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The Relationship Between Public Debt and Fiscal Sustainability: An Econometric Study for the Period (2004–2023)

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ABSTRACT: This study aims to analyze the relationship between public debt and fiscal sustainability in Iraq during the period (2004–2023), considering the economic and financial fluctuations experienced by the Iraqi economy as a rentier economy that relies heavily on oil revenues. The study adopts a quantitative approach using annual time-series data, alongside a descriptive-analytical approach to interpret financial and economic developments.

The Autoregressive Distributed Lag (ARDL) methodology was employed after verifying the properties of the time series using the Augmented Dickey–Fuller (ADF) test. The results of the bounds testing approach indicated the existence of a long-run equilibrium relationship between public debt and oil revenues, non-oil revenues, gross domestic product (GDP), and the general budget deficit. The results of the error correction model further showed that short-run disequilibria in public debt are rapidly adjusted toward the long-run equilibrium. The study concludes that the continued reliance on oil revenues and the high level of fiscal deficits constitute two main factors contributing to the exacerbation of public debt, thereby constraining the achievement of genuine fiscal sustainability. Accordingly, the study recommends diversifying revenue sources, strengthening fiscal discipline, and adopting an effective public debt management strategy that supports long-term financial stability.

KEYWORDS: Public Debt, Fiscal Sustainability, Oil Revenues, Economic Growth

1. INTRODUCTION

Public debt is considered one of the core topics in contemporary economic analysis, due to its direct role in determining the degree of fiscal stability and the state's ability to continue implementing its economic and developmental policies. Under various circumstances, governments resort to borrowing as a means of financing budget deficits, coping with economic disturbances, or supporting investment-oriented expenditure. However, excessive accumulation of debt may impose increasing pressures on fiscal sustainability and lead to what is known as the debt burden, which constrains the state's ability to meet its financial obligations in the medium and long terms (D'Erasmo et al., 2015, p. 7).

The issue of public debt sustainability is no longer confined solely to its fiscal dimension; rather, it has become a comprehensive economic and political concern, the effects of which are reflected in growth rates, levels of social stability, and investor confidence at both the domestic and international levels. As noted by (Neck,2008, p. 15), fiscal sustainability is achieved when the state is able to service its debt without resorting to coercive fiscal policies, such as excessive tax increases or sharp cuts in public expenditure—conditions that assume heightened importance in economies suffering from limited structural diversification.

Iraq represents a prominent case among economies facing intertwined challenges in the areas of public debt and fiscal sustainability, due to its heavy reliance on oil revenues, which account for more than 90% of total government revenues. This dependence renders its fiscal position highly vulnerable to fluctuations in global oil prices. Over the period from 2000 to 2024, the Iraqi economy was exposed to a series of economic and political shocks that left clear impacts on the trajectory of public debt, beginning with the political changes following 2003, through security challenges, the decline in oil prices in 2014 and 2020, and culminating in the repercussions of the COVID-19 pandemic, which contributed to a sharp contraction in economic activity. Economic studies highlight that these disturbances exerted significant pressure on the public budget, compelling the government to expand both domestic and external borrowing to address recurrent deficits (Hamzah & Awad, 2023, p. 12).

Recent international literature indicates that achieving fiscal sustainability is based on a set of interrelated determinants, foremost among them the effectiveness of public expenditure management, the diversification of revenue sources, the level of economic growth, as well as institutional efficiency in adopting flexible and proactive fiscal policies (Blanchard & Das, 2017, p. 4). In the Iraqi context, however, these challenges are further exacerbated by the dominance of current expenditure at the expense of

investment spending, weaknesses in the public financial management system, and the absence of long-term strategies for public debt management, which has rendered deficit financing a near-continuous approach to meeting government obligations.

Accordingly, this study derives its significance from its attempt to analyze the relationship between public debt and fiscal sustainability in the Iraqi economy during the period (2004–2023), relying on an econometric framework based on time-series analysis and tests of relationships in both the short and long run. The study aims to address fundamental questions regarding the degree of public debt sustainability in Iraq, whether its trends over previous years pose a threat to financial stability, and to identify the economic variables with the greatest influence on this relationship—particularly oil revenues, fiscal deficits, and economic growth rates.

Accordingly, this study seeks to address a significant knowledge gap in the economic literature, given the limited number of empirical studies that have examined the relationship between public debt and fiscal sustainability in Iraq over the period (2004–2023). Moreover, its findings provide a scientific indicator upon which policymakers can rely to develop public debt management mechanisms and restructure public finances in a manner that supports the achievement of long-term economic sustainability.

2. LITERATURE REVIEW

The relationship between public debt and fiscal sustainability is regarded as one of the fundamental topics that have attracted considerable attention in the international economic literature over recent decades, particularly in the aftermath of recurrent financial crises since the mid-1990s. These studies have evolved from simple analyses linking debt to gross domestic product to advanced dynamic models that take into account a range of factors, most notably economic growth rates, interest rates, the size of the primary deficit, and the efficiency of financial institutions.

The study by (Reinhart and Rogoff,2010, p. 576) is among the prominent contributions in this field, as it concluded that an increase in public debt beyond 90% of gross domestic product is often associated with a slowdown in economic growth. It also demonstrated that high levels of debt entail serious fiscal risks, which may, in some cases, lead to sovereign debt crises. The study relied on an extensive historical database spanning more than two centuries and covering a large number of countries, thereby reinforcing its conclusion that the accumulation of debt at high levels has historically tended to be unsustainable in the long run.

In another study, (Abbas and Christensen, 2010, p.269) provided a comprehensive analysis of public debt conditions in more than one hundred developing countries. They concluded that debt sustainability is not determined solely by its aggregate size but is also influenced by other factors such as the achievement of a primary surplus, political stability, and the efficiency of the tax system in revenue collection. The authors further emphasized that countries suffering from weak institutions are more prone to entering unsustainable debt trajectories, even when their debt levels are below the global average.

The study by (Escolan,2010, p. 12), issued as part of the International Monetary Fund's work, is considered one of the most prominent recent theoretical contributions to the assessment of public debt sustainability. The author introduced what is known as the Debt Sustainability Analysis (DSA) Framework, which is based on analyzing the dynamics of economic growth, interest rates, and deficit levels, with a particular emphasis on future debt trajectories rather than relying solely on current indicators. This framework has proven effective in estimating the long-term capacity to meet debt obligations, especially in countries characterized by fragile financial structures.

