Testing the Triple Deficit Hypothesis: The Case of The Jordanian Economy

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Abstract: Jordan faces a chronic deterioration in its Budget Balance (BB), Current Account Balance (CAB), and Private Saving-Investment Gap (PSGAP). This poses a significant threat to economic stability, growth, employment, and future generations in Jordan. This study assesses the Triple Deficit Hypothesis (TDH) validity in Jordanian economy, an extension of the twin deficit hypothesis incorporating the saving-investment gap. By using annual time series data from 1980 to 2022, Granger Causality has been conducted, indicating that the TDH is not valid for Jordan, as the test results show one-way causality from BB to CAB, another from PSGAP to CAB, and a two-way causality between BB and PSGAP. In addition, the study Employed the Fully Modified Ordinary Least Squares (FMOLS) method, which identifies a statistically significant positive relationship between CAB and BB, supporting the twin deficit hypothesis in Jordan. Furthermore, a statistically positive relationship between CAB and PSGAP is found. Two dummy variables were combined, (DI) for the IMF-supported programs and (D2) for pegging the dinar exchange rate to the US dollar to measure the impact of each on the CAB. Results indicate a positive but statistically insignificant effect of the IMF's programs, contrasting with a positive and statistically significant effect attributed to exchange rate pegging.

Keywords: Triple Deficit Hypothesis, Current Account Balance, Saving-Investment Gap, Budget Balance, FMOLS, Jordan.

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اختبار فرضية العجز الثلاثي: حالة الاقتصاد الأردني

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المستخلص: يعاني الاقتصاد الأردني من تدهور مزمن في رصيد كل من الموازنة العامة، الحساب الجاري، وفجوة الادخار الخاص – الاستثمار، بحيث تشكل هذه الحالة تهديداً كبيراً للاستقرار الاقتصادي والنمو والتوظيف والأجيال القادمة في الأردن. وقد هدفت هذه الدراسة إلى اختبار فرضية العجز الثلاثي في الاقتصاد الأردني، والتي هي امتداد لفرضية العجز الثنائي. وباستخدام بيانات السلاسل الزمنية السنوية للفترة (1980-2022) تم إجراء اختبار السببية (Granger Causality) والذي أشار الى عدم انطباق فرضية العجز الثلاثي على حالة الأردن، لا سيما وأن نتائج هذا الاختبار أشارت إلى وجود علاقة سببية في اتجاه واحد من عجز الموازنة العامة إلى عجز الحساب الجاري، وأخرى من فجوة الادخار الخاص – الاستثمار إلى عجز الحساب الجاري، ووجود علاقة سببية باتجاهين بين عجز الموازنة العامة وفجوة الادخار الخاص – الاستثمار. كما تم استخدام منهجية المربعات الصغرى المعدلة كلياً (FMOLS)، وأشارت النتائج إلى وجود علاقة إيجابية بين عجز الحساب الجاري وعجز الموازنة العامة، مما يدعم فرضية العجز الثنائي (Twin Deficit) في حالة الاقتصاد الأردني، ووجود علاقة إيجابية بين عجز الحساب الجاري وفجوة الادخار الخاص – الاستثمار. وتم دمج متغيرين وهميين، هما: (D1) لقياس أثر برامج صندوق النقد الدولي و(D2) لمعرفة أثر ربط سعر صرف الدينار بالدولار الأمريكي على رصيد الحساب الجاري. وأشارت النتائج إلى وجود أثر إيجابي، ولكن ليست له دلالة إحصائية، لبرامج الصندوق، أما أثر الربط بالدولار فقد كان إيجابياً وذو دلالة إحصائية.

الكلمات المفتاحية: فرضية العجز الثلاثي، رصيد الحساب الجاري، فجوة الادخار الخاص – الاستثمار، رصيد الموازنة، منهجية المربعات الصغرى المعدلة كلياً، الأردن.

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1. Introduction

Nations worldwide are actively pursuing economic equilibrium, both internally and externally, to achieve stability and foster sustainable growth. This shared goal emphasizes the need for a resilient economic framework capable of withstanding internal pressures and external dynamics for long-term prosperity. The twin deficit hypothesis, proposing a positive relationship between current account and budget deficits, has been a persistent concern in academic and policy discussions (Kesgingöz and Ahmed, 2021). The globalization movement, particularly since the 1980s, has led to a rise in current account deficits in many countries, sparking debates on the implications of these imbalances. The development of the triple deficit hypothesis (TDH), considering the relationship between budget, current account, and saving-investment balances, becomes essential (Çoban and Balikçioğlu, 2016). The study focuses on Jordan, a country that has faced chronic imbalances in its saving-investment, budget, and current account balances, raising concerns about external sustainability. The specific motivations for choosing Jordan as the focus of this study stem from its unique economic characteristics and the relevance of the triple deficit hypothesis to its economic challenges. Additionally, Jordan's experience offers valuable insights into the broader discourse on macroeconomic imbalances and policy responses in developing economies. As the study examines the validity of TDH in the Jordanian economy, addressing the relationships among private saving-investment, budget, and current account balances, the study's importance lies in providing insights for policymakers and academics, aiding in the development of effective macroeconomic policies and strategies to promote economic development and mitigate risks. The objectives include testing the applicability of the TDH in Jordan, determining causality directions among key balances, estimating the magnitude and direction of relationships, and conducting a comprehensive temporal analysis of balance dynamics during the period (1980 to 2022). The study utilizes annual time series data, employing descriptive and quantitative analysis approaches and an econometric model based on economic theory and previous studies. The findings aim to contribute to macroeconomic literature and inform future research in developing economies facing similar challenges. Mentioning that the study is organized into seven sections, starting with the introduction. The second section delves into the theoretical background and literature review, followed by a brief overview of the performance of the private saving-investment, budget, and current account balance. Sections four and five focus on the study's problem statement and the econometric analysis of the TDH, respectively. Following this, the main findings are presented in the sixth section. Finally, the seventh section provides the study's key recommendations.

2. Theoretical Background and Literature Review

2.1 Economic Theories Explaining the Triple Deficit Hypothesis (TDH)

The TDH has been studied within the same framework of the twin deficit hypothesis, as the explanation of the TDH can be attributed to two distinct approaches, the Keynesian approach, and the Ricardian Equivalence Hypothesis (REH) approach.

