terms of trade (i.e. an improvement in the terms of trade) led to an increase in real *GDP* of around 0.39%, *ceteris paribus*. The estimated coefficient of the final determinant of economic growth indicates that a 1% increase in public expenditure led to an increase in real *GDP* of around 0.15%, *ceteris paribus*.

The figures in Table 5 also show that, based on *the p-values of the t-statistics* for the estimated coefficients, Model II (regression of imports of goods and services) yielded five statistically significant explanatory variables. It should be noted that these explanatory variables are those for which *the p-values* of *the t-statistics* of their respective estimated coefficients are less than the 10% significance level. Thus, this model identifies five determinants of imports of goods and services in Mozambique, namely the immediately preceding level of imports, the interaction between persistent foreign exchange scarcity (measured by the months of import coverage) and the official exchange rate, the time trend variable, foreign aid and COVID-19. It should be noted that the immediately preceding level of imports has a positive impact (as expected), the interaction between the months of import coverage and the official exchange rate has a negative impact (contrary to expectations), the time trend variable has a positive impact, and that foreign aid has a positive impact (as expected) on the country's imports of goods and services. However, no inference can be drawn from the results associated with the remaining regressions, including the test variables "persistent foreign exchange shortage (measured by months of import coverage)" and "official exchange rate", as they are statistically insignificant.

The estimated coefficient of the first determinant of imports indicates that, during the period of this study, a 1% increase in the country's immediately preceding level of imports led to an increase in the current level of imports of around 0.68%, *ceteris paribus*. The estimated coefficient of the second determinant of imports indicates that, during the period of this study, a 1% increase in the combined effect of months of import coverage and the official exchange rate led to a reduction in imports of around 0.33%, *ceteris paribus*. The estimated coefficient of the third determinant of imports indicates that, during the period of this study, year-on-year changes led to an increase in imports of around 0.02%, *ceteris paribus*. The estimated coefficient of the fourth determinant of imports indicates that during the period of this study, a 1% increase in foreign aid led to an increase in imports of around 0.22%, *ceteris paribus*. The estimated coefficient of the final determinant of imports indicates that during the years in which Mozambique and the rest of the world were ravaged by the COVID-19 pandemic, imports fell by around 0.23% compared with previous years in the same period, *ceteris paribus*.

The figures in Table 5 also show that, based on *the p-values of the t-statistics* for the estimated coefficients, Model III (regression of inflation, measured by the percentage change in the *GDP* deflator over time) produced only two statistically significant explanatory variables. It should be noted that these explanatory variables are those for which *the p-values of the t-statistics* of their respective estimated coefficients are less than the 10% significance level. Thus, this model identifies two determinants of inflation in Mozambique, namely the immediately preceding general price level (i.e. the *GDP* deflator at time *t-1*) and the official exchange rate. It should be noted that the immediately preceding general price level has a positive impact (as expected) and that the official exchange rate has a positive impact (also as expected) on the country's inflation. The estimated coefficient of the first determinant of inflation indicates that, during the period covered by this study, a 1% increase in the previous general price level led to an increase in the current general price level of around 0.48%, *ceteris paribus*. The estimated coefficient of the last determinant of inflation indicates that a 1% increase in the official exchange rate (i.e. a depreciation of the metical) led to an increase in the general price level of around 0.31%, *ceteris paribus*. However, no inference can be drawn from the results associated with the remaining regressions, including the test variables "persistent foreign exchange shortage (measured by months of import coverage)" and "official exchange rate", as they are statistically insignificant.

The figures in the same table also show that, based on *the p-values of the t-statistics* of the estimated coefficients, Model IV (regression of the fiscal deficit, measured by the positive difference between public expenditure and tax revenue) produced three statistically significant explanatory variables. It should be noted that these explanatory variables are those for which *the p-values of the t-statistics* of their respective estimated coefficients are less than the 10% significance level. Thus, this model identifies three determinants of the fiscal deficit in Mozambique, namely domestic income (measured by *GDP*), public expenditure and tax revenue. The first variable (domestic income) has a negative impact on the fiscal deficit (as expected), the second variable (public expenditure) has a positive impact on the country's fiscal deficit (as expected) and the last variable (tax revenue) has a negative impact on the fiscal deficit (also as expected).

The estimated coefficient of the first determinant of the fiscal deficit indicates that, during the period covered by this study, a 1% increase in the level of domestic income (measured by *GDP*) led to a reduction in the level of the fiscal deficit of around 0.48%, *ceteris paribus*. The estimated coefficient of the second determinant of the fiscal deficit in Mozambique indicates that, during the period covered by this study, a 1% increase in the level of public expenditure led to an increase in the level of the fiscal deficit of around 1.94%, *ceteris paribus*. The estimated coefficient of the final determinant of the fiscal deficit indicates that, during the period covered by this study, a 1% increase in the level of tax revenue led to a reduction in the fiscal deficit of around 0.04%, *ceteris paribus*. However, no inference can be drawn from the results associated with the remaining regressions, including the test variables 'persistent foreign exchange shortage (measured by months of import coverage)' and 'official exchange rate', as they are statistically insignificant.

Finally, the figures in the table show that, based on the *p-values of the t-statistics* for the estimated coefficients, Model V (regression of total public debt) produced five statistically significant explanatory variables. It should be noted that the explanatory variables are those for which *the p-values* of *the t-statistics* for their respective estimated coefficients are less than the 10% significance level. Thus, this model identifies five determinants of total public debt in Mozambique, namely the immediately preceding level of total public debt, the official exchange rate, the interaction between the months of import coverage and the official exchange rate, the hidden debt crisis and the COVID-19 pandemic. The first variable (the immediately preceding level of public debt) has a negative impact on the current level of public debt (contrary to expectations), the second variable (the official exchange rate) has a positive impact on the country's total public debt (as expected), the third variable (interaction between months of import coverage and the official exchange rate) has a positive impact on public debt (as expected), the fourth variable (hidden debt crisis) has a negative impact on the country's total public debt (as expected) and the final variable (the COVID-19 pandemic) has a positive impact on total public debt (also as expected). The estimated coefficient of the first determinant of total public debt in Mozambique indicates that, during the period covered by this study, a 1% increase in the immediately preceding level of total public debt led to a reduction in its current level of approximately 0.56%, *ceteris paribus*. The estimated coefficient of the second determinant of total public debt in Mozambique indicates that, during the period covered by this study, a rise in the official exchange rate of around 1% led to an increase in total public debt of around 0.13%, *ceteris paribus*. The estimated coefficient of the third determinant of total public debt in Mozambique indicates that, during the period covered by this study, a 1% increase in the combined effect of the months of import coverage and the official exchange rate led to a reduction in total public debt of around 0.05%, *ceteris paribus*. The estimated coefficient of the fourth determinant of total public debt in Mozambique indicates that during the period of this study when Mozambique faced the hidden debt crisis, total public debt decreased by around 0.03% compared to previous years in the period in question. The estimated coefficient of the final determinant of total public debt in Mozambique indicates that during the period of this study when Mozambique and the rest of the world were ravaged by the COVID-19 pandemic,

total public debt increased by around 0.06% compared to previous years in the period in question. However, no inference can be drawn from the results associated with the remaining regressions, including the test variables 'persistent foreign exchange shortage (measured by months of import coverage)' and 'official exchange rate', as they are statistically insignificant.

5.4 Results of the Measurement of the EPD's Impact on Private Sector Activities and Household Living Standards

The results summarised in the table below were produced through fieldwork and a survey based on direct interviews with the ten companies and two associations from the selected sample.

Table 6: Results of the Private Sector Survey

Area of Impact	Reported Evidence	Magnitude/Indicators Observed
Access to foreign exchange	Persistent difficulties in accessing foreign exchange for the import of goods and services	Estimated average 40% reduction in import capacity
Economic Activity	A decline in the volume of transactions and slowdown in business activity	Contraction of economic activity by around 40%
Business sustainability	Closure of companies affected by foreign currency shortages	Over 500 businesses closed
Employment	Job losses linked to company closures	Estimated at over 15,000 workers affected

Source: Compiled by the author based on interviews with private companies and business associations (2026)

As mentioned in the penultimate paragraph of Section 3, the interviewees reported that they continue to face immense difficulties in accessing foreign currency for importing goods and services. They estimated that their import capacity had reduced by around 40% on average, which has directly resulted in a contraction of economic activity of a similar magnitude.

Some companies with foreign equity have requested that their shareholders abroad pay for their import requirements, with payment deferred to a later date. However, this solution is unavailable to most domestic companies, who are more vulnerable to foreign exchange restrictions. Furthermore, there have been reports of informal practices being employed, such as private negotiations between importers and exporters holding foreign currency at exchange rates significantly higher than the official rates. These transactions are then facilitated by banks. While these strategies partially mitigate the problem resulting from the shortage of foreign exchange, they also generate distortions in the foreign exchange market and encourage irregularities.

The situation in question has had a profound impact, contributing to a reduction in business activity and, in some cases, the permanent closure of companies. Notable cases include the closures of Kawena and Dimatel. Meanwhile, the Association of Small and Medium-sized Enterprises (2026) reports that the total number of companies that have closed due to difficulties in accessing foreign exchange exceeds 500. According to the same source, this phenomenon has resulted in the unemployment of more than 15,000

people, with an average of 30 people per company affected, and a consequent reduction in household income. This has had a direct negative impact on consumption levels and the well-being of the affected populations.

5.5 Discussion on the Key Findings

The following subsections present the key findings of this study. The discussion is restricted solely to the implications of these results for economic performance and the country's macroeconomic management. These results address each of the three specific objectives of the study, as defined in the first section of the paper.

5.5.1 Results of the Estimation of Exponential Trend Models

As indicated in Subsection 5.1 of this paper, determining the trend for the main variables in this study produced results showing that, from 1990 to 2024, GDP, inflation, the fiscal deficit, and the persistent foreign exchange shortage (as measured by import cover) all decreased, while the official exchange rate increased. The following paragraphs analyse the main results of this study relating to the first specific objective.

The negative GDP trend observed in Mozambique during the period in question suggests persistent structural and macroeconomic weaknesses that appear to have constrained long-term economic performance. These results imply reduced productive capacity, weak income growth, limited job creation, fiscal pressures and greater external vulnerability for the country's economy. These findings may also reflect the adverse effects of exchange rate instability, foreign exchange shortages, external shocks, and structural dependence on primary sectors. These factors characterised the Mozambican economy during the aforementioned period and may have compromised the country's sustainable economic development.