In this context, the study by (Aizenman and Jinjarak ,2012, p. 145) examined the relationship between the size of public debt and the weakness of the tax base. It concluded that countries relying on limited or highly volatile revenue sources tend to expand borrowing during periods of economic expansion, but face significant difficulties in reducing debt when the economy enters phases of contraction. Such behavior leads to a gradual deterioration in fiscal sustainability indicators. This study is of particular importance in explaining debt patterns in economies dependent on primary resources or unstable revenues.

Recent literature has also turned toward examining the link between the quality of fiscal institutions and public debt sustainability. In a study by (Checherita and Rother,2012, p. 340), the authors found that high levels of public debt exert negative effects on long-term economic growth, particularly in countries characterized by weak governance, low efficiency of public expenditure, or limited effectiveness of fiscal policies. They further explained that the adverse effects of debt may emerge at ratios well below the 90% threshold in countries with fragile institutional frameworks.

Within the same framework, the study by (Eichengreen, El-Ganainy, and Esteves ,2011, p. 20) indicated that the ability to control public debt is closely linked to macroeconomic characteristics, including labor market flexibility, the degree of diversification of the productive base, and the stability of the financial system. The authors demonstrated that economies that rely excessively on a single source of revenue often encounter significant difficulties in returning to a path of fiscal sustainability after experiencing economic shocks.

Reports by the International Monetary Fund (IMF, 2022, p. 33), along with studies issued by the World Bank, indicate that countries whose economic structures are predominantly rentier in nature face greater challenges in achieving fiscal sustainability. This body of literature has shown that revenue volatility, the continued expansion of current expenditure, and the weakness of the tax base are among the most prominent factors that drive economies toward unsustainable debt trajectories.

Recent literature confirms that the reciprocal relationship between fiscal deficits and public debt constitutes a fundamental element in explaining fiscal sustainability problems. In a study by (Mauro and Zilinsky,2016, p. 5), it was shown that countries that do not adopt countercyclical fiscal policies are more vulnerable to the widening of deficits during periods of economic downturn, which in turn leads to an accelerated growth of public debt in a manner that threatens its sustainability.

A review of the economic literature on the relationship between public debt and fiscal sustainability reveals that most studies have relied on general analytical frameworks or focused on applications in advanced economies or international samples, with an almost complete assumption of stability in public revenue structures. This limits the applicability of their findings to rentier economies. Moreover, a large portion of these studies has concentrated on the level of public debt as the primary determinant of fiscal sustainability, with relatively limited attention given to the role of fiscal deficits and the revenue structure as key channels through which debt exerts its effects. In addition, many studies have employed relatively short time horizons, which has constrained their ability to capture structural transformations and major economic shocks. In this context, the present study stands out for its importance in analyzing the relationship between public debt and fiscal sustainability in the Iraqi economy, which is characterized as a rentier economy marked by sharp revenue volatility. By adopting an extended time horizon that allows for a deeper dynamic analysis, and by integrating a set of supporting fiscal and economic variables within an econometric model that takes into account the structural specificities of the economy, the study contributes to addressing a clear knowledge gap in economic literature.

3- RESEARCH METHODOLOGY

This study is based on a main hypothesis that public debt exerts both direct and indirect effects on the level of fiscal sustainability in Iraq during the period (2004–2023). To test this hypothesis, the study adopts a quantitative (econometric) approach through the analysis of annual time-series data, aiming to estimate the nature and direction of the relationship between public debt and fiscal sustainability indicators. The econometric model incorporates a set of supporting economic variables, including the fiscal deficit, oil revenues, and the economic growth rate.

In addition, the study employs the descriptive–analytical approach to present the theoretical framework related to the concepts of public debt and fiscal sustainability, as well as to analyze the evolution of fiscal policy and the general trends of public finance indicators in Iraq over the study period. This methodological integration seeks to provide a comprehensive analytical perspective that links econometric results with economic reality, thereby enhancing the robustness of the conclusions and supporting the formulation of practical policy recommendations that contribute to achieving long-term fiscal sustainability.

4- RESEARCH RESULTS

4-1 The Theoretical Framework of the Relationship between Public Debt and Fiscal Sustainability

1. The Conceptual Foundation of Public Debt and Its Role in the Economy

Public debt refers to the total financial obligations incurred by the government as a result of resorting to borrowing from domestic and external sources for the purpose of financing the budget deficit or covering public expenditures. It is considered one of the main instruments of fiscal policy, as it can play a positive role in stimulating economic activity when directed toward financing productive investments. Conversely, public debt may turn into an economic burden if its accumulation persists in the presence of weak debt-servicing capacity or the absence of effective debt management (IMF, 2013, p. 5).

Economic studies further indicate that public debt does not, in itself, constitute an inherent problem; rather, its risk is determined by the pace of its growth relative to the economy's capacity to generate revenues. When the growth rate of public debt exceeds the growth rate of gross domestic product, this negatively affects fiscal balance and increases the likelihood of public finances being exposed to risks of unsustainability (Escolano, 2010, p. 12).

2. The Theoretical Relationship between Public Debt and Fiscal Sustainability

Fiscal sustainability refers to the government's ability to continue meeting its current and future financial obligations without resorting to extraordinary increases in the tax burden or undertaking substantial reductions in public expenditure levels. According to the dynamic debt sustainability approach, the evolution of the public debt trajectory is determined by three main factors: the rate of economic growth, the real interest rate, and the size of the primary surplus or deficit in the general budget (Blanchard, 1990, p. 12).

Within this theoretical framework, economic schools of thought differ in their interpretation of the role of public debt and its implications for fiscal sustainability. The Keynesian school views government borrowing as a justified measure during periods of economic recession, aimed at stimulating aggregate demand and supporting economic activity. However, continued reliance on borrowing during phases of economic recovery and expansion may lead to an expansion of public debt, which in turn negatively affects fiscal sustainability (Alesina & Perotti, 1995, p. 231). In contrast, the neoclassical school emphasizes that rising levels of public debt result in the crowding-out of the private sector from financial resources and an increase in borrowing costs, thereby weakening economic growth rates and increasing the financial burdens borne by the state.