2.1.1 Keynesian Mundell-Fleming Approach

The Keynesian Mundell-Fleming model, or the IS-LM-BP model, is an economic framework that combines elements of John Maynard Keynes' macroeconomic theory with the open economy model of Mundell-Fleming. It is used to evaluate the simultaneous impact of monetary and fiscal policies, as well as exchange rate policies, on a country's output, exchange rates, and interest rates.

In this model, an increase in the budget deficit results in higher interest rates due to the insufficient availability of domestic funds for profitable investment opportunities and government borrowing. As foreign capital inflows are attracted, the domestic currency appreciates which makes domestic goods less competitive against foreign goods and contributes to a trade deficit (Mankiw, 2016).

The theoretical analysis of the TDH commences with the national income identity for an open economy, serving as the baseline of the TDH (Şen and Kaya, 2020).

$$GDP = C + G + I + X - M \quad\text{.........................} \quad (1)$$

C = Household consumption.

G = Government expenditure.

I = Gross capital formation.

X = Exports.

M = Imports.

That is, the expenditure approach to GDP,

$$GDP = C + S + T \quad\text{.............................} \quad (2)$$

By definition, nations dispose of their income (GDP) for the period "t" as consumption (C), saving (S), or taxes (T).

The total expenditure in any economy equals total income.

$$C + G + I + X - M = C + S + T \quad\text{.............} \quad (3)$$
$$(T - G) + (S - I) = X - M \quad\text{...................} \quad (4)$$

Where total saving (S) consists of two parts, the portion of disposable income that is not consumed, but rather saved, is referred to as private saving. Government savings, on the other hand, are calculated by subtracting government expenditures from government revenues.

$$Sp = GDP - C - T \quad\text{...........................} \quad (5)$$
where Sp is Private Sector Saving.

$$Sg = T - G \quad\text{.......................................} \quad (6)$$
where Sg is Government Saving.

Substituting (4) and (5) into (3) reveals,

$$(T - G) + ((GDP - C - T) - I) = X - M \quad\text{.......} \quad (7)$$

Rearranging, produce the following;

$$(T - G) + (Sp - I) = X - M \quad\text{...................} \quad (8)$$

Equation (8) shows that (X-M), which is the current account represented by the trade balance, is the combination of the government budget balance (T-G) and the difference between private savings and investment (Sp-I). Considering that, the private sector savings roughly equals investment (Sp≅I), the budget balance and trade balance will move in the same direction by the same amount. This indicates a direct relationship or "twinning" between the two balances. On the other hand, if the private sector savings do not equal the investment, and the budget balance is negative (T<G), then TDH is held, where the sum of the two internal deficits equals the external deficit expressed by (X-M).

2.1.2 Ricardian Equivalence Hypothesis (REH)

The REH states that, when there is an increase in the budget deficit, resulting from a cut of taxes or higher spending, forward-looking economic agents tend to save more in anticipation of future tax increases to finance the rising deficit and accumulated debt. In this approach, economic agents react to the budget deficit by accumulating more wealth instead of increasing spending. Consequently, the increase in the budget deficit is offset by a corresponding increase in private sector savings, leaving the domestic savings unchanged, leading to no response of the current account deficit to changes in the budget deficit (Barro, 1989).

2.1.3 Current Account Targeting Hypothesis

Summers (1988) introduced the concept of the "maintained external balance hypothesis", which reflects the idea of current account targeting in international economics. According to this hypothesis, governments strategically intervene in their economic policies to ensure that the current account remains relatively stable. The argument is that tax policies, particularly, those aimed at incentivizing investment, may be supported by firms in traded-goods

industries if they anticipate that these incentives will be accompanied by other policies intended to stabilize the current account. These accompanying policies might include measures to increase public savings, implement expansionary monetary policies, or even resort to protectionist measures. In essence, the maintained external balance hypothesis suggests that governments actively work to prevent significant and sustained deficits or surpluses in their current accounts by adjusting various economic levers and recognizing the interconnectedness of fiscal and external economic dynamics.

2.1.4 Feldstein-Horioka Puzzle

Feldstein and Horioka (1980) argued that the level of correlation between investment and savings serves as a measure of international capital mobility. If national capital markets are fully integrated, it implies that foreign savings can finance domestic investment, resulting in a low correlation between them. To investigate this, they conducted a cross-sectional data analysis on 16 countries of Organization for Economic Co-Operation and Development (OECD) during the 1960-1974 period. Their estimated model was as follows:

$$I/Y = \alpha + \beta \, (S/Y) + \varepsilon_t \quad ....(9)$$

Here, (I / Y) is the investment as a percent of GDP, (S / Y) is the savings as a percent of GDP, β is the savings-retention coefficient. A high value of the savings coefficient suggests no international capital mobility, as domestic investment relies on domestic savings. Conversely, if capital were mobile, the coefficient would equal zero, indicating that foreign savings are financing the domestic investment. Therefore, a non-zero savings-retention coefficient suggests limited capital mobility.

Based on that econometric model, Feldstein and Horioka found that the value of the coefficient (β) was 0.887 in their estimated model. This finding led them to propose a relationship between investments and savings, implying that capital is not highly mobile among OECD countries. In a closed economy, domestic savings must cover investments. However, the presence of foreign savings that can fund some investments allows for investment and savings to vary independently. Thus, despite a strong correlation between investment and savings, Feldstein and Horioka suggest that capital may not be as mobile as expected. However, the prevailing conditions, such as integrated financial markets, minimal capital controls, accessible information, and interest rate differentials among these countries, seem to challenge their findings. This paradox is referred to as the Feldstein-Horioka puzzle. In 1983, they extended their analysis to a larger group of OECD countries and continued to find empirical support for their hypotheses.

This insight prompted Fidrmuc (2003) to investigate the long-run relationship among the current account, represented by the trade balance, the budget deficit, and total investment. Fidrmuc's model, with variables measured as a percentage of GDP, was as follows:

$$X_t - M_t = \beta_1 + \beta_2 \, (T_t - G_t) - \beta_3 I_t + \varepsilon_t \, ...(10)$$

In this model, (X−M) represents the current account deficit, (T−G) represents the government budget deficit, and (I) represents the investment ratio. According to the national account identity, all else being equal, an increase in investment leads to deteriorate the trade balance. Therefore, it is expected that (β_3) will be negative. As discussed earlier, if Ricardian equivalence does not hold, a positive coefficient is anticipated (β_2), resulting in a twin deficit.