From a macroeconomic perspective, the upward trend in inflation observed in Mozambique between 1990 and 2024 may have positive or negative implications for the country's economic performance, depending on the broader economic context. On the one hand, it suggests a gradual deterioration in price stability and macroeconomic management in the long term. This implies increased inflationary pressures and a reduction in purchasing power, as well as a deterioration in macroeconomic stability. However, the rising inflation trend may also reflect periods of strong aggregate demand and dynamic economic activity.

The downward trend in Mozambique's fiscal deficit observed between 1990 and 2024 suggests gradual improvement in fiscal discipline and macroeconomic management in the long term. This development could have significant implications for the country's macroeconomic performance, fiscal sustainability, and economic stability. It implies greater fiscal sustainability, reduced debt pressures, improved macroeconomic stability, and increased investor confidence. However, the decline in the fiscal deficit may also have reflected periods of fiscal consolidation and restraint in public spending,

which could have limited aggregate demand, public investment, and the provision of essential social and economic services.

The downward trend in months of import coverage (used in this study as an indicator of foreign exchange scarcity) observed in Mozambique between 1990 and 2024 suggests a gradual deterioration in long-term external liquidity conditions. This implies a reduced capacity to finance imports, alleviate balance of payments constraints, and improve exchange rate stability, as well as lower investor confidence. However, the available data indicate that this deterioration coexists with periods of external vulnerability and short-term foreign exchange shortages, which are likely driven by external shocks and structural constraints in the economy.

The positive trend in the official exchange rate in Mozambique between 1990 and 2024 suggests that the national currency has depreciated over time. This implies a deterioration in purchasing power, an increase in imports, imported inflation and higher external debt servicing costs. However, if accompanied by productivity gains and export diversification, currency depreciation may also lead to increased export competitiveness and reduced trade imbalances.

5.5.2 Findings from the MRLM estimation

The MRLMs derived from Equations 3–7 were specified to empirically estimate the relations between fiscal risks associated with persistent foreign exchange shortages and fluctuations in the official exchange rate, on the one hand, and macro-fiscal variables, on the other. The macro-fiscal variables are: imports of goods and services, economic growth, inflation, the fiscal deficit and total public debt.

The results of the regression estimation of the natural logarithm of *GDP* indicate that there is no statistically significant relations between economic growth and persistent foreign exchange shortages (measured by months of import coverage). However, this does not necessarily mean that persistent foreign exchange shortages are irrelevant to the Mozambican economy. Conversely, this result suggests that foreign exchange scarcity did not directly explain variations in GDP growth during the analysed period and under the estimated model specification. The main implication is that economic growth in Mozambique does not appear to be solely determined by persistent foreign exchange scarcity. Instead, growth may be influenced more strongly by structural dynamics, investment, and the external sector. Nevertheless, persistent foreign exchange shortages could still undermine business operations, macroeconomic stability and long-term development, even if the short-term effects on GDP are not statistically significant.

The results of the regression estimation of the natural logarithm of *GDP* also indicate that a 1% increase in the official exchange rate led to a reduction in Mozambique's real *GDP* of around 0.65%. These regression results suggest that exchange rate depreciation has a negative effect on the country's economic growth. In other words, when the Mozambican metical depreciates against foreign currencies,

real economic activity tends to decline. These results imply that exchange rate depreciation negatively affects Mozambique's real economic growth, a fact that highlights the economy's structural vulnerability to external shocks, import dependency and macroeconomic instability. Thus, maintaining exchange rate stability and strengthening domestic productive capacity appear to be the key factors for sustaining long-term economic growth in the country.

The results of the regression analysis of the natural logarithm of imports of goods and services suggest that there is no statistically significant relations between imports and foreign exchange shortages, as measured by import coverage in months. These results suggest that import levels are not directly determined by foreign exchange constraints within the analysed period and model. These results have several important implications for our understanding of Mozambique's economic performance. The main implication is that Mozambique's imports appear to be driven more by structural dependence and external financing mechanisms than by the scarcity of foreign exchange in the short term. While foreign exchange scarcity may not significantly reduce import volumes, it can affect prices, macroeconomic stability, and external vulnerability. These findings suggest that improving long-term economic resilience requires reducing dependence on imports, expanding domestic productive capacity, and strengthening management of the external sector. This approach is preferable to relying exclusively on foreign exchange allocation policies.

Regression estimation of the natural logarithm of imports of goods and services also indicates that there is no statistically significant relations between imports and the official exchange rate in Mozambique. These results suggest that import levels are not directly affected by changes in the official exchange rate during the analysed period. The main implication is that structural factors determine Mozambique's imports, making them relatively insensitive to changes in the official exchange rate. This suggests a weak link between exchange rate policy and import behaviour, reflecting high import dependence and limited domestic substitution capacity. Therefore, improving economic performance will require structural transformation, particularly strengthening domestic production, diversifying the economy, and increasing export capacity, rather than relying solely on exchange rate adjustments to manage imports.

Regression estimation of the natural logarithm of imports of goods and services also indicates that a 1% increase in the interaction between persistent debt scarcity (measured by import coverage in months) and the official exchange rate reduces imports by around 0.33%. This implies that imports in Mozambique are not solely affected by foreign exchange conditions or exchange rate movements in isolation but are more sensitive when both pressures occur simultaneously. In other words, the combination of foreign currency scarcity and depreciation significantly limits import activity. The main implication is that imports in Mozambique are highly sensitive to the combined effect of persistent foreign exchange scarcity and exchange rate depreciation. This suggests that external shocks reinforce one another, causing sharper contractions in imports. While this helps to correct external imbalances in the short term, it can also reduce productive capacity and slow economic growth. This highlights the

need for structural reforms to reduce import dependency and strengthen economic resilience.

The results of the inflation regression analysis suggest that there is no statistically significant relations between inflation and persistent foreign exchange shortages (as measured by import coverage) in Mozambique. This implies that, in the short term and in the model and period analysed, inflation dynamics are not directly determined by foreign exchange shortages. This has several important consequences for how the Mozambican economy is understood and managed. The main implication is that inflation in Mozambique appears to be driven more by internal structural and macroeconomic factors than by foreign exchange shortages. This suggests that policies aimed at controlling inflation should focus on improving domestic supply capacity, stabilising fiscal and monetary conditions, and resolving sectoral bottlenecks rather than relying primarily on foreign exchange management. In other words, while foreign exchange shortages may still be relevant to the economy as a whole, they do not appear to be a statistically significant determinant of inflation in the estimated model.

The results of the inflation regression estimation also suggest that a 1% increase in the official exchange rate — i.e. a depreciation of the metical — led to an increase in inflation of around 0.31%. These results suggest that exchange rate depreciation contributes to higher inflation in Mozambique. The main implication is that depreciation of the exchange rate contributes significantly to inflation, which highlights the economy's strong exposure to external price shocks due to its dependence on imports. Therefore, maintaining macroeconomic stability requires exchange rate management and structural reforms to strengthen domestic production and reduce dependence on imported goods.

The regression results suggest that persistent foreign exchange shortages do not have a statistically significant impact on Mozambique's fiscal deficit. This suggests that fiscal deficits are influenced more by domestic fiscal and structural factors than by foreign exchange constraints. The absence of a significant relations between the two variables implies that foreign exchange shortages are not the primary cause of fiscal imbalance in Mozambique. This highlights the importance of effective domestic fiscal management, tax revenue mobilisation, and expenditure control in mitigating budget deficits.

The regression results indicate that there are no statistically significant relations between the fiscal deficit and the official exchange rate in Mozambique. This means that changes in the official exchange rate do not significantly account for variations in the fiscal deficit. This implies that exchange rate policies alone may be insufficient to resolve fiscal deficits in Mozambique. Therefore, greater emphasis should be placed on internal fiscal management and long-term structural transformation to help the country achieve sustainable macroeconomic stability.

The regression results indicate that there are no statistically significant relations between total public debt and persistent foreign exchange shortages (as measured by months of import cover) in Mozambique. This implies that persistent foreign exchange shortages do not significantly influence variations in total public debt in the country. In other words, fluctuations in foreign exchange shortages are not a major factor in determining the evolution of total public debt in Mozambique. In other words,

increases or decreases in foreign exchange shortages do not directly result in higher or lower levels of public debt in the country. The absence of a statistically significant relations between persistent foreign exchange shortages and total public debt suggests that debt accumulation in Mozambique is primarily determined by domestic fiscal and macroeconomic factors rather than exchange rate constraints. Therefore, policy efforts should focus on strengthening fiscal discipline, improving revenue mobilisation, and ensuring prudent debt management.

The regression results indicate a positive and statistically significant relations (elasticity = 0.13) between the official exchange rate and total public debt in Mozambique between 1990 and 2024. In practical terms, an increase in the official exchange rate (i.e. depreciation of the metical) is associated with an increase in total public debt. These results imply that exchange rate depreciation contributes to an increase in public debt in Mozambique and suggest significant exposure to external exchange rate risk. Therefore, policies should prioritise exchange rate stability, the prudent management of external debt, and the strengthening of export capacity to reduce vulnerability and improve debt sustainability.

Finally, the regression results indicate that the interaction between persistent foreign exchange shortages and the official exchange rate had a positive elasticity of 0.13 on total public debt between 1990 and 2024. This implies that public debt increases when both conditions worsen simultaneously (i.e. when there is greater foreign exchange scarcity combined with exchange rate depreciation), suggesting that debt vulnerability is driven by combined external pressures rather than isolated factors. Therefore, policies should focus on integrated macroeconomic management, exchange rate stability, strengthening foreign exchange reserves, and reducing dependence on foreign currency debt in order to improve fiscal sustainability.

5.5.3 Measuring the Impact of the EPD on Private Sector Activities and Household Living Standards

The results of the assessment of the impact of the persistent foreign exchange shortage on private-sector activities and household living standards suggest that the shortage has significantly reduced firms' operational capacity, particularly among those dependent on imports of raw materials, equipment, and other essential supplies. Consequently, some companies have encountered issues such as reduced production, operational challenges, elevated operating expenses, and permanent closure of their operations. The cases of Kawena and Dimatel illustrate the severe impact that limited access to foreign currency can have on business sustainability. Furthermore, the closure of over 500 companies shows that the persistent shortage of foreign exchange constitutes a major obstacle to the development of the private sector and the country's economic stability.

The implications of the findings reported in the previous paragraph are as follows: (i) rising unemployment (the dismissal of more than 15,000 workers shows that the shortage of foreign exchange contributed directly to job losses, (ii) a reduction in household income and increased social

vulnerability), a reduction in aggregate consumption (with the decline in household income, household consumption fell, aggregate demand weakened and economic activity slowed – this may have negatively affected national economic growth), (iii) a decline in production and investment (difficulties in accessing foreign exchange limited the import of inputs, business expansion, private investment and productive capacity – as a result, there must have been a reduction in business competitiveness), (iv) negative impacts on tax revenue (the closure of businesses reduced tax revenue, tax payments, social security contributions and government revenue – this may have exacerbated fiscal deficits and budgetary difficulties) and (v) increased poverty and social unrest (unemployment and the loss of household income may have contributed to a deterioration in living standards, increased poverty, economic insecurity and a reduction in social welfare).