3. The Fiscal Deficit Channel as an Intermediary between Public Debt and Fiscal Sustainability

The fiscal deficit represents the primary channel through which the effects of public debt are transmitted to the level of fiscal sustainability. The persistence of deficits in the general budget contributes to the accumulation of public debt over time. Conversely, rising debt service burdens lead to a contraction of the fiscal space available to the government, thereby limiting its ability to allocate resources toward investment expenditure, which negatively affects the development of the economy's productive base (Ghosh et al., 2013, p. 12).

Recent economic models demonstrate that the relationship between public debt and fiscal sustainability is not linear in nature. Public debt may remain sustainable within certain limits and thresholds; however, it turns into a source of fiscal pressure once it exceeds the state's capacity to manage deficits and control public spending levels, particularly in economies characterized by highly volatile revenues.

4.1 The Integrative Relationship between Public Debt and Fiscal Sustainability

Recent economic literature emphasizes the need to address the relationship between public debt and fiscal sustainability within a comprehensive dynamic framework, in which public debt is viewed as one of the main financing instruments of fiscal policy. In this context, both the fiscal deficit and debt service burdens constitute the primary channels through which the effects of public debt are transmitted to public finances. Accordingly, public debt does not, in itself, represent an economic burden as long as it is managed within sound fiscal frameworks. When public debt is invested in productive activities capable of generating future returns, it contributes to enhancing the economy's productive capacity and increases the state's ability to meet its financial obligations without escalating pressures, thereby supporting fiscal sustainability (Blanchard, 2019, p. 1201).

Fiscal sustainability represents the ultimate outcome of the state's ability to manage these interactions efficiently, ensuring the continued fulfillment of financial obligations without falling into financial crises (Ghosh et al., 2013, p. 18).

In the case of Iraq, the relationship between public debt and fiscal sustainability is of particular importance due to the heavy reliance on oil revenues and the resulting volatility in government resources. Weak economic diversification and limited fiscal discipline render public debt more vulnerable to pressures. Therefore, improving fiscal sustainability through better revenue management and expenditure rationalization is essential to maintaining public debt at sustainable levels over the medium and long term.

4.2 Phased Analysis of the Evolution of Public Debt and Fiscal Sustainability Indicators in Iraq (2004–2023)

Table (1) illustrates the relationship between public debt levels and fiscal sustainability indicators in Iraq during the period (2004–2023), thereby facilitating the tracking of the main transformations experienced by public finances.

Table 1: The Relationship between Public Debt and Fiscal Sustainability in Iraq during the Period (2004–2023)

Budget Deficit	Gross Domestic Product	Non-Oil Revenues	Oil Revenues	Public Debt	Year
871850	101845262	355536	32625108	135422168	2004
14060740	103551403	1022821	39453950	111660680	2005
10248544	109389941	2147502	46908043	87063402	2006
15933849	111455813	1436859	53163644	77303389	2007
21238040	120626517	1120430	77589442	59114133	2008
2676526	124702847	3490094	51752349	61101599	2009
5826233	132687028	2701447	66923337	64778036	2010
34349088	142700217	1908562	102452810	60282889	2011
29442000	162587533	2869327	117187000	58083553	2012
6967000	174990175	3089853	111107939	54163847	2013
18831000	178951406	8314213	97072000	59895883	2014
- 3928000	183616252	15157631	57645000	84780811	2015
- 12657730	208932109	10142207	44806000	99597195	2016
1932000	205130066	12264026	65266000	120832236	2017
25697000	202776268	10950014	96063000	90448698	2018
- 4156528	211789774	8350677	99216300	96220028	2019
- 12882754	188112265	8751175	37706575	99069559	2020
6232100	202523457	13811166	95270300	101460700	2021
44737800	212408657	8047100	153623300	96379000	2022
- 6754500	221312425	11058000	124428700	110354000	2023

References:

- Central Bank of Iraq. Statistics and Reports, Annual Bulletins (2004–2023).
- Central Statistical Organization Annual Report (2004-2023).
- Official financial data published by the Iraqi Ministry of Finance.

Public finances in Iraq experienced divergent transformations in the trajectory of public debt and the level of fiscal sustainability during the period 2004–2023, as a result of fluctuations in economic and financial conditions. Accordingly, this period can be divided into successive time phases that reflect the nature of the changes that occurred in public finance indicators.

First Phase: Post-Transition and Fiscal Framework-Building Phase (2004–2008)

This phase represents the initial stages of restructuring the fiscal and economic frameworks in Iraq following 2003. Available data indicate that gross domestic product followed an upward trend, increasing from approximately (101,845,262) million dinars in 2004 to about (120,626,517) million dinars in 2008, reflecting a relative improvement in the level of economic activity during this period. Concurrently, public debt exhibited a clear downward trajectory, declining from (135,422,168) million dinars in 2004 to around (59,114,133) million dinars in 2008, indicating a relative improvement in public debt management.

During the same period, oil revenues recorded a significant increase, rising from (32,625,108) million dinars in 2004 to (77,589,442) million dinars in 2008. This improvement contributed to reducing reliance on borrowing to finance public expenditure. In contrast, non-oil revenues remained relatively limited, not exceeding (2,147,502) million dinars at their highest level, reflecting the continued heavy dependence on oil as the primary source of public revenues.

Second Phase: Fiscal Expansion and Rising Oil Revenues Phase (2009–2013)

This phase witnessed a significant increase in oil revenues as a result of improvements in global oil prices, with oil revenues reaching their highest level at approximately (117,187,000) million dinars in 2012. In parallel, gross domestic product experienced a marked expansion, reaching (174,990,175) million dinars in 2013, reflecting an overall improvement in economic performance. This increase in financial resources contributed to a reduction in public debt, which declined to (54,163,847) million dinars by the end of the period.

However, this improvement did not lead to the complete elimination of the fiscal deficit, as deficit levels continued to fluctuate, reflecting limited efficiency in fiscal planning and instability in fiscal policy orientation. Moreover, non-oil revenues remained relatively low compared to the scale of economic activity, indicating that the improvement observed in fiscal sustainability during this phase was temporary in nature and largely driven by oil market conditions rather than by permanent structural reforms.