Furthermore, if a country is fully integrated into the international economy and both the budget deficit and investment are financed through the world capital market, the coefficients of both variables should be equal to one. However, if the Feldstein–Horioka puzzle is at play, (β_3) will be significantly lower than one. In this context, a negative (β_2) would reject the

twin-deficit hypothesis (Altintas and Taban, 2011).

In a nutshell, drawing upon the aforementioned theoretical background, the causal relationship between the CAB and the BB can be summarized as follows. In the Keynesian perspective, the causal relation is posited to flow from the BB to the CAB. Conversely, the Ricardian viewpoint contends that no such causal relationship exists between these balances. Meanwhile, the Current Account Targeting Hypothesis suggests a causal relationship emerging from the CAB to the BB. Lastly, the Feldstein-Horioka Puzzle suggests a bidirectional causal relationship between these two balances.

2.2 Literature Review

The TDH extends the twin deficits hypothesis by including the saving-investment gap. While there is no specific origin or credited source for this extension, numerous studies and researchers have examined and discussed the TDH. This concept has evolved as scholars and economists expand their understanding of deficits beyond the traditional focus on budget and current account imbalances. Akbaş et al. (2014) stated that studies that aimed to investigate the TDH are mainly theoretical.

Jayasiriwardana et al. (2023), examined the TDH in Sri Lanka, emphasizing bidirectional causality between financial account and budget deficits, and unidirectional causality from budget deficit to current account deficit. Batool et al. (2022) investigated the TDH in South Asian countries, finding co-integration among the variables and identifying a two-way causality between current account and budget deficit, as well as between current account and financial deficits. Al-Zu'bi and Athamneh (2022) examined the technology gap in Jordan's economy and the relationships between the economic resource gap, private saving gap, and government saving gap. Akçayir (2022) discussed the TDH and its

relationship to short and long-term macroeconomic stability in Türkiye, highlighting the importance of reducing the budget deficit and increasing savings to address the current account deficit problem. Karahan (2021) examined the presence of the TDH in Türkiye, concluding that policies addressing private sector saving shortages are more effective in closing the current account deficit than policies targeting the budget deficit. Kesgingöz and Ahmed (2021) investigated the TDH in Türkiye, finding causality from the budget deficit and saving-investment gap to the current account deficit.

Raouf (2020) Studied the validity of the TDH in 14 MENA countries, including Jordan, confirming a non-linear relationship between the current account, budget, and saving-investment gap deficits. However El-Khishin and El-Saeed (2021) analyzed fiscal and external balance in MENA, including Jordan, oil and non-oil countries, concluding that, oil-rich nations faced twin deficits, while non-oil countries dealt with structural issues, also, Alshammary et al. (2020) studied 20 MENA countries, including Jordan, by examining the link between fiscal balance, investment, and the current account balance, the results initially supported the twin deficits hypothesis but showed a decreasing effect over time. The study also rejected the Feldstein-Horioka hypothesis in the region. Moreover, Okafor, et al (2022) investigated deficits in the current account, fiscal account, and financial account balances in Sub-Saharan Africa (SSA), exploring their relationship and implications for the African Continental Free Trade Area (AFCFTA). Using panel data analysis with Pooled Mean Group-Autoregressive Distributed Lag (PMG-ARDL) specifications, the researchers tested the Triple Deficit Hypothesis (TDH) in the region. Their findings revealed the presence of TDH in SSA, showing bidirectional causality between current account and budget balances, and between saving gap and current account balance,

with unidirectional causality from budget balance to saving gap.

Magoti et al. (2020) tested the TDH in East African countries, finding that fiscal balance and saving gap had a positive long-run impact on the current account. Şen and Kay (2020) analyzed the twin and triple deficits hypotheses using panel data from six post-communist countries, rejecting these hypotheses for any of the sample countries. Ömer and Yildirim (2019) examined the TDH in Türkiye, emphasizing the significance of the saving gap as an indicator of Türkiye's overall economic balance. Raji (2019) studied the relationship between budget, current account, and financial deficits in Nigeria, supporting the TDH and recommending policies to promote fiscal and monetary discipline. Yeniwati (2018) investigated TDH in Indonesia, revealing one-way causality between budget and current account deficits and recommending appropriate economic policies to reduce deficits. Shastri et al. (2017) explored the TDH by examining the long-run relationship between the budget, current account, and private saving gap balances for five South Asian countries. Çoban and Balikçioğlu (2016) examined the TDH and analyzed the relationship among current account, budget, and saving-investment deficits in 24 transition countries. Akinci and Yilmaz (2012) studied the relationship between current account, saving, and budget deficits in Türkiye, finding a positive effect of both saving and budget deficits on the current account.

By reviewing previous studies, it is evident that the triple deficit hypothesis, which includes the savings-investment gap, adds additional complexity to the analyses. Some of the studies that were reviewed confirmed the validity of this hypothesis to the economies that were studied, such as Sri Lanka, the countries of South Asia, Egypt, and Türkiye, as these studies confirmed the existence of a mutual causality between these three balances, the results of these studies confirmed the

existence of a long-term causal relationship between these balances, with a focus on the interrelationship between these variables over time. However, unlike the twin deficits hypothesis, empirical literature investigating the TDH on the case of Jordan as a single country is absent and only analyzed using panel data for general region studies. Among these studies that investigated the twin deficits hypothesis in Jordan, AlShawabkeh and Warrad (2024) analyzed the impact of public debt on the Jordanian twin deficits using a threshold time series model. Their results indicated the existence of five significant thresholds. Their results support the Keynesian view of a strong and positive relationship between the current account deficit, saving, budget deficit, and trade openness. In addition, Daoud et al. (2023) investigated the determinants of Jordan's current account balance the study utilized both analytical-qualitative and econometric methods, along with the Autoregressive Distributed Lag (ARDL) approach. The study concluded that the general budget deficit, private saving, and trade openness negatively affected the current account balance, while the real effective exchange rate, gross investment, and GDP growth rate had a positive impact. The study confirmed that Jordan's current account deficit is primarily due to its trade balance and budget deficit, confirming the validity of twin deficit in Jordan. Al-Sawaei and Al-Azzam (2015) examined Jordan's macroeconomic dynamics, by focusing on the relationships among current account deficit, budget deficit, investment, and trade openness using the ARDL approach. The study found long-term connections among these variables, supporting the Keynesian perspective by showing a positive correlation between budget and trade deficits. The study also affirmed the Feldstein-Horioka hypothesis, indicating Jordan's integration with global capital markets. Trade openness increased current account deficits, while monetary policy had the opposite effect. Real

effective exchange rates helped reduce the current account deficit, whereas real economic growth showed no impact. Also, Tarawneh and Altayeb (2012) investigated the twin deficits hypothesis in the Jordanian economy. The study employed various methodologies including co-integration, Granger causality, variance decomposition analysis, and Impulse Response Functions (IRFs). The empirical findings confirmed the existence of twin deficits in Jordan.