In this context, the survey findings suggest that the foreign currency shortage in Mozambique has had a significant adverse effect on the business sector, resulting in a decline in economic activity, company closures and an increase in unemployment. These effects had a negative impact on household income, aggregate consumption and social welfare, thereby undermining the country's economic performance. The persistent shortage of foreign exchange has therefore proved to be a major structural constraint on the functioning of the private sector in Mozambique, affecting business sustainability, reducing investment, and exacerbating levels of unemployment and socio-economic vulnerability.

6. CONCLUSIONS

Mozambique has experienced a chronic shortage of foreign currency, with significant accumulated arrears in external payments, particularly since 2024. However, official data suggest that, since 2021, the exchange rate has been relatively stable, albeit seemingly artificially so, diverging from market conditions. The foreign exchange shortage and the unnatural stability of the exchange rate may have resulted in negative macro-fiscal effects. These include a decline in economic activity, import restrictions, a rise in the general price level, worsening of the fiscal deficit and increased public debt.

In this context, this paper attempts to empirically analyse the relevant macro-fiscal impacts of the fiscal risks associated with the persistent shortages of foreign exchange and fluctuations in the official exchange rate, using Mozambique as a case study. More specifically, the trends of the key variables examined in this study (persistent foreign exchange scarcity, the official exchange rate, gross domestic product, imports of goods and services, inflation, the fiscal deficit, and total public debt) were determined. The relations between the fiscal risks associated with persistent foreign exchange shortages and fluctuations in the official exchange rate, on the one hand, and relevant macro-fiscal variables (imports of goods and services, economic growth, inflation, fiscal deficit and total public debt), on the other, was empirically estimated. The impact of persistent foreign exchange shortages on private-sector activity and household living standards was also measured.

In order to achieve the study's first specific objective, an econometric method based on regression analysis was employed. More specifically, exponential trend models were estimated for each of the seven main study variables. The same method was employed to achieve the second specific objective. More specifically, separate regressions were estimated for economic growth, imports of goods and services, inflation, the fiscal deficit and total public debt against the persistent foreign exchange shortage (measured by months of import coverage), the official exchange rate and appropriate control variables. To achieve the study's final specific objective, the CIP conducted a survey based on direct interviews with managers of companies operating in the food, health, construction and e-commerce sectors in Maputo City. These companies' activities depend heavily on raw materials and imported goods, such as foodstuffs, medicines, medical equipment, construction materials, vehicles and machinery.

The econometric models referred to in the previous paragraph were estimated using annual time-series data covering the period from 1990 to 2024, which was collected from the World Bank website. In turn, the measurement of the impact of persistent foreign exchange shortages on

private sector activities and household living standards used cross-sectional data extracted from the aforementioned survey.

The main findings indicate that, during the period covered by this study (1990–2024), there was an upward trend in GDP, inflation, the fiscal deficit and the number of months of import cover (a measure of foreign exchange scarcity) in Mozambique, as well as an increase in the official exchange rate. The main results also indicate that during the same period there was no statistically significant relations between economic growth and persistent foreign exchange scarcity; exchange rate depreciation had a negative impact on real *GDP*; there were no statistically significant relations between imports of goods and services and persistent foreign exchange scarcity; imports were not significantly sensitive to changes in the official exchange rate; imports of goods and services decreased when foreign exchange shortages and depreciation of the official exchange rate interacted; there were no statistically significant relations between inflation and the persistent foreign exchange shortage; a 1% increase in the official exchange rate led to an increase in the general price level (i.e. inflation) of around 0.31%; persistent foreign exchange shortages did not significantly affect the fiscal deficit; there were no statistically significant relations between the fiscal deficit and the official exchange rate; persistent foreign exchange shortages did not significantly affect the fiscal deficit; there were no statistically significant relations between the fiscal deficit and the official exchange rate; there were no statistically significant relations between the persistent shortage of foreign exchange and total public debt; the depreciation of the official exchange rate led to a significant increase in total public debt (elasticity = 0.13); and the interaction between the shortage of foreign exchange and the depreciation of the exchange rate also led to a significant increase in total public debt. The main results also indicate that during the same period there were no statistically significant relations between economic growth and persistent foreign exchange scarcity; exchange rate depreciation had a negative impact on real *GDP*; there was no statistically significant relations between imports of goods and services and persistent foreign exchange scarcity; imports were not significantly sensitive to changes in the official exchange rate; imports of goods and services decreased when foreign exchange shortages and depreciation of the official exchange rate interacted; there were no statistically significant relations between inflation and the persistent foreign exchange shortage; a 1% increase in the official exchange rate led to an increase in the general price level (i.e. inflation) of around 0.31%; persistent foreign exchange shortages did not significantly affect the fiscal deficit; there were no statistically significant relations between the fiscal deficit and the official exchange rate; persistent foreign exchange shortages did not significantly affect the fiscal deficit; there

were no statistically significant relations between the fiscal deficit and the official exchange rate; there were no statistically significant relations between the persistent shortage of foreign exchange and total public debt; the depreciation of the official exchange rate led to a significant increase in total public debt (elasticity = 0.13); and the interaction between the shortage of foreign exchange and the depreciation of the exchange rate also led to a significant increase in total public debt. The main results also indicate that the persistent shortage of foreign exchange had a negative impact on businesses, leading to the closure of some firms, unemployment and a reduction in social welfare.

The negative GDP trend observed in Mozambique during the period covered by this study (1990–2024) suggests persistent structural and macroeconomic weaknesses that appear to have constrained long-term economic performance. These results imply reduced productive capacity, weak income growth, limited job creation, fiscal pressures, and greater external vulnerability for the country. To reverse this downward trend in *GDP*, it is recommended that the Government of Mozambique implement comprehensive structural and macroeconomic reforms aimed at promoting economic diversification, strengthening macroeconomic stability, improving foreign exchange management and enhancing institutional quality. Increased investment in productive infrastructure, human capital and agricultural modernisation is essential to stimulate productivity, job creation and sustainable economic growth. Furthermore, policies that improve the business environment and strengthen resilience to external shocks would contribute to long-term economic stability and development.

The upward trend in inflation observed during this period implies increased inflationary pressures, reduced purchasing power, less predictability for investment and economic planning, as well as a deterioration in macroeconomic stability. In order to reduce inflation while supporting economic growth and macroeconomic stability, it is recommended that the Government of Mozambique take measures aimed at strengthening coordination between monetary and fiscal policies, improving exchange rate management, and promoting domestic productive capacity through economic diversification and infrastructure development. To reduce supply-side constraints and strengthen price stability, greater investment is needed in agriculture, industrialisation and institutional quality. Furthermore, policies aimed at strengthening social protection and resilience to external shocks would contribute to sustainable and inclusive economic development.

The downward trend in the fiscal deficit observed during the period in question implies greater fiscal sustainability, reduced debt pressures, improved macroeconomic stability and greater investor confidence. To maintain this trend of fiscal deficit improvement whilst

supporting economic growth, it is recommended that the Government of Mozambique strengthen domestic revenue mobilisation, improve public finance management and maintain prudent debt management practices. In order to avoid constraints on long-term growth, fiscal discipline must be balanced with increased investment in productive sectors, infrastructure, education and health. Furthermore, policies that improve the efficiency of public spending, promote private sector participation and safeguard social spending are essential to ensuring sustainable and inclusive economic development.

The downward trend in import cover, a measure of persistent foreign exchange scarcity, suggests a long-term deterioration in external liquidity conditions. This has policy implications, including the need to consolidate foreign exchange reserves, diversify export earnings, and promote stable, long-term capital flows. In this context, in order to reverse this trend, it is recommended that the Government of Mozambique and the Bank of Mozambique take measures to strengthen import management, maintain exchange rate stability, and improve the coordination of macroeconomic policies. These measures are all essential to sustaining these gains. Furthermore, the Government of Mozambique is recommended to improve institutional quality and resilience to external shocks. These factors are fundamental to ensuring the long-term stability of the external sector and supporting sustainable economic development.

The positive trend in Mozambique's official exchange rate during 1990–2024 suggests a gradual depreciation of the national currency. This has policy implications, including the need to balance macroeconomic stability with preserving external competitiveness through export diversification, increased productivity, and promoting industrialisation. While exchange rate depreciation leads to higher imported inflation and increased external debt costs, it can also strengthen export competitiveness and reduce external imbalances if managed effectively. In light of this trend, it is recommended that the Bank of Mozambique adopt policy measures to maintain a balanced exchange rate regime, strengthen export competitiveness and promote economic diversification. Furthermore, increasing productivity, improving import substitution capacity, and strengthening macroeconomic coordination are essential to maximising the favourable effects of currency depreciation on external competitiveness. These measures are fundamental to sustaining macroeconomic stability and supporting long-term, inclusive economic growth.

The regression results indicate that there are no statistically significant relations between economic growth and persistent foreign exchange shortages in Mozambique. This suggests that foreign exchange shortages may not directly determine GDP growth, but they may still affect business confidence, inflation, imports, and long-term development. The policy

implication is that Mozambique should not rely exclusively on exchange rate management as a strategy for economic growth. In this context, it is recommended that government policies focus on structural transformation, economic diversification, export development, macroeconomic stability and institutional strengthening in order to support sustainable economic performance in the long term. Furthermore, it is recommended that the Government of Mozambique adopt policy measures that reinforce macroeconomic stability, diversify the economy, and enhance resilience.

The regression results suggest that exchange rate depreciation negatively impacts Mozambique's real GDP. The policy implication is that Mozambique should seek to stabilise the exchange rate in conjunction with broader structural reforms. Policies that strengthen domestic production, diversify exports, improve macroeconomic management and reduce dependence on imports are essential for achieving sustainable long-term economic growth and reducing vulnerability to currency depreciation. In this context, it is recommended that the Government of Mozambique implement policies aimed at stabilising the exchange rate, effectively reducing external vulnerability and strengthening domestic productive capacity.

The regression results indicate that there are no statistically significant relations between imports of goods and services and the persistent foreign exchange shortages (measured by months of import coverage) in Mozambique. The policy implication is that imports are determined by structural factors and cannot be easily constrained by the short-term availability of foreign exchange. This calls for broader structural reforms to the external sector, rather than the country relying solely on foreign exchange rationing. In this context, the main policy implication is that Mozambique should not use foreign exchange shortages or controls to manage imports, since imports are determined by structural factors and relatively unaffected by foreign exchange restrictions. In this context, it is recommended that the Government of Mozambique adopt economic policies that ensure long-term economic stability, which, in turn, requires structural transformation, expansion of domestic production, diversification of exports and improved management of the external sector, so that the country can reduce its dependence on imports and strengthen economic resilience.