Third Phase: Oil Shock and Deterioration of Fiscal Sustainability Phase (2014–2017)

This phase represented a clear setback in the trajectory of fiscal sustainability in Iraq, resulting from the coincidence of the oil shock with a deterioration in security conditions. Oil revenues experienced a sharp decline, falling from (97,072,000) million dinars in 2014 to approximately (44,806,000) million dinars in 2016, while gross domestic product was characterized by instability and continued volatility during this period. This contraction in financial resources was reflected in the trajectory of public debt, which recorded a significant expansion, increasing from (59,895,883) million dinars in 2014 to around (120,832,236) million dinars in 2017.

This development indicates a shift in Iraqi fiscal policy toward increased reliance on borrowing to finance the fiscal deficit, in light of the limited contribution of non-oil revenues and their inability to compensate for the sharp decline in oil revenues. This phase is considered one of the most stressful periods for fiscal sustainability, as rising debt service burdens coincided with a weakening of the state's financing capacity, thereby increasing the fragility of the overall fiscal position.

Fourth Phase: Relative Recovery and Financial Instability Phase (2018–2019)

This phase was characterized by a relative improvement in oil revenue performance, with oil revenues rising to (99,216,300) million dinars in 2019, alongside the stabilization of gross domestic product at relatively high levels. Nevertheless, public debt remained at elevated levels, reaching (96,220,028) million dinars in the same year, reflecting the limited capacity to rapidly return to a sustainable fiscal trajectory.

At the same time, non-oil revenues remained relatively low, indicating that the fiscal improvement achieved during this phase was fragile in nature and highly susceptible to potential external shocks.

Fifth Phase: COVID-19 Pandemic and Heightened Financial Volatility Phase (2020–2021)

This phase was characterized by a high degree of financial instability amid the repercussions of the COVID-19 pandemic. Oil revenues experienced a sharp decline, falling to (37,706,575) million dinars in 2020, before rebounding significantly to reach (95,270,300) million dinars in 2021. These fluctuations were directly reflected in the trajectory of public debt, which recorded an increase, reaching (101,460,700) million dinars in 2021.

These developments clearly reveal the fragility of fiscal sustainability, as the data indicate that exposure to external shocks rapidly leads to fiscal imbalances and rising levels of public debt, as a result of the heavy reliance on oil revenues as a near-exclusive source of public finance.

Sixth Phase: Improvement in Oil Revenues and Persistence of Fiscal Sustainability Challenges (2022–2023)

This phase was characterized by a noticeable increase in oil revenues, reaching (124,428,700) million dinars in 2023, alongside an expansion in gross domestic product to (221,312,425) million dinars. Despite this improvement in macroeconomic indicators, public debt remained at relatively high levels, recording approximately (110,354,000) million dinars in the same year. This indicates that the increase in revenues was not fully translated into a substantial reduction in debt levels.

This situation reflects the persistence of structural imbalances in public finances, particularly the limited diversification of revenue sources and the high level of current expenditures, which constrains the prospects for achieving genuine fiscal sustainability in the long term.

4-3 Measuring the Impact of Fiscal Sustainability Indicators on Public Debt in Iraq during the Period 2004–2023

Public debt is considered one of the most important outcomes of fiscal policy, as it reflects the cumulative effects of government decisions related to revenue mobilization, expenditure management, and the achievement of macroeconomic stability. In the Iraqi context, public debt has been significantly influenced by the structure of public revenues, particularly oil revenues, in addition to the persistence of fiscal deficits and fluctuations in economic activity. The expansion of public borrowing often reflects a fiscal response to revenue volatility and economic shocks rather than the result of a long-term debt management strategy.

The relationship between public debt and fiscal sustainability indicators is neither simple nor linear; rather, it is affected by structural changes in the economy, external shocks, and institutional constraints. In particular, volatility in oil revenues and changes in economic growth rates alter both the strength and direction of the relationship between debt accumulation and fiscal performance. Accordingly, analyzing public debt dynamics requires an analytical framework that simultaneously accounts for short-term adjustments and long-term equilibrium relationships.

Based on the available official data from the Iraqi Ministry of Finance, the Central Bank of Iraq, and the Central Statistical Organization, four main explanatory variables were identified: oil revenues, non-oil revenues, gross domestic product, and the general budget deficit, while public debt was adopted as the dependent variable in the econometric model. Despite the existence of some data gaps due to limitations in publication or updating, the data are subject to periodic revisions and exhibit an acceptable degree of consistency, allowing for the identification of general trends in Iraq's financial and economic conditions over the study period. Accordingly, these variables are considered appropriate and suitable for analyzing the determinants of public debt in the Iraqi economy.

This framework constitutes the foundation upon which the subsequent econometric tests are built, with the aim of examining the properties of the time series and measuring the nature of the relationship between the study variables in both the short and long run. Based on the theoretical foundations of macroeconomics and public finance, the evolution of public debt in Iraq does not occur in isolation from the economic and financial environment in which the state operates; rather, it is directly linked to the sources of government revenues, the level of economic activity, and the degree of imbalance in the general budget. Accordingly, the relationship between public debt and these factors can be represented through an economic function that reflects the nature of this interrelationship as follows:

$Y_t = f(X1_t, X2_t, X3_t, X4_t)$

Where Y_t represents the level of public debt, while the variables X_{1t}, X_{2t}, X_{3t}, and X_{4t} denote oil revenues, non-oil revenues, gross domestic product, and the budget deficit, respectively.

This relationship indicates that the level of public debt is determined by the state's ability to generate financial resources on the one hand, and the level of economic activity on the other, in addition to the size of the gap between public revenues and expenditures.

For the purpose of quantitatively estimating this relationship, it is formulated in the form of a linear econometric model that can be statistically estimated as follows:

$Y_t = \beta 0 + X1\beta_{1t,} + X2\beta_{2t,} + X3\beta_{3t,} + X4\beta_{4t} + \mu$

Where β_0 represents the level of public debt when all other factors are held constant, while the coefficients β_1 to β_4 measure the responsiveness of public debt to changes in each of the independent variables. The term μ represents other factors affecting public debt that are not included in the model.