3. Overview of Jordan's Current Account Balance, Budget Balance, and Private Saving-Investment Gap Over (1980-2022)

The overview of CAB, BB, and PSGAP, during (1980-2022) reveals a dynamic trajectory characterized by various challenges and reforms over different periods. In the 1980s, imbalances in the budget structure and external shocks contributed to deficits in both BB and CAB, with PSGAP reflecting the widening gap between private saving and investment. In the 1990s, structural measures, economic reforms, and geopolitical events influenced these variables, leading to fluctuations in deficits and surpluses. The 2000s witnessed a mix of economic shocks, global crises, and regional events impacting CAB, BB, and PSGAP, the years from 2010 to 2019, saw heightened deficits, influenced by regional conflicts, refugee crises, and economic shocks, prompting engagement in IMF-supported programs after the graduation in 2005. The most recent period, from 2020 to 2022, reflects the additional challenges posed by the COVID-19 pandemic and continued commitment to economic reforms. Overall, the consequences of these challenges affected the BB, CAB, and PSGAP are evident in their performance, both BB and CAB showed a deficit, albite there were surpluses recorded in some years, along with fluctuations in the PSGAP, which showed persistent deficit during the whole period, reflecting the complex interplay of domestic and global economic forces that have affected Jordan's economic stability.
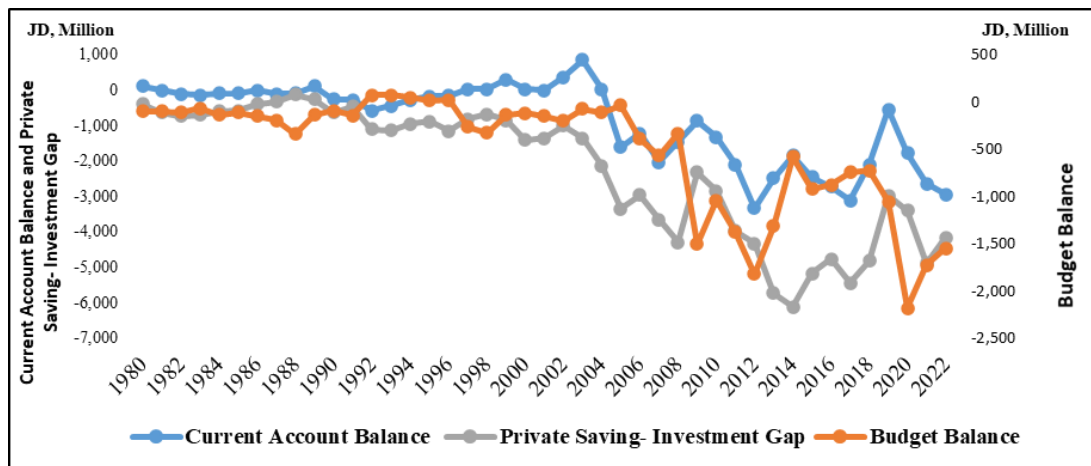

Figure (1): Current Account Balance, Budget Balance, and Private Saving-Investment Gap Developments Over (1980-2022)
Source: - For CAB and BB, The Central Bank of Jordan, annual statistical bulletin, several issues
- For PSGAP, The World Bank, and The IMF databases and researcher calculations.

4.Study's Problem

During the last two decades, Jordan's economy has witnessed a significant deterioration in its budget, current account and saving-investment balances, this raise concerns about the applicability of the TDH in the Jordanian economy, as the performance of these balances indicating a tendency for the TDH to be valid. This issue reflects negatively on the Jordanian economy performance, threaten Jordan's economic stability, internally and externally, economic growth, employment and potentially harming future generations. As a persistent budget deficit lead to

increase government borrowing, impacting interest rates and potentially crowding out private investment. Current account deficit deepening the reliance on external financing and affecting trade dynamics. Meanwhile, insufficient private savings for investment can hinder capital formation and limit economic growth.

To address these challenges, policymakers and academics in Jordan need to understand the relationships among budget, current account, and saving-investment balances, especially in the case of deficit, to mitigate their implications on macroeconomic performance. Therefore, this study came to fill the gap in the literature about the applicability of the TDH in Jordan, as the study try to answer the following questions:

4.1 Main Study Question is:

- Is the TDH valid in the Jordanian economy?

Meanwhile, the Sub-questions are:

- What is the causality direction between Private Saving-Investment Gap (PSGAP) and the current account balances (CAB)? And how do changes in PSGAP affect the CAB?

- What is the causality direction between budget balance (BB) and CAB? And how do changes in BB affect the CAB?

- What is the causality direction between BB and PSGAP?

4.2 Study's Hypotheses

In order to answer the study questions the following hypotheses will be tested:

- There is no statistically significant relationship between PSGAP and CAB.

- There is no statistically significant relationship between BB and CAB.

- There is no statistically significant relationship between PSGAP and BB.

5. Econometric Analysis of the Triple Deficit Hypothesis

5.1 The Study Sample

The study used annual time series data covering the period from 1980 to 2022, consequently, the dependent variable (CAB) is the current account balance,

which is defined as the sum of net exports of goods and services, net primary income, and net secondary income. As for (BB) it represents the budget balance, including grants, which is defined as the difference between the total government revenues and total expenditures. (PSGAP) is the private saving-investment gap, which is defined as the difference between the private sector saving and investment. Mentioning that all variables are denominated in million Jordanian dinars. In addition, two dummy variables were used to measure the effect of the IMF-supported program and pegging the exchange rate of the Jordanian Dinar with the US Dollar.