The regression results show that imports are not significantly sensitive to changes in the official exchange rate in Mozambique. The policy implication of these results is that exchange rate adjustments, on their own, are not an effective tool for managing imports. Thus, it appears that the import structure of the Mozambican economy is determined more by structural dependence than by price signals. The main implication is that Mozambique should not rely on exchange rate policy to manage imports, as these are determined by structural

factors and are relatively insensitive to currency fluctuations. In this context, it is recommended that the Government of Mozambique adopt policies leading to long-term economic improvement, which in turn requires structural reforms (particularly industrialisation, diversification and the strengthening of export capacity) with a view to reducing dependence on imports and improving economic resilience.

The regression results suggest that imports of goods and services decline when foreign exchange shortages and depreciation of the official exchange rate interact. The key message behind these results is that Mozambique's external sector is highly sensitive to combined macroeconomic *stress*. Therefore, policies should seek to reduce this vulnerability while protecting productive capacity. The main implication is that Mozambique should treat persistent foreign exchange shortages and exchange rate depreciation as mutually reinforcing shocks, rather than separately. In this context, it is recommended that the government adopt policies focused on stabilising macroeconomic conditions so that they can promote structural economic transformation while reducing dependence on imports and strengthening export capacity. It should be noted that this combination is essential for protecting imports of productive goods and sustaining long-term economic growth.

The regression results indicate that there are no statistically significant relations between inflation and persistent foreign exchange shortages (measured by months of import coverage) in Mozambique. These results suggest that inflation is primarily driven by internal structural and macroeconomic factors, not by short-term foreign exchange shortages. Policies should therefore focus less on foreign exchange constraints and more on domestic price and supply dynamics. The main implication is that inflation in Mozambique should be addressed primarily through domestic structural reforms, fiscal discipline and monetary policy management, rather than relying on interventions related to foreign exchange shortages. Strengthening productive capacity, improving infrastructure and stabilising macroeconomic conditions are essential for achieving long-term price stability. In this context, it is recommended that the Government of Mozambique adopt policies less focused on foreign exchange restrictions and more focused on domestic price and supply dynamics.

The regression results indicate that a 1% increase in the official exchange rate led to a rise in the general price level (i.e. inflation) of around 0.31%. These results suggest that exchange rate depreciation contributes significantly to inflation in Mozambique. The main policy implication is that Mozambique should seek exchange rate stability alongside structural reforms to reduce imported inflation. Government policies should therefore focus on reducing inflationary pressures resulting from currency depreciation and dependence on imports. It is

recommended that the Government of Mozambique adopt policies aimed at strengthening domestic production, diversifying exports, improving fiscal and monetary discipline, and reducing dependence on imported goods, factors that are essential for achieving long-term price stability and sustainable economic growth.

The regression results suggest that a persistent foreign exchange shortage does not significantly impact Mozambique's fiscal deficit. This implies that policy efforts directed exclusively at resolving the shortage may not significantly reduce the fiscal deficit. Therefore, greater emphasis should be placed on both domestic fiscal discipline and structural reforms of the economy. In this context, it is recommended that the Government of Mozambique adopt policies that prioritise domestic fiscal reforms, improved revenue mobilisation, control of public expenditure, prudent debt management and institutional strengthening, as these factors are likely to play a more significant role in influencing fiscal deficits than foreign exchange shortages.

The regression results indicate that there are no statistically significant relations between the fiscal deficit and the official exchange rate in Mozambique. The policy implication of these results is that exchange rate movements are not a determining factor in fiscal deficits. In this context, it is recommended that the Government of Mozambique adopt policies that focus more on domestic and structural fiscal reforms rather than resorting to exchange rate policy as a solution to the fiscal imbalance. However, policy interventions should prioritise strengthening domestic fiscal management, improving revenue mobilisation, tightening control over public expenditure and implementing structural economic reforms, since exchange rate policies alone do not appear to be sufficient to resolve fiscal deficits in Mozambique.

The regression results indicate that there are no statistically significant relations between the persistent shortage of foreign exchange and total public debt in Mozambique. The main implication of these results is that debt accumulation is determined primarily by internal fiscal and macroeconomic factors, rather than by a shortage of foreign currency. Therefore, government policies should focus more on internal reforms. In this context, it is recommended that the Government of Mozambique adopt policies that prioritise strengthening fiscal discipline, improving domestic revenue mobilisation, increasing the efficiency of public expenditure and ensuring prudent debt management, since foreign exchange shortages do not appear to be a significant factor in determining public debt in Mozambique.

The regression results indicate that the depreciation of the official exchange rate led to a significant increase in total public debt (elasticity = 0.13) in Mozambique. The main implication of these results is that the debt in question is highly exposed to exchange rate risk,

mainly due to foreign currency borrowing. It is therefore recommended that the Government of Mozambique adopt policies focused on reducing this vulnerability and stabilising macroeconomic conditions. Such policies should prioritise exchange rate stability, the reduction of foreign currency debt, the strengthening of export performance and the improvement of debt risk management, in order to ensure fiscal sustainability.

The regression results indicate that the interaction between foreign exchange shortages and exchange rate depreciation has also led to a significant increase in total public debt. These results imply that Mozambique's public debt is more vulnerable when foreign exchange shortages and exchange rate depreciation occur simultaneously. It is therefore recommended that the Government of Mozambique adopt policies focused on reducing this exposure to combined risk. Such policies should prioritise integrated macroeconomic coordination, exchange rate stability, the strengthening of foreign exchange reserves, the reduction of exposure to foreign currency debt, and the diversification of exports in order to improve debt sustainability.

The results of the survey, based on direct interviews with managers of companies operating in the food, health, construction and e-commerce sectors in Maputo City - whose activities are heavily dependent on raw materials and imported goods (foodstuffs, medicines, medical equipment, construction materials, vehicles, machinery, among others), indicate that the persistent shortage of foreign currency has negatively affected businesses, leading to the closure of some, unemployment and a reduction in social welfare. It is therefore recommended that the Government of Mozambique adopt policies aimed at strengthening the external sector, business activity and macroeconomic stability. These policies should focus on increasing the availability of foreign exchange, diversifying the economy, strengthening the domestic productive sector and promoting macroeconomic stability in order to mitigate the impacts of the foreign exchange shortage on businesses, employment and social welfare in the country. The persistence of the foreign exchange shortage requires structural and coordinated responses from the Government, including reforms aimed at increasing domestic productive capacity, improving the business environment and strengthening the external resilience of the Mozambican economy.

Overall, and in light of the key research question formulated in the first section of this paper, the study concludes that the Mozambican economy is structurally vulnerable to persistent foreign exchange shortages and exchange rate fluctuations. These external pressures significantly affect macroeconomic stability, public debt dynamics, inflation and the performance of the private sector. However, addressing these challenges requires an integrated

policy approach focused on macroeconomic stability, structural transformation and strengthening the resilience of the external sector.

Finally, due to certain limitations of this study, notably the use of time series that are not sufficiently long (only 35 annual observations), the use of imputed data for some variables included in the estimated econometric models, and the use of months of import coverage as an indicator of persistent foreign exchange shortages, readers are advised to interpret the results summarised above with a degree of scepticism (in other words, with caution). Regarding the first limitation, it should be noted that although the study used only 35 annual observations, this limitation is common in macroeconomic time-series analyses for developing economies, such as the economy of Mozambique, due to data availability constraints. However, the small sample size may have reduced statistical power, limited the number of degrees of freedom and affected the robustness of the parameter estimates. Furthermore, the relatively small sample size may have limited the reliability of long-run estimates and hypothesis tests, particularly (a fact that typically occurs in the presence of structural breaks and macroeconomic shocks). Regarding the second limitation, it is important to note that the use of imputed (interpolated, estimated or manually adjusted) time-series data in a regression model has important implications for the validity, reliability and interpretation of the econometric results. Although researchers sometimes use imputed data due to missing observations or data limitations, this practice can raise several methodological concerns. Thus, although the use of imputed data in this study helped to resolve the problem of missing observations, it may have reduced the robustness and empirical validity of the estimated relations, a fact that is particularly true in time-series models, which, in turn, are sensitive to structural changes and dynamic fluctuations. Regarding the latter limitation, it is important to note that the months of import coverage, defined as the ratio of 'total reserves to imports of goods and services', do not appear to be a good indicator of persistent debt scarcity. This assertion is supported by the argument put forward by Agénor and Montiel (2015) that, in economies with active dual or parallel foreign exchange markets, official reserve indicators are particularly poor *proxies* for effective exchange rate constraints, precisely because administrative management of the exchange rate decouples the *stock* of reserves from actual market pressure. In the context of developing economies, such as Mozambique's, the foreign exchange market premium (given by the difference between the parallel market exchange rate and the official exchange rate) has been seen as the best indicator of persistent foreign exchange scarcity. However, due to the lack of data on the parallel market exchange rate for the period covered by this study (1990–2024), the author opted for an alternative indicator variable (months of import coverage). In this context, future research on this subject is recommended to take into account the above limitations.

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8. APPENDICES

Appendix A: Survey conducted with Business Managers: Questionnaire

I. General Characteristics

1. The company's main sector of activity.
2. Degree of dependence on imports (equipment, raw materials and products).
3. Main external supply markets.

II. Access to Foreign Currency

4. When did the company start having difficulty accessing foreign exchange through commercial banks?
5. What is the current average time between submitting foreign exchange purchase requests and settling them?
6. Are there any outstanding import invoices due to a lack of foreign exchange settlement? If so, please provide an approximate figure and the relevant reference period.

III. Relations with Commercial Banks

7. Does the company identify any significant differences in how commercial banks handle foreign exchange requests?
8. Are there any perceived sectoral criteria or priorities in the allocation of foreign exchange?
9. Have any guarantees or additional requirements been requested that were not previously necessary?

IV. Operational and Financial Impacts

10. In what ways has the shortage of foreign exchange affected the company's production and the execution of its activities?
11. Regarding your workforce, are there any planned salary increases or investments?

VI. General Assessment

12. What are the main causes of the country's foreign exchange shortage, in your view?
13. What measures would you prioritise to mitigate the impact of the shortage on the private sector?
14. Would the company like to provide any additional information, comments or evidence that they consider relevant for understanding the impact of the shortage on their activities, the Mozambican economy in general, and their own sector in particular?