From an economic perspective, increases in oil revenues, non-oil revenues, and gross domestic product are expected to reduce the need for borrowing and, consequently, alleviate pressures on public debt. In contrast, an expansion of the budget deficit leads to greater reliance on debt financing by the government, thereby increasing the level of public debt.

Accordingly, this study relies on a set of economic variables and indicators to analyze the impact of fiscal sustainability indicators on public debt in Iraq during the period 2004–2023, with the aim of identifying the nature of the relationship between the study variables and measuring its direction and strength in explaining the developments in public debt.

4-3-1 Results of the Stationarity Test

The stationarity of the study variables was tested using EViews 13 by applying the Augmented Dickey–Fuller (ADF) test, in order to verify whether the time series are stationary or non-stationary, that is, whether they contain a unit root, as well as to determine the order of integration of each variable. After conducting the test on the study variables, the results shown below were obtained:

Table 2: Stationarity Test Results

UNIT ROOT TEST RESULTS TABLE (ADF)						
Null Hypothesis: the variable has a unit root						
	At Level					
		YI	X1	X2	X3	X4
With Constant	t-Statistic	-2.1842	-2.7706	-1.5851	-0.7526	-4.1460
	Prob.	***0.2176***	***0.0822***	***0.4704***	***0.8096***	***0.0056***
		n0	*	n0	n0	***
With Constant & Trend	t-Statistic	-3.0652	-3.3707	-2.7439	-1.7224	-4.5973
	Prob.	***0.1419***	***0.0870***	***0.2320***	***0.7010***	***0.0095***
		n0	*	n0	n0	***
Without Constant & Trend	t-Statistic	-0.9024	0.5161	-0.3141	2.3676	-3.0221
	Prob.	***0.3124***	***0.8167***	***0.5588***	***0.9932***	***0.0046***
		n0	n0	n0	n0	***
	At First Difference					
		d(YI)	d(X1)	d(X2)	d(X3)	d(X4)
With Constant	t-Statistic	-3.2937	-5.0760	-5.5560	-4.8346	-4.4792
	Prob.	***0.0308***	***0.0010***	***0.0003***	***0.0014***	***0.0034***
		**	***	***	***	***
With Constant & Trend	t-Statistic	-3.6304	-4.8859	-5.3993	-4.7599	-4.2939
	Prob.	***0.0556***	***0.0062***	***0.0022***	***0.0071***	***0.0191***
		*	***	***	***	**
Without Constant & Trend	t-Statistic	-3.4489	-4.9940	-5.5076	-3.4699	-6.3246
	Prob.	***0.0017***	***0.0001***	***0.0000***	***0.0016***	***0.0000***
		***	***	***	***	***
Notes:						
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant						
b: Lag Length based on SIC						
c: Probability based on MacKinnon (1996) one-sided p-values.						
This Result is The Out-Put of Program Has Developed By:						
Dr. Imadeddin AlMosabbeh						
College of Business and Economics						
Qassim University-KSA						

Source: Prepared by the researcher, based on EViews 13.

The results of the Augmented Dickey–Fuller (ADF) test, as presented in the table above, indicate that the time series of the general budget deficit variable (X4) is stationary at level. In contrast, the variables of public debt (Y), oil revenues (X1), non-oil revenues (X2), and gross domestic product (X3) do not exhibit stationarity at level, indicating the presence of a unit root. However, these variables become stationary after taking their first differences, which indicates that they are integrated of order one.

Based on the variation in the order of integration of the study variables between level and first difference, the Autoregressive Distributed Lag (ARDL) methodology was adopted, as it is suitable for analyzing economic relationships under this type of data structure and allows for the estimation of the relationship between public debt and the explanatory variables in both the short and long run.

1. Estimation of the Study Model Using the Autoregressive Distributed Lag (ARDL) Approach

After completing the stationarity tests of the study variables and determining their orders of integration, the analysis proceeded to the estimation of the Autoregressive Distributed Lag (ARDL) model as the next step in the econometric analysis. Following the estimation of the model, the results presented in the table below were obtained:

Table 3: ARDL Estimation Results of the Study Model for the Period (2004–2023)

Dependent Variable: DYI			
Method: ARDL			
Date: 01/05/26 Time: 00:24			
Sample (adjusted): 2007 2023			

Included observations: 17 after adjustments				
Maximum dependent lags: 1 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (2 lags, automatic): DX1 DX2 DX3 X4				
Fixed regressors: C				
Number of models evalulated: 81				
Selected Model: ARDL(1, 0, 2, 2, 0)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
DYI(-1)	0.170724	0.151430	1.127414	0.2967
DX1	-0.002718	0.107783	-0.025213	0.9806
DX2	2.784658	0.649754	4.285709	0.0036
DX2(-1)	0.739585	0.762218	0.970307	0.3642
DX2(-2)	1.916852	0.942177	2.034494	0.0814
DX3	0.225131	0.234847	0.958627	0.3697
DX3(-1)	0.180833	0.260666	0.693733	0.5102
DX3(-2)	-0.590282	0.230619	-2.559551	0.0376
X4	-0.369868	0.198401	-1.864242	0.1046
C	2883662.	2747589.	1.049525	0.3288
R-squared	0.900358	Mean dependent var		1370035.
Adjusted R-squared	0.772248	S.D. dependent var		13615407
S.E. of regression	6497732.	Akaike info criterion		34.50097
Sum squared resid	2.96E+14	Schwarz criterion		34.99110
Log likelihood	-283.2583	Hannan-Quinn criter.		34.54969
F-statistic	7.027982	Durbin-Watson stat		1.683521
Prob(F-statistic)	0.008786			
*Note: p-values and any subsequent tests do not account for model selection.				

Source: Prepared by the researcher, based on EViews 13.