The data for CAB and BB were obtained directly from the Central Bank of Jordan's annual statistical bulletin, several issues. Whereas, since the data related to the PSGAP are not published, the study constructed a time series data for it, mentioning that the process was based on the data published by both the World Bank and the IMF database.

5.2.1 Calculating the Private Saving - Investment Gap

Many studies have calculated the PSGAP due to the unavailability of data for it, of which, Al-Zu'bi and Athamneh (2022) and many others. Mentioning that the domestic saving represents the summation of the saving for both the private sector and the government, Şen et al. (2014) that is shown in equation (11).

Domestic Saving = Private Savings + Government Savings ……………………… (11)

From this standing point and following the definition of domestic saving by the World Bank, which is defined as GDP less final consumption expenditure, while the total consumption is the sum of private consumption and general government expenditure, as shown in equation (12).

Domestic Saving = GDP - Private Consumption - Government expenditure………………..… (12)

Based on the equations (11) and (12), private saving can be calculated as:

Private Savings = Domestic Saving - Government Savings…………..………..…… (13)

Where, Government saving is defined as total government revenue minus total expenditure (T-G), which is the (BB).

After the data related to the private sector savings have been constructed, and by referring to the IMF database to get the data related to the total investment, private saving-investment gap data have been estimated based on equation (14).

Private saving- investment gap = Domestic Saving - Government Savings - Total Investment....... (14)

5.3 The Study Model

The study developed an econometric model, which is shown in equation (16), based on the economic theory and empirical literature of Khan and Alam (2022), Batool et al. (2022), Ömer and Yildirim (2019), and Akinci and Yilmaz (2012). After making the required adjustments to fit the study aims, which were, replacing the trade balance with the current account balance, excluding the interest rate and exchange rate, which were used by Khan and Alam (2022). Consequently, the general functional form is shown in equation (15), showing that the CAB is a function of both BB and PSGAP.

CAB=f (BB, PSGAP, D1, D2) .... (15)

Based on the general functional form (15), the econometric model shown in equation (16) is derived, which shows that the dependent variable is the CAB، representing the external balance. Meanwhile, the two independent variables, which together represent the internal balance, are the BB, and the PSGAP, these two independent variables explain the variation of the dependent variable at time (t). Consequently, the coefficients (β_1) and (β_2) represent the magnitude of the CAB response to a one-unit change in BB and PSGAP, respectively. Meanwhile (β_3) and (β_4) measure the effect of the IMF-supported program and the pegging of the exchange rate of the Jordanian Dinar with the US Dollar on the CAB, taking into account that the dummy variable (D1) takes the value of (1) in the years of implementing an IMF-supported program otherwise take the value of (0), for the dummy variable (D2) takes the value of (1)

from 1995 onward, and the value of (0) for the years before 1995 (Table (8) in the Appendix), mentioning that (μ_t) is the random error term.

$CAB_t = \alpha + \beta_1 BB_t + \beta_2 PSGAP_t + \beta_3 D1 + \beta_4 D2 + \mu_t$ .... (16)

This equation will be subject to the causality test, and the appropriate econometric techniques to test for the long-term relationships among the variables under study, after conducting the stationarity and co-integration tests.

5.4 Estimation Results

This part represents the results of the econometric analysis of the adopted model, starting with testing the data stationarity, utilizing Augmented Dicky Fuller (ADF) test, passing through testing the causality between the variables, using, Pairwise Granger Causality. As well as testing the co-integration between the variables, ending with estimating the magnitude and direction of the relationship between these variables in the long term using the appropriate econometric model based on the results of the ADF test.

5.4.1 Unit Root Test

Examining the presence of a unit root has become a widespread practice in time series data. This is to avoid both the inconsistent estimated parameters and the associated statistical tests, and the problem of spurious regression. The Augmented Dicky Fuller (ADF) unit root test is used to test the stationarity of time series of variables. The null hypothesis of this test reflects the existence of a unit root, i.e. the non-stationarity of the variables, whereas, the alternative hypothesis reflects the stationarity of the time series data (Wooldridge, 2012). The results of the ADF test are shown in Table (1). The results of the test indicate that all the three balances under study, (CAB, BB, and PSGAP), are stationary after taking the first difference and thus, are integrated into the first degree I (1). This is evident by looking at the probability value (P-value), as it is less than 5%.

Table (1): Unit Root Test Result (Augmented Dicky Fuller Test Results)

| Variables | At Level | | | | | | Result |
| | Intercept | | Intercept & Trend | | None | | |
	ADF	Prob.	ADF	Prob.	ADF	Prob.	
CAB	-1.419794	0.5636	-2.861137	0.1850	-0.643479	0.4325	**Nonstationary**
BB	-1.551871	0.4979	-3.115318	0.1161	-0.754843	0.3833	**Nonstationary**
PSGAP	-1.214424	0.6594	-2.827542	0.1966	-0.133727	0.6317	**Nonstationary**
At First Difference							
CAB*	-6.179452	0.0000	-6.142168	0.0000	-6.132479	0.0000	**Stationary**
BB*	-7.826966	0.0000	-7.796113	0.0000	-7.816222	0.0000	**Stationary**
PSGAP*	-6.800898	0.0000	-6.707356	0.0000	-6.681276	0.0000	**Stationary**

*: Reject the Null Hypothesis at 0.05 level of significance.
Source: Researcher Calculation Using E-views.

5.4.2 Lag Selection

The co-integration test typically follows a preliminary examination of the optimal lag length, which expresses the time during which the CAB responds to changes in other independent variables (BB and PSGAP), as the outcome of the test can be influenced by the number of lags incorporated into the VAR model. To ascertain the ideal lag length for the co-integration test, several criteria are employed of which Akaike information criterion (AIC), Schwarz criterion (SC), and Hannan-Quinn Information Criterion (HQ), as presented in Table (2), all of these criteria converge on one lag length, at a significance level of 5% as the optimal lag, and this lag length will be employed in the context of this study.