Appendix B: Secondary Data

ANOS	PIB	IMP	INF	DEF	DPT	MCI	TCO	T	CAP	TRB	ENE	RCN	ETP	RGL	GAE	AJE	IDE	TOT	TAR	POP	EXP	DEP	RCF	IMT	OFM	EEIC	COR	DES	SDT	DPIB	DOC	COV
1990	1.161.295.389,81	629.617.243,53	28,74	144.427.542,21	127.330.125,56	4,55	0,93	1,00	441.455.794,66	5.981.740,00	443,81	9,79	33,76	16,19	0,62	464.239.491,99	4.281.664,63	198,90	19,66	13.094.537,00	93.100.280,78	157.608.431,01	13.180.888,79	46.822.384,11	664.992.385,91	158.498.465,42	50,62	2,86	36.542.254,74	2,15	0	0
1991	1.113.899.310,41	462.060.910,76	33,56	132.577.339,20	127.270.123,37	4,52	1,43	2,00	352.004.842,38	6.105.373,00	432,85	9,66	36,15	17,32	0,49	307.771.287,58	6.501.599,97	202,31	19,18	13.352.090,00	89.105.527,74	145.981.093,93	13.403.754,73	44.657.919,79	621.484.976,13	407.654.746,41	49,36	2,84	23.873.373,60	3,46	0	0
1992	586.829.941,66	294.504.578,00	37,81	81.094.943,84	127.210.121,18	4,49	2,52	3,00	204.555.885,07	6.231.258,00	429,60	13,71	38,54	18,44	0,59	306.065.326,25	5.304.897,29	160,73	18,69	13.613.316,00	53.703.697,67	94.721.564,51	13.626.620,67	22.410.295,87	604.993.931,85	832.030.812,81	48,09	3,03	17.342.347,91	4,77	0	0
1993	422.884.920,05	198.754.395,23	42,96	63.915.917,20	127.150.118,99	4,46	3,87	4,00	144.103.935,31	6.444.044,00	424,53	11,46	40,94	19,56	0,55	172.629.008,63	4.693.568,35	153,50	18,21	14.051.192,00	34.848.370,33	77.765.403,80	13.849.486,60	15.737.131,74	656.568.046,52	1.291.019.272,08	46,83	2,90	17.945.356,60	6,82	0	0
1994	288.787.638,10	139.279.919,87	50,24	57.394.537,80	127.090.116,80	4,42	6,04	5,00	87.103.278,96	6.915.461,00	402,28	13,45	43,33	20,68	0,59	117.145.081,11	3.416.902,54	184,35	17,73	15.033.853,00	30.360.364,09	71.466.890,34	14.072.352,54	7.966.587,37	633.670.733,56	2.171.850.428,62	45,57	2,88	12.036.364,17	10,24	0	0
1995	197.343.123,86	103.428.618,44	51,46	10.212.328,53	127.030.114,61	4,39	9,02	6,00	77.131.249,18	7.366.643,00	388,82	19,49	45,72	21,81	0,64	68.542.442,68	2.900.544,37	171,70	17,24	15.960.530,00	22.424.069,75	24.507.547,00	14.295.218,47	6.149.668,18	626.266.602,84	3.131.459.449,90	44,30	2,76	10.463.725,31	15,51	0	0
1996	174.555.059,99	68.384.183,85	48,82	4.722.881,83	126.970.112,42	4,36	11,29	7,00	44.549.568,43	7.634.613,00	384,51	14,47	46,28	23,62	0,51	38.406.350,48	3.140.144,66	130,88	16,76	16.492.480,00	20.690.028,39	19.240.966,24	14.518.084,41	26.576.887,42	596.159.746,89	4.179.453.516,66	40,86	2,76	6.093.646,97	23,09	0	0
1997	190.953.629,74	62.192.815,10	10,55	8.665.866,27	126.910.110,23	4,33	11,54	8,00	48.078.546,35	7.851.935,00	386,52	11,22	54,19	22,13	0,43	37.151.622,84	2.523.238,02	131,66	16,28	16.949.982,00	20.487.589,76	23.406.816,61	14.740.950,34	27.710.591,39	722.654.844,73	4.824.840.866,73	43,37	2,70	4.298.505,93	25,52	0	0
1998	204.879.357,28	59.558.104,43	6,16	13.464.534,67	126.850.108,04	4,29	11,87	9,00	56.742.269,83	8.059.784,00	383,19	10,26	51,06	24,50	0,39	38.382.173,06	8.669.633,71	132,60	15,80	17.340.464,00	20.360.305,22	28.428.350,95	14.963.816,28	28.483.729,93	827.753.980,07	5.617.201.394,42	43,32	2,64	3.865.309,44	27,09	0	0
1999	212.941.171,00	78.029.302,33	8,94	17.007.737,91	126.790.105,85	4,26	12,78	10,00	94.339.052,49	8.265.462,00	383,70	5,94	39,80	26,87	0,46	27.736.217,42	12.931.870,16	133,78	15,31	17.734.506,00	18.917.730,21	32.194.420,12	15.186.682,21	72.992.849,96	1.013.995.936,08	10.300.327.899,91	37,64	2,66	3.860.336,62	29,52	0	0
2000	180.019.410,07	65.950.463,02	11,62	10.180.543,68	126.730.103,66	4,23	15,23	11,00	74.043.189,35	8.468.296,00	396,03	6,21	40,74	27,36	0,48	27.542.897,44	4.228.297,90	113,66	14,83	18.129.653,00	20.316.423,90	25.590.091,83	15.409.548,15	62.500.394,08	1.176.671.259,50	11.902.950.083,69	37,23	2,83	3.374.256,41	32,94	0	0
2001	149.417.234,58	47.328.696,93	14,78	9.198.974,85	126.670.101,47	4,20	20,70	12,00	50.055.319,80	8.679.877,00	407,15	6,29	50,38	31,84	0,50	25.425.783,03	6.754.942,27	110,07	14,81	18.537.729,00	28.000.464,45	24.831.388,93	15.632.414,09	36.434.617,57	994.352.261,28	12.580.605.640,79	36,82	2,84	6.304.613,66	37,81	0	0
2002	143.279.850,50	74.275.151,31	9,83	5.416.338,31	126.610.099,28	4,16	23,68	13,00	58.161.715,02	8.900.839,00	409,46	7,16	51,32	30,35	0,73	53.388.838,65	8.360.991,66	103,95	12,73	18.958.338,00	30.762.107,49	21.271.618,33	15.855.280,02	25.482.128,61	1.192.567.671,96	14.454.739.578,29	38,62	2,90	6.470.835,54	41,53	0	0
2003	152.947.571,90	72.430.626,07	3,64	7.489.487,25	126.550.097,09	4,13	23,78	14,00	51.125.202,38	9.131.272,00	421,13	10,10	52,26	28,86	0,70	24.382.378,34	7.822.129,97	105,27	13,08	19.392.475,00	34.890.176,71	23.567.633,21	16.078.145,96	30.420.805,37	1.368.931.372,89	15.964.299.435,69	32,80	2,86	7.506.569,73	43,04	0	0
2004	174.297.924,22	79.614.736,94	5,79	13.136.597,71	126.490.094,90	4,10	22,58	15,00	49.845.421,75	9.280.551,00	426,38	8,00	44,66	31,25	0,72	27.323.952,27	10.442.025,90	112,95	13,77	19.840.313,00	45.970.403,70	29.437.609,60	16.301.011,89	38.393.793,60	1.526.945.768,94	16.681.685.957,21	30,54	2,95	7.815.921,58	45,54	0	0
2005	181.445.788,11	80.092.887,57	7,33	13.337.645,20	126.430.092,71	3,95	23,06	16,00	46.032.537,64	9.434.822,00	424,49	7,52	50,97	32,54	0,72	26.389.949,43	2.504.532,68	116,60	12,95	20.304.569,00	50.564.883,52	29.861.523,03	16.523.877,83	40.926.731,70	1.898.651.140,71	15.273.675.314,74	37,07	3,04	8.260.787,21	48,88	0	0
2006	181.057.790,94	71.174.208,41	7,46	11.877.041,05	126.370.090,52	3,48	25,40	17,00	43.336.089,33	9.594.635,00	428,69	8,51	61,84	31,58	0,67	31.260.934,96	4.781.486,73	140,00	12,13	20.787.087,00	50.768.028,54	28.623.784,81	16.746.743,76	37.563.221,87	2.126.106.178,66	9.112.056.966,68	32,20	3,04	11.724.453,91	52,52	0	0
2007	191.592.030,65	72.420.910,70	7,44	12.250.579,81	126.310.088,33	4,11	25,84	18,00	42.821.760,54	9.755.517,00	338,47	9,81	55,56	33,49	0,66	31.632.150,14	7.384.237,46	135,50	10,99	21.287.635,00	54.260.472,20	29.220.189,52	16.969.609,70	39.367.238,16	2.596.693.617,69	10.573.940.690,17	36,89	3,08	21.034.332,92	56,43	0	0
2008	217.744.087,58	81.948.316,02	5,15	17.373.943,79	126.250.086,14	3,69	24,30	19,00	47.969.558,00	9.917.392,00	338,66	10,20	57,21	33,17	0,65	33.589.188,54	10.809.384,28	125,10	10,78	21.819.036,00	59.544.876,44	34.566.419,43	17.192.475,64	49.753.350,34	3.321.874.523,57	10.837.491.905,47	37,86	3,11	10.553.347,81	59,34	0	0
2009	203.684.168,75	81.300.844,13	1,47	17.168.699,75	126.190.083,95	5,34	27,52	20,00	40.239.951,11	10.084.170,00	358,88	10,02	68,72	33,18	0,68	33.442.753,66	15.447.517,42	104,40	8,80	22.391.745,00	56.997.799,41	34.584.041,33	17.415.341,57	40.613.481,35	3.891.047.080,03	20.575.201.839,18	40,67	3,21	8.987.264,71	60,21	0	0
2010	176.072.622,79	78.297.946,85	7,65	21.630.460,73	126.130.081,76	5,21	33,96	21,00	40.840.962,66	10.258.571,00	317,88	10,27	58,29	36,97	0,74	27.372.664,07	19.416.507,32	113,90	8,77	22.999.235,00	51.709.417,65	30.575.891,38	8.945.430,65	31.333.351,22	3.928.486.616,39	23.158.644.925,65	40,95	3,26	2.932.467,58	64,81	0	0
2011	220.383.544,15	116.863.468,82	2,35	27.677.264,36	126.070.079,57	3,89	29,07	22,00	64.806.170,01	10.455.626,00	370,87	11,37	58,29	32,86	0,84	31.136.611,35	55.233.325,33	109,80	10,75	23.649.039,00	69.153.932,53	41.627.732,74	13.950.468,38	50.072.115,49	4.947.148.162,73	23.530.241.494,10	38,39	3,30	7.610.981,04	66,34	0	0
2012	243.828.785,72	185.107.862,34	3,18	28.810.134,53	126.010.077,38	2,82	28,37	23,00	123.354.030,17	10.674.835,00	364,83	11,92	59,24	33,33	1,06	30.269.410,00	82.333.916,73	100,50	8,76	24.337.846,00	73.191.157,39	48.751.835,06	19.941.700,54	58.849.606,09	6.555.989.500,61	24.150.105.043,13	34,60	3,30	4.580.454,69	68,44	0	0
2013	244.909.093,05	199.335.354,26	2,60	32.088.780,12	125.950.075,19	3,20	30,10	24,00	138.118.468,98	10.904.768,00	380,58	11,63	38,39	23,47	1,09	32.934.005,17	95.374.618,32	100,20	9,74	25.051.611,00	68.559.379,50	56.719.953,80	24.631.173,68	63.549.268,26	7.189.214.250,75	24.617.289.549,94	34,12	3,35	7.803.557,01	70,22	0	0
2014	253.268.977,07	211.651.357,67	1,09	35.856.023,66	125.890.073,00	3,24	31,35	25,00	135.861.519,97	11.146.461,00	383,32	11,90	32,38	22,12	1,16	29.668.462,74	70.420.704,71	96,90	7,45	25.788.475,00	83.044.459,35	66.064.643,17	30.208.619,51	59.704.926,07	8.435.316.222,29	23.193.799.444,15	29,33	3,38	8.991.363,45	70,98	0	0
2015	213.286.548,75	141.172.042,05	7,06	33.810.377,10	125.830.070,81	2,82	39,98	26,00	90.104.582,16	11.397.352,00	385,15	12,22	27,62	20,48	0,99	23.937.023,11	50.901.880,06	100,00	7,34	26.547.572,00	69.472.320,73	54.419.443,90	20.609.066,80	45.386.408,92	8.340.269.449,43	30.291.477.323,27	24,76	3,43	11.973.994,80	76,00	0	0
2016	141.592.191,99	106.211.730,88	12,16	23.078.708,99	130.608.101,18	3,00	63,06	27,00	65.529.426,97	11.753.394,00	380,81	16,31	12,86	12,86	1,10	17.993.979,17	36.698.958,07	101,30	7,16	27.337.105,00	50.098.060,73	36.919.401,51	13.840.692,52	21.202.616,12	5.822.841.069,74	30.244.894.834,18	17,14	3,65	12.397.773,93	85,24	1	0
2017	144.120.690,46	93.249.224,78	7,98	16.771.391,50	113.141.385,05	4,69	63,58	28,00	46.413.069,38	12.130.020,00	371,74	18,05	16,19	15,24	1,06	19.623.257,62	25.196.781,63	108,10	8,88	28.166.393,00	59.152.122,73	35.402.909,58	18.631.518,07	20.398.735,94	6.068.257.264,83	31.575.720.949,42	19,05	3,94	13.997.189,27	92,04	1	0
2018	157.198.166,84	124.306.685,29	3,80	16.562.640,57	127.886.551,47	3,12	60,33	29,00	72.280.920,97	12.515.124,00	366,24	16,40	18,40	14,29	1,25	19.088.610,08	17.565.548,25	111,00	8,96	29.018.644,00	71.573.953,68	34.154.667,19	17.592.026,62	24.219.509,82	6.921.894.862,59	28.988.055.900,35	23,81	4,21	19.759.320,95	95,53	1	0
2019	155.127.579,99	106.183.455,69	4,68	9.641.486,94	122.362.061,66	4,52	62,55	30,00	63.363.597,37	12.903.560,00	359,75	12,68	19,81	14,29	1,06	18.424.626,44	33.793.289,08	98,10	9,04	29.884.380,00	57.617.573,19	35.020.356,66	25.378.869,72	27.006.009,21	7.569.623.924,22	37.500.987.791,51	21,90	4,46	17.037.751,42	100,00	1	1
2020	137.977.997,70	92.605.689,04	3,17	12.119.504,28	139.897.177,44	5,31	69,47	31,00	61.850.950,62	13.187.062,00	342,95	11,86	10,85	14,76	1,00	24.789.941,63	30.899.395,81	96,50	8,94	30.783.688,00	45.242.810,86	28.472.922,02	16.353.417,74	22.288.907,04	8.402.495.086,35	71.034.008.836,35	24,76	5,02	10.433.954,54	103,17	1	1
2021	149.889.411,20	107.513.375,25	4,55	11.179.289,32	126.142.381,51	4,09	65,47	32,00	60.509.326,73	13.595.901,00	353,11	14,91	11,32	15,71	1,12	21.194.544,20	49.092.100,50	123,80	8,84	31.707.800,00	60.481.124,65	28.074.166,21	16.894.876,88	29.958.284,26	9.083.441.724,40	102.186.037.372,24	22,38	5,41	64.871.584,49	107,87	1	1
2022	160.385.886,95	137.053.967,55	9,15	7.382.993,04	122.911.821,58	2,01	63,85	33,00	69.293.674,82	14.168.284,00	358,64	15,86	11,32	16,04	1,35	21.866.443,96	25.668.630,02	154,90	8,74	32.656.246,00	79.915.384,15	26.460.748,95	19.077.755,91	34.877.404,49	10.126.671.389,56	120.892.126.978,03	21,70	6,79	48.255.481,35	117,74	1	1
2023	169.084.739,65	102.202.141,73	5,09	7.936.471,25	122.858.667,02	3,27	63,89	34,00	33.031.168,10	14.644.495,00	355,31	16,26	11,85	17,45	1,06	23.659.152,81	21.688.171,42	121,80	8,64	33.635.160,00	77.126.788,66	29.102.540,63	21.166.069,39	39.335.744,38	10.928.379.036,65	132.479.708.568,15	22,17	6,66	36.318.723,15	123,73	1	1
2024	172.665.806,10	91.209.200,57	6,46	11.023.736,91	123.962.391,83	3,44	63,91	35,00	30.493.190,25	15.148.294,00	356,00	16,67	12,08	18,87	0,96	25.451.861,66	26.634.894,82	131,50	8,54	34.631.766,00	73.961.908,70	31.776.086,35	20.752.349,45	42.094.350,61	11.790.467.188,26	153.694.542.998,33	22,64	6,67	24.381.964,95	131,73	1	1