- The results of estimating the ARDL model show that the explanatory power of the model is relatively high, with the adjusted coefficient of determination reaching approximately (Adjusted R-squared = 0.77). This indicates that the independent variables included in the model explain about 77% of the variations in public debt in Iraq, while the remaining proportion of approximately 23% of the variations is attributable to random factors (U_i).
- It is also evident that the model exhibits overall statistical significance according to the F-test, with the calculated F-value reaching approximately (7.027), which is statistically significant at the 1% significance level, with a probability value of (Prob F-statistic = 0.008786). Accordingly, the null hypothesis ($H_0: \beta = 0$) is rejected, and the alternative hypothesis ($H_1: \beta \neq 0$) is accepted.
- With regard to the issue of autocorrelation, the value of the Durbin–Watson statistic reached approximately (1.68), which is close to 2. This indicates that the model does not suffer from autocorrelation among the residuals. Accordingly, the null hypothesis, which states that there is no autocorrelation problem, is accepted, and the alternative hypothesis is rejected.
- Based on the information presented in Table (3), and according to the Akaike Information Criterion (AIC) for lag selection, the lag structure of the model was determined as follows: **ARDL (1,0,2,2,0)**.

2. Bounds Test

The next step involves examining the existence of a cointegration relationship among the study variables, that is, testing for the presence of a long-run equilibrium relationship, by applying the Bounds Test, as presented in the table below.

Table 4: Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	11.28605	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	17		Finite Sample: n=35	
		10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532
			Finite Sample: n=30	
		10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

Source: Prepared by the researcher, based on EViews 13.

The results of the Bounds Test presented in the table above indicate that the calculated F-statistic value reached (11.28605), which exceeds both the lower critical bound value of (2.2) and the upper critical bound value of (3.09) at the 10% significance level. Accordingly, the results indicate the existence of a long-run equilibrium relationship among the study variables.

Therefore, the null hypothesis, which states that there is no long-run equilibrium relationship among the variables, is rejected, and the alternative hypothesis, which confirms the existence of a long-run equilibrium relationship among the study variables, is accepted.

3. Conducting Diagnostic Tests

After estimating the model parameters in both the long and short run, and in order to assess the quality of the model used in the study, a set of diagnostic tests was applied to evaluate the model econometrically, as follows:

a. Heteroskedasticity Test

Table 5: Breusch–Pagan–Godfrey Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
Null hypothesis: Homoskedasticity			
F-statistic	0.269105	Prob. F(9,7)	0.9643
Obs*R-squared	4.369915	Prob. Chi-Square(9)	0.8854
Scaled explained SS	1.139521	Prob. Chi-Square(9)	0.9990

Source: Prepared by the researcher, based on EViews 13.

The results of the test presented in Table (5) indicate that the model does not suffer from a heteroskedasticity problem, as the statistical indicators are not significant, implying that the error variance is homoscedastic. Specifically, the probability value of the F-statistic (Prob. F = 0.9643) exceeds the adopted significance level of 0.05. Accordingly, the null hypothesis, which states that there is no heteroskedasticity problem, is accepted.

b. Test for Serial Autocorrelation of Residuals

Table 5: LM Test

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.248532	Prob. F(2,5)	0.7890
Obs*R-squared	1.537198	Prob. Chi-Square(2)	0.4637

Source: Prepared by the researcher, based on EViews 13.

The results of the test presented in Table (6) indicate that the model does not suffer from the problem of serial autocorrelation among the residuals, as the statistical indicators are not significant. Specifically, the probability value of the F-statistic (Prob. F = 0.7890) exceeds the significance level of 0.05, which implies acceptance of the null hypothesis stating that there is no serial autocorrelation among the model residuals.

c. Normality Test

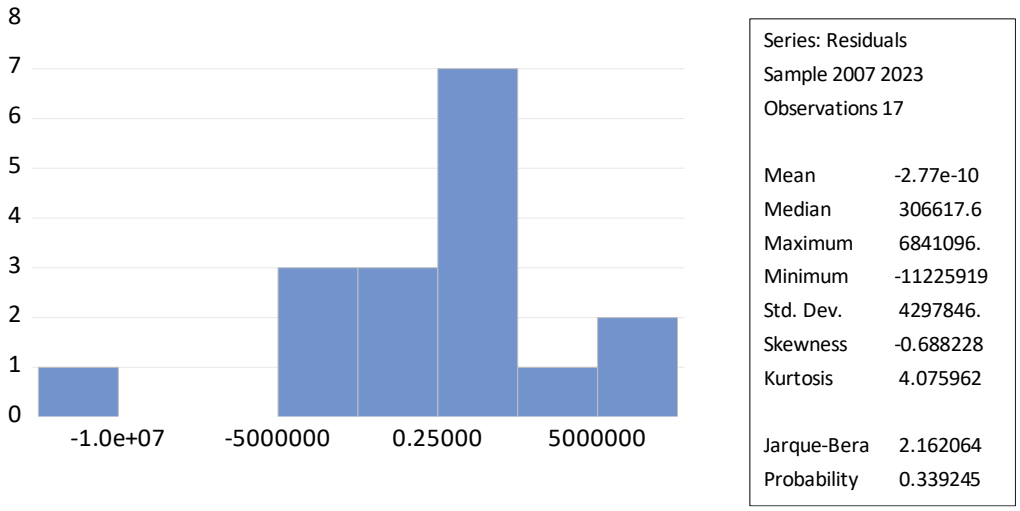

Figure 1: Normality Test

Source: Prepared by the researcher, based on EViews 13.

Based on the results of the Jarque–Bera test, the probability value reached (0.339245), which is greater than the 5% significance level. Accordingly, the test statistic value (JB = 2.16) is less than the critical chi-square value (χ^2 = 7.815), indicating that the test is not statistically significant. Consequently, the histogram exhibits a bell-shaped form, and the null hypothesis stating that the residuals of the regression equation are normally distributed is accepted.

4. Structural Stability Test of the Model Parameters

To ensure the stability of the estimated model parameters over time, the CUSUM and CUSUM of Squares tests were employed, as they are among the standard econometric tools used to examine the structural stability of the model. The results are illustrated in the following figure.