Table (2): VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-958.7296	NA	1.4e+17	48.08648	48.21315	48.13228
1	-890.5212	122.7751*	7.97e+15*	45.12606*	45.63272*	45.30925*
2	-885.1013	8.942895	9.62e+15	45.30506	46.19173	45.62656
3	-877.5447	11.33490	1.06e+16	45.37723	46.64389	45.83522

*: Indicating the Optimal Lag.
Source: Researcher Calculation Using E-views.

5.4.3 Co-integration Test

If the variables are not stationary at the level and were integrated of the first degree, there may be a co-integration relationship and a stable long-run relationship between them, so the co-integration test should be conducted to examine whether there is a long-run relationship between the variables (Wooldridge, 2012). Based on the results of the unit root test, which confirmed the stationarity of all study variables after taking the first difference i.e integrated of order one I(1), and after determining the optimal lag (one lag), the study employed the Johansen and Juselius (1990) test to ascertain the existence of a long-term relationship among CAB, BB, and PSGAP. The Johannes test relies on Maximum Likelihood estimators and serves the purpose of testing and estimating multiple co-integration vectors. This approach entails examining the stationarity of the residuals arising from the long-term relationship. If these residuals exhibit stationarity, it suggests that there is a co-integration between the dependent and independent variables. This, in turn, signifies the existence of a long-run relationship or balance between these variables. Additionally, it aids in testing restricted co-integration vectors and assessing adjustment parameters. The test's foundation lies in the relationship

between the rank of the matrix and its eigenvalues, making use of two specific tests for co-integration, the Trace test and the Maximum Eigenvalue test, the results of these two tests are presented in Table (3) and (4) respectively.

Table (3): Unrestricted Co-integration Rank Test (Trace)

Hypothesized No of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.409070	30.07687	29.79707	0.0464
At most 1	0.182062	8.508515	15.49471	0.4127
At most 2	0.006534	0.268778	3.841465	0.6042

*: Denotes rejection of the hypothesis at the 0.05 level.
Source: Researcher Calculation Using E-views.

Table (4): Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.409070	21.56835	21.13162	0.0434
At most 1	0.182062	8.239738	14.26460	0.3549
At most 2	0.006534	0.268778	3.841465	0.6042

*: Denotes rejection of the hypothesis at the 0.05 level of significance.
Source: Researcher Calculation Using E-views.

The results shown in tables (3) and (4) reveal a rejection of the null hypothesis of no co-integration at 5%. Both the trace and maximum eigenvalue statistics point to the existence of a single co-integrating equation at the 5% critical value, with a p-value less than 5%. Consequently, it can be confidently inferred that the variables in the model are indeed co-integrated. This significant finding leads to the important conclusion that there is a shared trend among the variables, signifying the existence of a long-term relationship between the CAB, BB, and PSGAP, this could be noticed in Figure (1).

5.4.4 Granger Causality Test

The presence of a long-run relationship between the variables, by itself, does not indicate the direction of causality. Co-integration suggests a long-term relationship or equilibrium between variables, but it does not reveal which variable is causing changes in the other. Consequently, the Granger causality test was utilized to fulfill the central objective of the study, testing the TDH in Jordan. This test serves the purpose of identifying causal relationships and determining their direction, whether it is one-way (unidirectional), two-way (bidirectional),

or if there is simply no causality between the variables (Gujarati, 2004). The results, as shown in Table (5), indicated that there is a one-way causal relationship between BB and CAB, from BB to CAB, which is compatible with the Keynesian approach, as the null hypothesis is rejected at a 5% level of significance, this result suggests that policies aimed at addressing and stabilizing the BB may positively affect the CAB over time, this might be attributed that budget deficit may lead to a corresponding increase in the current account deficit as the government need to borrow from foreign sources to finance its deficit, to avoid crowding out the privet sector, thus putting pressure on the current account.

Regarding the causality between BB and PSGAP, based on the results, it is considered a two-way causal relationship, this result can be explained by the fact that the Jordanian economy is suffering from a persistence deficit, as the revenue base is mainly limited to taxes and grants, and since the private saving is less than investment, meaning that the investment in Jordan is financed from external sources, the incentives and exemptions provided by the government to stimulate investment

lead to an increase in investment at a faster pace than the increase in private saving, and may cause a budget deficit through a decline in revenues and or an increase in government expenditures, also, the policies adopted by the government to mitigate the budget deficit, such as increasing tax rates, or cutting the expenditures may lead to a change in the pattern of saving and investment among economic agents.

Meanwhile, the results indicate that there is no significant causality between PSGAP and CAB. This result might be attributed to several economic factors, including, the composition of private investments, international economic conditions, government policies, behavioral matters, and the degree of capital mobility, as the complex interplay of these factors within the specific economic characteristic of Jordan may introduce complexities that diminish the causal relationship between PSGAP and CAB.

Based on the results of this causality test, the TDH is not valid for the Jordanian economy, as to validate the TDH, deficits must be recorded in all three balances simultaneously. Additionally, there should be a two-way causality between them. In terms of the applicability of the TDH, this result is contradicting the result of Raouf (2020) which indicates that the triple deficit hypothesis is valid in the MENA region, including Jordan, meanwhile, the results supporting the existence of the twin deficit hypothesis in the Jordanian economy which is consistence to the results of AlShawabkeh and Warrad (2024) Daoud et al. (2023), Alshammary et al. (2020), Al-Sawaei and Al-Azzam (2015), and, Tarawneh and Altayeb (2012). Mentioning that, the rejection of the TDH in Jordan has broader implications for economic theory and policy in comparable economies, particularly within the region. Firstly, this suggests that the dynamics driving deficits in each account may vary across different economies, undermining the universality of the TDH as a framework for understanding macroeconomic imbalances.

Moreover, the validation of the twin deficit hypothesis in Jordan, underscores the importance of fiscal policy in influencing external balances. This highlights the need for coordinated fiscal and monetary policy measures to address external imbalances and promote economic stability.

The factors affecting the rejection of the TDH could indeed indicate a larger trend or irregularity in the region. Other economies in the MENA region may also exhibit similar patterns, with fiscal policy playing a significant role in shaping external balances. However, it is essential to consider the unique characteristics and policy contexts of each country within the region.

Furthermore, the findings in Jordan may prompt a reevaluation of economic policy frameworks and strategies in comparable economies. Policymakers may need to reassess the effectiveness of traditional approaches to macroeconomic management and explore alternative policy measures to address external imbalances and promote sustainable economic growth.