Appendix D: Results of the Exponential Trend Model Estimation

(i) Persistent Foreign Exchange Shortages (Months of Import Coverage) (*MCI*)

```
. reg lnmci t
```

Source	SS	df	MS	Number of obs	=	35
				F(1, 33)	=	9.90
Model	.327046735	1	.327046735	Prob > F	=	0.0035
Residual	1.08993567	33	.033028354	R-squared	=	0.2308
				Adj R-squared	=	0.2075
Total	1.41698241	34	.041675953	Root MSE	=	.18174

lnmci	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
t	-.0095713	.0030417	-3.15	0.003	-.0157596	-.003383
_cons	1.540423	.062779	24.54	0.000	1.412699	1.668148

(ii) Official Exchange Rate (*OER*)

```
. reg lntco t
```

Source	SS	df	MS	Number of obs	=	35
				F(1, 33)	=	158.78
Model	33.5279345	1	33.5279345	Prob > F	=	0.0000
Residual	6.96835346	33	.211162226	R-squared	=	0.8279
				Adj R-squared	=	0.8227
Total	40.496288	34	1.19106729	Root MSE	=	.45952

lntco	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
t	.0969102	.0076908	12.60	0.000	.081263	.1125573
_cons	1.283914	.1587372	8.09	0.000	.9609606	1.606867

(iii) Gross Domestic Product (*GDP*)

```
. reg lnpib t // modelos de tendência
```

Source	SS	df	MS	Number of obs	=	35
				F(1, 33)	=	18.29
Model	3.17058005	1	3.17058005	Prob > F	=	0.0002
Residual	5.72134837	33	.173374193	R-squared	=	0.3566
				Adj R-squared	=	0.3371
Total	8.89192842	34	.261527306	Root MSE	=	.41638

lnpib	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
t	-.0298013	.0069688	-4.28	0.000	-.0439794	-.0156232
_cons	19.72439	.1438345	137.13	0.000	19.43176	20.01702

(iv) Imports of Goods and Services (*IMP*)

```
. reg lnimp t
```

Source	SS	df	MS	Number of obs	=	35
				F(1, 33)	=	1.27
Model	.406322459	1	.406322459	Prob > F	=	0.2681
Residual	10.5690691	33	.320274822	R-squared	=	0.0370
				Adj R-squared	=	0.0078
Total	10.9753916	34	.322805634	Root MSE	=	.56593

lnimp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
t	-.0106684	.0094717	-1.13	0.268	-.0299387	.0086018
_cons	18.7098	.1954934	95.71	0.000	18.31207	19.10754

(iv) Inflation (Percentage change in the GDP deflator over time)

```
. reg lndpib t
```

Source	SS	df	MS	Number of obs	=	35
				F(1, 33)	=	148.22
Model	30.0576789	1	30.0576789	Prob > F	=	0.0000
Residual	6.69198569	33	.202787445	R-squared	=	0.8179
				Adj R-squared	=	0.8124
Total	36.7496645	34	1.08087249	Root MSE	=	.45032

lndpib	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
t	.0917579	.0075368	12.17	0.000	.0764242	.1070916
_cons	2.047581	.1555576	13.16	0.000	1.731097	2.364065

(v) Fiscal Deficit (*DEF*)

```
. reg lndef t
```

Source	SS	df	MS	Number of obs	=	35
				F(1, 33)	=	5.10
Model	3.20836512	1	3.20836512	Prob > F	=	0.0307
Residual	20.7585785	33	.629047835	R-squared	=	0.1339
				Adj R-squared	=	0.1076
Total	23.9669437	34	.704910108	Root MSE	=	.79313

lndef	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
t	-.0299784	.0132742	-2.26	0.031	-.0569849	-.0029718
_cons	17.23382	.273976	62.90	0.000	16.67641	17.79123

(vi) Total Public Debt (*DPT*)

```
. reg lndtp t
```

Source	SS	df	MS	Number of obs	=	35
				F(1, 33)	=	1.21
Model	.000957196	1	.000957196	Prob > F	=	0.2801
Residual	.026191571	33	.000793684	R-squared	=	0.0353
				Adj R-squared	=	0.0060
Total	.027148767	34	.000798493	Root MSE	=	.02817

lndtp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
t	-.0005178	.0004715	-1.10	0.280	-.0014771	.0004415
_cons	18.66318	.0097318	1917.75	0.000	18.64338	18.68298