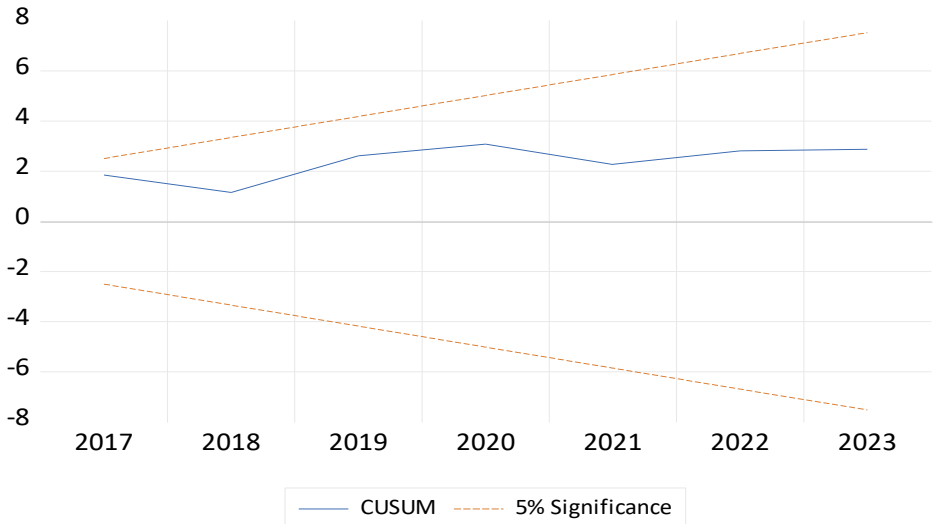

Figure 2: Structural Stability Test of the Estimated Model Parameters Using the CUSUM Tes

Source: Prepared by the researcher, based on EViews 13.

The results of the CUSUM test show that the cumulative sum of the residuals remains within the critical bounds at the 5% significance level, indicating the stability of the estimated model parameters and the absence of structural changes that could affect the stability of the estimated relationships over the study period.

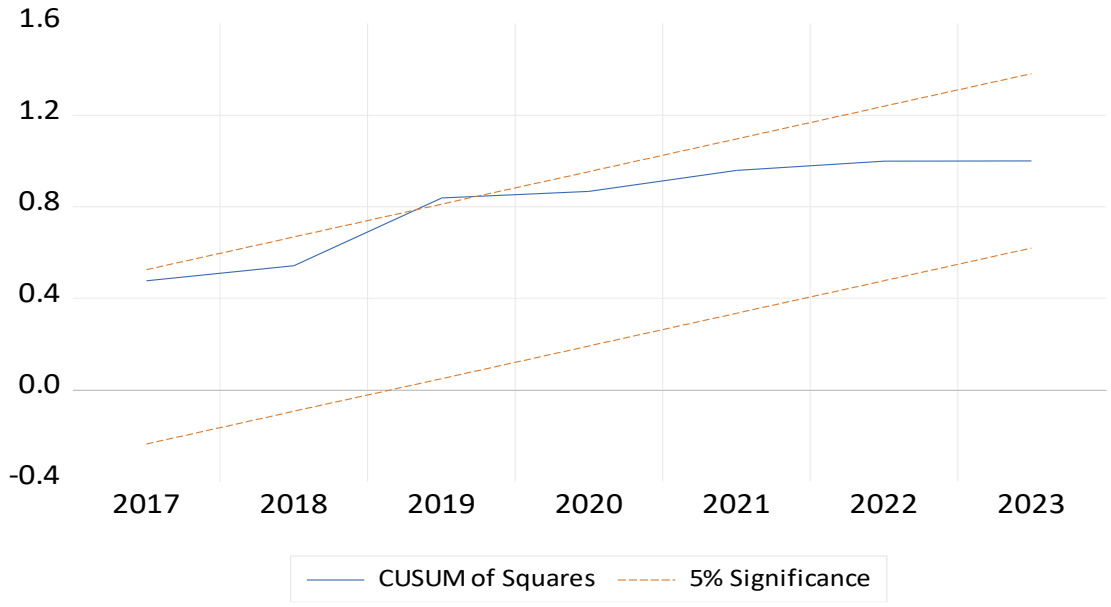

Figure 3: Structural Stability of the Estimated Model Using the CUSUM of Squares Test

Source: Prepared by the researcher, based on EViews 13.

The results of the CUSUM of Squares test indicate that the cumulative sum of the residuals remains within the critical bounds at the 5% significance level, which confirms the stability of the estimated model parameters and the absence of structural changes over the study period.

5. Estimation of Short-Run and Long-Run Parameters and the Error Correction Term

After conducting the diagnostic tests and verifying the stability of the estimated model, in addition to confirming the existence of a long-run equilibrium relationship among the study variables, the short-run parameters (Error Correction Model) and the long-run parameters were estimated according to the ARDL methodology. This was accomplished through the specification of the Error Correction Model (ECM), which allows for measuring short-run adjustment dynamics while simultaneously estimating the long-run relationships among the variables.

Table 7: Error Correction Model (ECM) Results

ARDL Error Correction Regression				
Dependent Variable: D(DYI)				
Selected Model: ARDL(1, 0, 2, 2, 0)				
Case 2: Restricted Constant and No Trend				
Date: 01/05/26 Time: 00:34				
Sample: 2004 2023				
Included observations: 17				
ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DX2)	2.784658	0.394614	7.056664	0.0002
D(DX2(-1))	-1.916852	0.424002	-4.520852	0.0027
D(DX3)	0.225131	0.120988	1.860768	0.1051
D(DX3(-1))	0.590282	0.133694	4.415169	0.0031
CointEq(-1)*	-0.829276	0.076968	-10.77428	0.0000

R-squared	0.948065	Mean dependent var	2268958.
Adjusted R-squared	0.930753	S.D. dependent var	18859017
S.E. of regression	4962725.	Akaike info criterion	33.91274
Sum squared resid	2.96E+14	Schwarz criterion	34.15780
Log likelihood	-283.2583	Hannan-Quinn criter.	33.93710
Durbin-Watson stat	1.683521		

Source: Prepared by the researcher, based on EViews 13.

The estimation results reveal the following:

1. The Error Correction Model (ECM) exhibits a high degree of goodness of fit and strong explanatory power, as the independent variables explain approximately (94.8%) of the short-run variations in public debt. The most prominent result is the highly significant and negative coefficient of the error correction term (CointEq), which amounts to (-0.83). This carries a strong economic implication, indicating that fiscal policy is characterized by a high degree of flexibility and rapid responsiveness, as about 83% of any disequilibrium in public debt is corrected and the system returns to its long-run path within just one year.
2. Non-oil revenues (X2) exhibit an immediate positive effect that increases public debt, which can be economically interpreted as the government's tendency to expand public spending or increase borrowing on the back of improved creditworthiness resulting from enhanced liquidity. However, this effect is reversed in the following year, exerting a debt-reducing impact (with a negative coefficient), reflecting the corrective role of revenues in subsequently amortizing public debt.
3. Gross domestic product (X3) is positively associated with public debt with a one-period lag, indicating that economic growth enhances the state's financial solvency and increases its borrowing capacity to finance ongoing development requirements.