Overall, the rejection of the TDH in Jordan and its implications for economic theory and policy suggest the need for a nuanced understanding of macroeconomic dynamics and policy responses tailored to the specific circumstances of each economy within the region.

Table (5): Pairwise Granger Causality Test Result

Null Hypothesis	Obs	F-Statistics	Prob.
BB ⟶ CAB	42	9.64464	0.0035*
CAB ⟶ BB		0.47767	0.4936
PSGAP ⟶ CAB	42	3.22700	0.0802
CAB ⟶ PSGAP		1.49001	0.2295
PSGAP ⟶ BB	42	4.37230	0.0431*
BB ⟶ PSGAP		15.9496	0.0003*

*: Denotes rejection of the null hypothesis at 0.05 level of significance.
⟶ : Implies does not Granger Cause.
Source: Researcher Calculation Using E-views.

5.4.5 Model Estimation

Once the co-integration between the variables exists, and the ADF test shows the stationarity of all variables at the first difference, the utilization of the Fully Modified Least Squares (FMOLS) approach becomes viable to estimate the long-run relationship among the CAB, BB, and PSGAP, as this technique produces reliable estimates for small sample size and provides a check for robustness of the results, this is crucial given the empirical nature of the analysis and the potential impact of data limitations on the validity of the findings. This method, proposed by Phillips and Hansen (1990), offers several advantages that align with the objectives of the study. They introduced an innovative estimator featuring a semi-parametric adjustment designed to mitigate issues stemming from the long-term relationship between the co-integrating equation and innovations in stochastic regressors, addresses concerns arising from the long-term relationship between the co-integrating equation and innovations in stochastic regressors, ensuring the accuracy of our estimates even in the presence of complex dynamics. This innovation resulted in the development of the FMOLS estimator, which, in its asymptotic behavior, demonstrates a notable absence of bias and adheres to a fully efficient mixture normal distribution. Indeed, the FMOLS estimator considers the potential presence of autocorrelation

and heteroscedasticity patterns within the residuals. Furthermore, it addresses the issue of endogeneity within the explanatory variables, this distinctive feature allows for the use of standard Wald tests, employing asymptotic Chi-square statistical inference for robust analysis. This feature is particularly advantageous in the study, where the relationships between CAB, BB, and PSGAP may be subject to endogeneity concerns due to potential feedback effects.

While alternative econometric techniques such as Vector Autoregression (VAR) models or ARDL offer valuable insights into the dynamics of the variables under investigation, we opted for FMOLS due to its ability to estimate a single co-integrating relationship and its robustness to issues such as endogeneity and small sample sizes. By leveraging the strengths of FMOLS, the study ensures the reliability and validity of the empirical analysis, ultimately enhancing the credibility of the research findings.

The results are introduced in Table (6), revealing that, there is a statistically significant, at a 5% level of significance, positive relationship between CAB and BB, with a coefficient value of 0.50, indicating that an increase of BB deficit by JD 1.0 million lead to an increase of CAB deficit by about JD 0.5 million. This result supports the existence of the twin deficit hypothesis in the Jordanian economy as many studies did before. On the other hand,

the results indicated a statistically significant, at a 5% level of significance, positive relationship between CAB and PSGAP, with a coefficient value of 0.53, indicating that an increase of PSGAP deficit by JD 1.0 million led to an increase of CAB deficit by about JD 0.53 million.

Regarding the dummy variables, the results indicated that D1, which represents the engagement in an IMF-supported program, is not statistically significant, this was expected as the Tsikata et al. (2005) mentioned that the evaluation of the IMF's role in Jordan suggests moderate success. Meanwhile, the pegging of JD with the USD has a statistically significant positive effect on the CAB, as the pegging contributed to reducing the current account deficit by JD 518.8 million.

Based on the estimated parameters, the elasticity between the CAB, BB, and PSGAP can be estimated. This involves multiplying the estimated value of β_1 by

the ratio of the average BB to the average CAB over the period from 1980 to 2022. The calculated elasticity value of 0.29 between the CAB and BB suggests that the CAB is relatively inelastic concerning variations in the BB. In practical terms, this indicates that changes in the government's budgetary position, as reflected by the BB, have a limited impact on CAB. The inelastic response implies that the CAB is less sensitive to alterations in the BB, possibly due to other factors exerting more influence on the current account dynamics.

On the other hand, the significant elasticity value of 1.36 between the CAB and PSGAP, which was calculated by using the same approach, implies that the CAB is highly responsive to changes in the PSGAP. This suggests that shifts in PSGAP have a substantial impact on the CAB. The higher elasticity indicates a more dynamic adjustment of the CAB to fluctuations in the PSGAP.

Table (6): Fully Modified Ordinary Least Square (FMOLS) Result

Variable	Coefficient	STDH.Error	t-Statistic	Prob.
BB	0.505707	0.124466	4.063012	0.002
PSGAP	0.534755	0.046164	11.58369	0.0000
C	165.7510	109.4016	1.515069	0.1383
D1	86.02162	118.8503	0.723781	0.4738
D2	518.7690	156.0534	3.324305	0.0020
R-squared	0.880430	Mean dependent var		-903.0381
Adjusted R-squared	0.867504	S.D dependent var		1132.136
S.E of regression	412.0976	Sum squared resid		6283504
Long-run variance	122060.7			

Source: Researcher Calculation Using E-views.