Appendix D: Results of the *DFA* Stationarity Test

(i) Gross Domestic Product (*GDP*)

```
. dfuller pib, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: pib                                   Number of obs  = 33
                                                Number of lags =  1

H0: Random walk without drift, d = 0

                                                Dickey–Fuller
                    Test      ———————— critical value ————————
                statistic           1%           5%          10%
———————————————————————————————————————————————————————————————
 Z(t)            -19.401       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000.
```

(ii) Imports of Goods and Services (*IMP*)

```
. dfuller imp, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: imp                                   Number of obs  = 33
                                                Number of lags =  1

H0: Random walk without drift, d = 0

                                                Dickey–Fuller
                    Test      ———————— critical value ————————
                statistic           1%           5%          10%
———————————————————————————————————————————————————————————————
 Z(t)             -4.434       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0003.
```

(iii) Deficit (*DEF*)

```
. dfuller def, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: def                                Number of obs  = 33
                                             Number of lags =  1

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                   Test      ———————— critical value ————————
                statistic           1%           5%          10%
———————————————————————————————————————————————————————————————
 Z(t)            -6.819       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000.
```

(iv) Total Public Debt (*TPD*)

```
. dfuller dpt, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: dpt                                Number of obs  = 33
                                             Number of lags =  1

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                   Test      ———————— critical value ————————
                statistic           1%           5%          10%
———————————————————————————————————————————————————————————————
 Z(t)            -4.021       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0013.
```

(v) Months of Import Coverage (*MCI*)

```
. dfuller mci, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: mci                                Number of obs  = 33
                                             Number of lags =  1

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                   Test      ———————— critical value ————————
                statistic           1%           5%          10%
———————————————————————————————————————————————————————————————
 Z(t)            -3.517       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0076.
```

(vi) Official Exchange Rate (*OER*)

```
. dfuller tco, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: tco                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -0.673       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.8535.
```

(vii) Capital (*CAP*)

```
. dfuller cap, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: cap                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -6.097       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000.
```

(viii) Labour (*TRB*)

```
. dfuller trb, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: trb                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)             1.190       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.9959.
```

(ix) Energy (*ENE*)

```
. dfuller ene, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: ene                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -2.132       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.2320.
```

(x) Natural Resources (*RCN*)

```
. dfuller rcn, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: rcn                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -1.989       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.2916.
```

(xi) Political Stability (*ETP*)

```
. dfuller etp, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: etp                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -0.658       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.8573.
```

(xii) Rule of Law (*RGL*)

```
. dfuller rgl, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: rgl                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -1.159       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.6912.
```

(xiii) Degree of Economic Openness (*GAE*)

```
. dfuller gae, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: gae                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -1.264       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.6455.
```

(xiv) Foreign Aid (*AJE*)

```
. dfuller aje, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: aje                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -7.016       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000.
```

(xv) Foreign Direct Investment (*FDI*)

```
. dfuller ide, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: ide                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -2.187       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.2109.
```

(xvi) Terms of Trade (*TOT*)

```
. dfuller tot, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: tot                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -3.442       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0096.
```

(xvii) Tariffs (*TAR*)

```
. dfuller tar, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: tar                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -1.909       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.3279.
```

(xviii) Population (*POP*)

```
. dfuller pop, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: pop                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)             1.639       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.9980.
```

(xix) Exports of Goods and Services (*EXP*)

```
. dfuller exp, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: exp                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -2.495       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.1166.
```

(xx) Public Expenditure (*DEP*)

```
. dfuller dep, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: dep                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -6.073       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000.
```

(xxi) Tax Revenue (*RCF*)

```
. dfuller rcf, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: rcf                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -3.157       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0226.
```

(xxii) Total Taxes (*IMT*)

```
. dfuller imt, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: imt                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -3.480       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0085.
```

(xxii) Money Supply (*OMF*)

```
. dfuller ofm, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: ofm                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)             0.600       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.9876.
```

(xxiv) External Borrowing and Capital Inflows (*EEIC*)

```
. dfuller eeic, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: eeic                              Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)             1.299       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.9966.
```

(xxv) Corruption (*COR*)

```
. dfuller cor, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: cor                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -1.273       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.6413.
```

(xxvi) Unemployment (*DES*)

```
. dfuller des, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: des                               Number of obs  = 33
                                            Number of lags =  1

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)             1.859       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.9985.
```

(xxvii) Total Debt Service (*TDS*)

```
. dfuller sdt, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: sdt                              Number of obs  = 33
                                           Number of lags =  1

H0: Random walk without drift, d = 0

                                       Dickey–Fuller
                   Test      ———————— critical value ————————
              statistic           1%           5%          10%
--------------------------------------------------------------
 Z(t)            -2.205       -3.696       -2.978       -2.620
--------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.2043.
```

(xxviii) GDP Deflator (*DPIB*)

```
. dfuller dpib, lags(1)

Augmented Dickey–Fuller test for unit root

Variable: dpib                             Number of obs  = 33
                                           Number of lags =  1

H0: Random walk without drift, d = 0

                                       Dickey–Fuller
                   Test      ———————— critical value ————————
              statistic           1%           5%          10%
--------------------------------------------------------------
 Z(t)             1.589       -3.696       -2.978       -2.620
--------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9978.
```

Appendix E: Results of the Economic Growth Model Estimation

```
. reg lnpib lnlagpib1 lnmci Dlntco Dlnmcitco lncap Dlntrb Dlnene Drcn lndep Dinf Detp Drgl Dlng
> ae lnaje Dlnide lntot doc
```

Source	SS	df	MS	Number of obs	=	34
				F(17, 16)	=	105.25
Model	5.91686028	17	.348050605	Prob > F	=	0.0000
Residual	.052908148	16	.003306759	R-squared	=	0.9911
				Adj R-squared	=	0.9817
Total	5.96976843	33	.180902074	Root MSE	=	.0575

lnpib	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
lnlagpib1	.5919508	.1577215	3.75	0.002	.2575962	.9263054
lnmci	-.0391955	.0841196	-0.47	0.648	-.2175211	.1391301
Dlntco	-.6504544	.1820719	-3.57	0.003	-1.03643	-.2644793
Dlnmcitco	.0445242	.0764211	0.58	0.568	-.1174813	.2065296
lncap	.1166045	.0494912	2.36	0.032	.0116878	.2215212
Dlntrb	-3.708775	1.520498	-2.44	0.027	-6.932087	-.4854642
Dlnene	.1140867	.2456143	0.46	0.649	-.4065924	.6347659
Drcn	-.003423	.0056196	-0.61	0.551	-.0153361	.00849
lndep	.1491351	.0774546	1.93	0.072	-.0150613	.3133314
Dinf	-.0007789	.0020343	-0.38	0.707	-.0050914	.0035336
Detp	.0008963	.0022651	0.40	0.698	-.0039056	.0056981
Drgl	.0016278	.0064536	0.25	0.804	-.0120533	.0153089
Dlngae	-.1725883	.1076535	-1.60	0.128	-.4008036	.055627
lnaje	.0388806	.059423	0.65	0.522	-.0870906	.1648518
Dlnide	.0202875	.0214402	0.95	0.358	-.0251637	.0657387
lntot	.3874535	.1457817	2.66	0.017	.07841	.6964969
doc	-.0503319	.0290269	-1.73	0.102	-.1118661	.0112023
_cons	.7872937	.958398	0.82	0.423	-1.244419	2.819007

Appendix F: Results of the Goods and Services Imports Model Estimation

```
. reg lnimp lnlagimp1 lnmci Dlntco Dlnmcitco t lnpib lnaje Dlntar Dlnpop cov
```

Source	SS	df	MS	Number of obs	=	34
				F(10, 23)	=	39.12
Model	7.41265699	10	.741265699	Prob > F	=	0.0000
Residual	.435862788	23	.018950556	R-squared	=	0.9445
				Adj R-squared	=	0.9203
Total	7.84851978	33	.237833933	Root MSE	=	.13766

lnimp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
lnlagimp1	.6673563	.1472517	4.53	0.000	.362743	.9719696
lnmci	.043371	.1975936	0.22	0.828	-.3653825	.4521244
Dlntco	-.3519455	.314897	-1.12	0.275	-1.00336	.2994687
Dlnmcitco	-.3302909	.1478099	-2.23	0.035	-.6360589	-.024523
t	.0205956	.0067453	3.05	0.006	.0066418	.0345494
lnpib	.1871099	.2313466	0.81	0.427	-.291467	.6656869
lnaje	.221736	.1186859	1.87	0.075	-.0237844	.4672565
Dlntar	-.3288109	.2756924	-1.19	0.245	-.8991241	.2415023
Dlnpop	1.20133	3.108722	0.39	0.703	-5.229551	7.632211
cov	-.232818	.0957666	-2.43	0.023	-.4309262	-.0347098
_cons	-1.692897	1.716602	-0.99	0.334	-5.24396	1.858165

Appendix G: Results of the Inflation Model Estimation

```
.  reg Dlndpib Dlnlagdpib1 lnmci Dlntco Dlnmcitco lnimt Dlnofm lndep
```

Source	SS	df	MS	Number of obs	=	33
				F(7, 25)	=	23.34
Model	.399537515	7	.057076788	Prob > F	=	0.0000
Residual	.061131879	25	.002445275	R-squared	=	0.8673
				Adj R-squared	=	0.8301
Total	.460669394	32	.014395919	Root MSE	=	.04945

Dlndpib	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
Dlnlagdpib1	.4854031	.1020029	4.76	0.000	.2753241	.695482
lnmci	-.0176653	.0622116	-0.28	0.779	-.1457924	.1104618
Dlntco	.3064244	.11194	2.74	0.011	.0758796	.5369691
Dlnmcitco	-.0444597	.0485717	-0.92	0.369	-.1444949	.0555755
lnimt	-.0388912	.024019	-1.62	0.118	-.0883592	.0105769
Dlnofm	.0414135	.123626	0.33	0.740	-.213199	.2960259
lndep	-.0102974	.0280159	-0.37	0.716	-.0679973	.0474024
_cons	.891046	.662001	1.35	0.190	-.4723706	2.254463

Appendix H: Results of the Fiscal Deficit Model Estimation

```
. reg lndef lnlagdef1 lnmci Dlntco Dlnmcitco t lnpib lndep lnrcf lnimt Ddes Dlnsdt doc cov
```