Table 8: Long-Run Estimation Results

ARDL Long Run Form and Bounds Test				
Dependent Variable: D(DYI)				
Selected Model: ARDL(1, 0, 2, 2, 0)				
Case 2: Restricted Constant and No Trend				
Date: 01/05/26 Time: 00:35				
Sample: 2004 2023				
Included observations: 17				
Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2883662.	2747589.	0.000000	0.0000
DYI(-1)*	-0.829276	0.151430	-5.476305	0.0009
DX1**	-0.002718	0.107783	-0.025213	0.9806
DX2(-1)	5.441095	1.616401	3.366179	0.0120
DX3(-1)	-0.184318	0.400823	-0.459850	0.6596
X4**	-0.369868	0.198401	-1.864242	0.1046
D(DX2)	2.784658	0.649754	4.285709	0.0036
D(DX2(-1))	-1.916852	0.942177	-2.034494	0.0814
D(DX3)	0.225131	0.234847	0.958627	0.3697
D(DX3(-1))	0.590282	0.230619	2.559551	0.0376
* p-value incompatible with t-Bounds distribution.				
** Variable interpreted as Z = Z(-1) + D(Z).				

Source: Prepared by the researcher, based on EViews 13.

The results of estimating the conditional error correction regression specification confirm the following:

1. The results indicate the existence of a long-run equilibrium relationship among the model variables, as the coefficient of the lagged dependent variable *DYI(−1)* is negative and relatively large, with a t-statistic value of (-5.47), which is statistically significant at the 1% significance level (Prob < 0.01). Economically, this reflects that public debt in Iraq follows a long-run equilibrium path determined by the financial and economic variables under consideration, and that any deviation from this path is gradually corrected over time. The relatively large t-statistic further indicates the strength of the error correction mechanism, suggesting that deviations in public debt are not merely temporary but rather structural in nature, linked to the structure of public finances rather than being simple responses to short-term shocks.
2. The estimation results show that non-oil revenues (X2) represent the most statistically significant variable in the long-run equation, with a probability value of (Prob = 0.012), which is below the 5% significance level, and a positive coefficient sign. Economically, this positive effect indicates that increases in non-oil revenues are associated with higher public debt, reflecting an expansionary fiscal behavior whereby such revenues were not directed toward reducing the deficit or curbing debt, but rather used to finance increased public spending, particularly current expenditure. This result can also be interpreted as indicating that improvements in non-oil revenues enhance the state's financial solvency and creditworthiness, thereby facilitating access to domestic or external financing and, consequently, increasing public borrowing rather than restraining it. Overall, this finding reflects a weak linkage between revenue diversification and the achievement of fiscal sustainability in the Iraqi context.
3. The results of the level equation indicate that oil revenues (X1), gross domestic product (X3), and the general budget deficit (X4) are not statistically significant, as their probability values (Prob) exceed the conventional significance levels of 5% and 10%. Economically, this suggests that these variables do not constitute direct long-run determinants of the trajectory of public debt within this model. The lack of significance of oil revenues (X1) can be attributed to their highly volatile nature and dependence on global oil prices, rendering their impact on public debt conditional and unsustainable over time. Similarly, the insignificance of gross domestic product (X3) reflects the limited role of economic growth in reducing public debt, given the dominance of the rentier nature of growth and the weak contribution of non-oil sectors. As for the budget deficit (X4), its lack of long-run significance indicates that its effect materializes through short-run accumulations and shocks, rather than as an independent structural factor determining the level of public debt in the long-run equation.

CONCLUSIONS

The results of the ARDL model indicate the existence of a long-run equilibrium relationship between public debt in Iraq and oil revenues, non-oil revenues, gross domestic product, and the general budget deficit, reflecting the close linkage between public debt and the structure of public finances over the long term.

The findings also reveal that oil revenues, despite their importance as a primary source of budget financing, did not contribute significantly to reducing public debt, due to the coincidence of rising oil revenues with a marked expansion in government spending. Moreover, non-oil revenues were found to be positively associated with public debt, indicating their limited role in supporting fiscal sustainability, as they are accompanied by increased public expenditure, particularly current spending.

With regard to economic growth, the results indicate that increases in gross domestic product were insufficient to reduce public debt in the long run, reflecting the limited capacity of the economy to translate growth into effective fiscal resources. In contrast, the general budget deficit emerged as the most influential factor in the accumulation of public debt, confirming that structural imbalances in public finances constitute the primary driver of public debt in Iraq.

The Error Correction Model also revealed the presence of an adjustment speed toward equilibrium; however, this equilibrium is often achieved at relatively high levels of public debt, due to the persistence of fiscal deficits and expansionary expenditure policies. Accordingly, the study concludes that the public debt problem in Iraq is primarily linked to weaknesses in revenue management and the structure of government expenditure rather than to a shortage of resources, posing a genuine challenge to achieving long-term fiscal sustainability.

RECOMMENDATIONS

- The importance of redirecting fiscal policy in Iraq toward controlling public expenditure, particularly current spending, in order to limit the automatic expansion of expenditures accompanying increases in oil revenues, which contributes to widening fiscal deficits and the accumulation of public debt.
- Directing the development of non-oil revenues toward reducing the fiscal deficit and financing productive investments, rather than using them to cover operating expenditures, is essential.
- Enhancing the efficiency of the tax system and broadening the tax base in a manner that enables the transformation of economic growth into effective fiscal resources that support fiscal sustainability, ensuring that growth is reflected in public finance outcomes.

- The necessity of adopting a clear framework for public debt management that links borrowing to the economy's repayment capacity and ensures that loans are directed toward projects capable of generating future returns, alongside strengthening coordination between fiscal policy and broader economic policies in a manner that supports the development of a more diversified and sustainable economic base.

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