Source	SS	df	MS	Number of obs	=	34
				F(13, 20)	=	100.20
Model	19.1586572	13	1.47374286	Prob > F	=	0.0000
Residual	.294156943	20	.014707847	R-squared	=	0.9849
				Adj R-squared	=	0.9750
Total	19.4528142	33	.589479217	Root MSE	=	.12128

lndef	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
lnlagdef1	.088996	.0825642	1.08	0.294	-.08323	.2612219
lnmci	.10597	.2282643	0.46	0.647	-.3701809	.582121
Dlntco	-.22536	.4241067	-0.53	0.601	-1.110031	.6593111
Dlnmcitco	-.0854716	.1992862	-0.43	0.673	-.5011753	.3302322
t	.0042954	.0085055	0.51	0.619	-.0134468	.0220377
lnpib	-.4807684	.2312909	-2.08	0.051	-.9632329	.001696
lndep	1.93709	.1810314	10.70	0.000	1.559465	2.314715
lnrcf	-.8091439	.1942029	-4.17	0.000	-1.214244	-.4040437
lnimt	.0387546	.0717684	0.54	0.595	-.1109516	.1884608
Ddes	-.0749466	.1261635	-0.59	0.559	-.338119	.1882258
Dlnsdt	-.0008893	.0468354	-0.02	0.985	-.0985863	.0968077
doc	-.097102	.1174662	-0.83	0.418	-.3421321	.1479281
cov	-.1246589	.1296795	-0.96	0.348	-.3951655	.1458478
_cons	3.297677	3.885638	0.85	0.406	-4.807622	11.40298

Appendix I: Results of the Total Public Debt Model Estimation

```
. reg lndpt lnlagdpt1 lnmci Dlntco Dlnmcitco Dinf lnpib lndep lnimt lndef Dlneeic Dlncor doc co
> v
```

Source	SS	df	MS	Number of obs	=	34
				F(13, 20)	=	2.08
Model	.015563997	13	.001197231	Prob > F	=	0.0682
Residual	.011511601	20	.00057558	R-squared	=	0.5748
				Adj R-squared	=	0.2985
Total	.027075598	33	.000820473	Root MSE	=	.02399

lndpt	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
lnlagdpt1	-.5646377	.1814498	-3.11	0.005	-.9431354	-.1861399
lnmci	.0615448	.0425822	1.45	0.164	-.0272801	.1503698
Dlntco	.1296199	.0628766	2.06	0.052	-.0015384	.2607781
Dlnmcitco	-.0537816	.0296433	-1.81	0.085	-.1156165	.0080534
Dinf	-.0008178	.000705	-1.16	0.260	-.0022884	.0006528
lnpib	-.0342005	.0322445	-1.06	0.301	-.1014615	.0330604
lndep	-.0423243	.0608934	-0.70	0.495	-.1693457	.0846971
lnimt	.0110239	.0120432	0.92	0.371	-.0140978	.0361455
lndef	.0361001	.030217	1.19	0.246	-.0269313	.0991316
Dlneeic	.0159577	.0254892	0.63	0.538	-.0372118	.0691271
Dlncor	-.0608629	.0506124	-1.20	0.243	-.1664384	.0447127
doc	-.0355497	.0192917	-1.84	0.080	-.0757914	.004692
cov	.0562903	.0231829	2.43	0.025	.0079317	.1046488
_cons	29.68704	3.395705	8.74	0.000	22.60373	36.77036

J. Results of Regression Diagnostic Tests

A. Model I: Economic Growth Regression

(i) Results of the Multicollinearity Test

```
. estat vif
```

Variable	VIF	1/VIF
lnlagpib1	66.51	0.015035
lnaje	18.42	0.054291
lndep	12.34	0.081044
Dlntco	11.18	0.089440
lntot	7.92	0.126307
lncap	6.88	0.145426
Dlnmcitco	5.77	0.173448
Dlntrb	3.33	0.300113
Drgl	3.31	0.302214
lnmci	2.98	0.335054
Detp	2.51	0.397827
Dinf	2.41	0.415583
Dlngae	2.34	0.426850
Dlnene	2.03	0.493474
Drcn	1.74	0.574670
doc	1.69	0.593061
Dlnide	1.33	0.752299
Mean VIF	8.98	

(ii) Results of the White Heteroscedasticity Test

```
. estat imtest, white

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

   chi2(33) =  34.00
Prob > chi2 = 0.4192

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	34.00	33	0.4192
Skewness	24.73	17	0.1008
Kurtosis	2.26	1	0.1329
Total	60.99	51	0.1595

(iii) Results of the Shapiro-Wilk Numerical Test of Error Normality

```
. swilk r

                Shapiro-Wilk W test for normal data
```

Variable	Obs	W	V	z	Prob>z
r	34	0.95095	1.713	1.121	0.13109

(iv) Results of the Breusch-Godfrey Serial Correlation Test

```
. estat bgodfrey

Breusch–Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.346	1	0.5565

H0: no serial correlation

(v) Results of the Model Mis-Specification Test (RESET)

```
. estat ovtest

Ramsey RESET test for omitted variables
Omitted: Powers of fitted values of lnpib

H0: Model has no omitted variables

F(3, 13) =  39.17
Prob > F = 0.0000
```

B. Model II: Regression of Imports of Goods and Services

(i) Results of the Multicollinearity Test

```
. estat vif
```

Variable	VIF	1/VIF
lnpib	16.86	0.059311
lnaje	12.82	0.077993
lnlagimp1	12.52	0.079899
t	7.86	0.127272
Dlntco	5.84	0.171357
Dlnmcitco	3.76	0.265711
lnmci	2.87	0.348003
cov	2.39	0.418181
Dlnpop	1.56	0.639161
Dlntar	1.15	0.866866
Mean VIF	6.76	

(ii) Results of the White Heteroscedasticity Test

```
. estat imtest, white

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

   chi2(33) =  34.00
Prob > chi2 = 0.4192

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	34.00	33	0.4192
Skewness	17.87	10	0.0572
Kurtosis	0.01	1	0.9220
Total	51.88	44	0.1937

(iii) Results of the Numerical Test for Normality of Errors (RESET)

```
. swilk r

                  Shapiro-Wilk W test for normal data
```

Variable	Obs	W	V	z	Prob>z
r	34	0.96133	1.350	0.626	0.26577

(iv) Results of the Breusch-Godfrey Serial Correlation Test

```
. estat bgodfrey

Breusch–Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.965	1	0.3259

H0: no serial correlation

(v) Results of the Model Mis-Specification Test (RESET)

```
. estat ovtest

Ramsey RESET test for omitted variables
Omitted: Powers of fitted values of lnimp

H0: Model has no omitted variables

F(3, 20) =   1.06
Prob > F = 0.3897
```

C) Model III: Inflation Regression

(i) Results of the Multicollinearity Test

```
. estat vif
```

Variable	VIF	1/VIF
Dlntco	5.22	0.191523
Dlnofm	3.18	0.314310
Dlnmcitco	3.06	0.327272
Dlnlagdpib1	2.50	0.400490
lnimt	2.18	0.457829
lnmci	2.17	0.460109
lndep	1.54	0.651219
Mean VIF	2.84	

(ii) Results of the White Heteroscedasticity Test

```
. estat imtest, white

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

   chi2(32) =  33.00
Prob > chi2 = 0.4180

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	33.00	32	0.4180
Skewness	5.88	7	0.5542
Kurtosis	2.28	1	0.1308
Total	41.16	40	0.4196

(iii) Results of the Shapiro-Wilk Numerical Test of Error Normality

```
. swilk r
```

Shapiro–Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
r	33	0.95251	1.621	1.005	0.15744

(iv) Results of the Breusch–Godfrey serial correlation test

```
. estat bgodfrey

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.715	1	0.3978

H0: no serial correlation

(v) Results of the Model Mis-Specification Test (RESET)

```
. estat ovtest

Ramsey RESET test for omitted variables
Omitted: Powers of fitted values of Dlndpib

H0: Model has no omitted variables

F(3, 22) =  23.85
Prob > F = 0.0000
```

Model IV: Fiscal Deficit Regression

(i) Results of the Multicollinearity Test

```
. estat vif
```

Variable	VIF	1/VIF
lnpib	21.71	0.046055
t	16.10	0.062125
lndep	15.15	0.065986
Dlntco	13.64	0.073319
lnlagdef1	11.00	0.090918
Dlnmcitco	8.81	0.113446
doc	6.21	0.161072
cov	5.65	0.177001
lnmci	4.94	0.202386
lnrcf	4.10	0.243767
lnimt	3.28	0.304755
Ddes	2.57	0.388774
Dlnsdt	1.37	0.732182
Mean VIF	8.81	

(ii) Results of the White Heteroscedasticity Test

```
. estat imtest, white

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

   chi2(33) =  34.00
Prob > chi2 = 0.4192

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	34.00	33	0.4192
Skewness	6.92	13	0.9064
Kurtosis	0.72	1	0.3950
Total	41.64	47	0.6935

(iii) Results of the Shapiro-Wilk Numerical Test of Error Normality

```
. swilk r

                Shapiro–Wilk W test for normal data
```

Variable	Obs	W	V	z	Prob>z
r	34	0.95306	1.639	1.030	0.15160

(iv) Results of the Model Mis-Specification Test (RESET)

```
. estat ovtest

Ramsey RESET test for omitted variables
Omitted: Powers of fitted values of lndef

H0: Model has no omitted variables

F(3, 17) =  18.84
Prob > F = 0.0000
```

(v) Results of the Breusch-Godfrey Serial Correlation Test

```
. estat bgodfrey

Breusch–Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.235	1	0.6279

H0: no serial correlation

Model V: Public Debt Regression

(i) Results of the Multicollinearity Test

```
. estat vif
```

Variable	VIF	1/VIF
lndep	43.81	0.022823
lndef	30.86	0.032406
lnpib	10.78	0.092733
Dlntco	7.66	0.130540
Dlnmcitco	4.98	0.200653
cov	4.61	0.216741
lnmci	4.39	0.227591
doc	4.28	0.233702
Dlneeic	2.97	0.336780
lnimt	2.36	0.423535
Dlncor	1.90	0.525675
Dinf	1.66	0.602307
lnlagdpt1	1.53	0.652287
Mean VIF	9.37	

(ii) Results of the White Heteroscedasticity Test

```
. estat imtest, white

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

   chi2(33) =  34.00
Prob > chi2 = 0.4192

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	34.00	33	0.4192
Skewness	22.32	13	0.0506
Kurtosis	0.14	1	0.7035
Total	56.47	47	0.1622

(iii) Results of the Shapiro-Wilk Numerical Test of Error Normality

```
. swilk r

                Shapiro–Wilk W test for normal data
```

Variable	Obs	W	V	z	Prob>z
r	34	0.98978	0.357	-2.148	0.98412

(iv) Results of the Breusch-Godfrey Serial Correlation Test

```
. estat bgodfrey

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.076	1	0.7832

H0: no serial correlation

(v) Results of the Model Mis-Specification Test (RESET)

```
. estat ovtest

Ramsey RESET test for omitted variables
Omitted: Powers of fitted values of lndpt

H0: Model has no omitted variables

F(3, 18) =  26.79
Prob > F = 0.0000
```

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