5.4.6 Diagnostics Tests
5.4.6.1 Normality Test

The Jarque-Bera test is used to test whether the residuals are normally distributed or not. This test depends on the p-value if it is below a chosen significance

level (commonly 5%), the null hypothesis is rejected, and it concluded that the residuals are not normally distributed. As shown in Figure (2) the p-value is strongly indicating that the null hypothesis cannot be rejected.
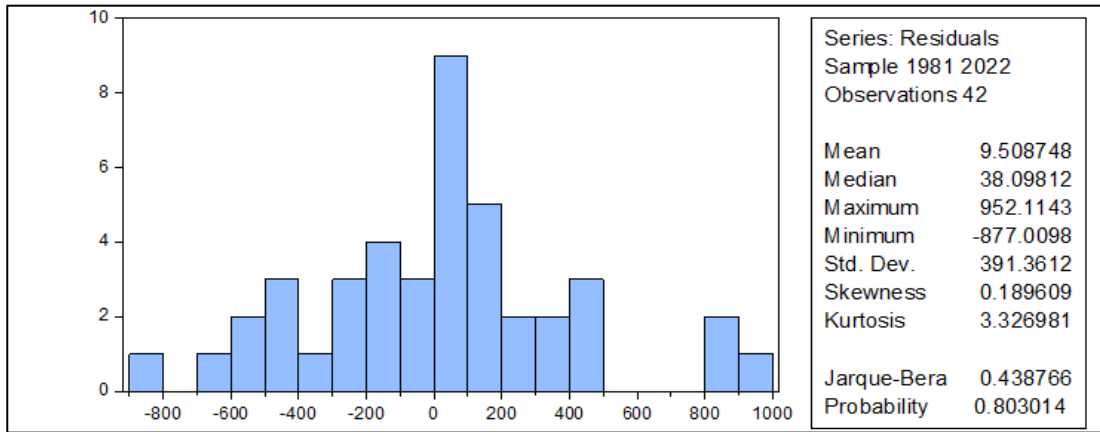
Series: Residuals	
Sample 1981 2022	
Observations 42	
Mean	9.508748
Median	38.09812
Maximum	952.1143
Minimum	-877.0098
Std. Dev.	391.3612
Skewness	0.189609
Kurtosis	3.326981
Jarque-Bera	0.438766
Probability	0.803014

Figure (2): Jarque-Bera Normality Test

Source: Researcher Calculation Using E-views.

5.4.6.2 Multi-collinearity Test

The presence of multi-collinearity between the explanatory variables indicates a negative impact on the reliability and credibility of the regression results. The strong correlation between the explanatory variables leads to an increase in the standard error, and thus a decrease in the value of the t-statistic, and this negatively affects the significance of the estimated parameters (Wooldridge, 2012).

The Variance Inflation Factors (VIFs) were conducted, which serve as a tool for quantifying the extent of collinearity among the independent variables within a regression equation. VIFs provide insights into the degree to which the variance of a coefficient estimated for a particular independent variable has been magnified due to its correlation with other independent variables. Essentially, VIFs help assess the impact of multi-collinearity on the reliability of regression results. Table (7) represents the result of this test, indicating that centered VIF values for the independent variables are less than 2.5 as a low VIF suggests that the variance of a coefficient for a particular independent variable is not significantly inflated due to its correlation with other independent variables, indicating no substantial multicollinearity.

Table (7): Variance Inflation Factors Result

Variable	Coefficient Variance	Centered VIF
BB	0.015492	1.874152
PSGAP	0.002131	2.421320
C	11968.71	NA
D1	14125.40	1.115914
D2	24352.65	1.862118

Source: Researcher Calculation Using E-views.

6. Main Study Results

The empirical findings indicated the invalidity of TDH and as expected to the validity of the twin deficit hypothesis for the Jordanian economy. This is consistent with the results of the causality test which showed a one-way causality from the BB to the CAB, a one-way causality from the PSGAP to the CAB, and a bidirectional causality between the BB and the PSGAP. Meanwhile, the estimation of the coefficients based on (FMOLS) indicates a statistically significant positive relationship between CAB and BB, indicating that an increase in BB deficit leads to an increase in CAB deficit, this result supports the existence of the twin deficit hypothesis in the Jordanian economy, a statistically significant positive relationship between CAB and PSGAP, indicating that an increase of PSGAP leads to an increase of CAB deficit. As for the dummy variables, the results showed that the IMF-supported programs (D1) have a

positive but statistically insignificant effect on the CAB. These results are consistent with previous studies on testing the twin deficit hypothesis in the case of Jordan. On the other hand, the results indicated that pegging the dinar exchange rate to the US dollar has a positive and statistically significant effect on the CAB. Meanwhile, the estimation of the elasticity indicated that the CAB exhibits relative inelasticity (elasticity value of 0.29) to changes in the BB. Conversely, the elasticity (1.36) between CAB and the (PSGAP) indicates a highly responsive CAB to variations in PSGAP.

7. Study recommendations

The study's recommendations aim to guide policymakers and researchers in addressing economic challenges and fostering a more balanced and sustainable economic environment in Jordan, considering the TDH does not hold in the Jordanian economy. Firstly, given the positive relationship between budget balance (BB) and current account balance (CAB), indicating the existence of the Twin Deficit Hypothesis in Jordan, policymakers are advised to address the challenge of energy dependency and the high energy import bill rather than solely focusing on fiscal adjustment. In addition to investing in renewable energy sources, policymakers should consider addressing potential risks and barriers to the implementation of renewable energy projects, such as regulatory hurdles or financing constraints. Furthermore,

exploring partnerships with international organizations or neighboring countries to leverage expertise and resources in the renewable energy sector. Secondly, recognizing the bidirectional causality between BB and the private saving-investment gap (PSGAP), the study advocates for diversifying revenue sources and mitigating dependency on foreign aid by promoting key sectors such as tourism, technology, and services. Creating an investment-friendly environment and diversifying into knowledge-based industries can attract foreign investment, fostering economic resilience, However, it's crucial to acknowledge potential risks and barriers to diversification efforts, such as limited human capital or infrastructure constraints. Thirdly, although PSGAP does not show a direct causal relationship with the current account, the positive relationship underscores the importance of policymakers focus on promoting domestic savings and investment. Encouraging savings and facilitating productive domestic investments can contribute to a stable economic environment by developing robust domestic financial markets, Additionally, policymakers should consider conducting further research to explore the relationship between PSGAP and CAB in more detail, perhaps through a sectoral analysis to better understand the dynamics at play. This, in turn, can provide alternative sources of financing, reducing reliance on external borrowing.

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Appendix
Table (8): Study's Data

JD Million / Year	CAB	BB	PSGAP	D1	D2
1980	111.6	-104.0	-397.2	0	0
1981	-13.7	-101.5	-645.0	0	0
1982	-118.3	-113.0	-735.8	0	0
1983	-141.4	-68.7	-704.0	0	0
1984	-104.1	-142.1	-597.9	0	0
1985	-99.9	-112.2	-594.3	0	0
1986	-16.0	-153.1	-398.9	0	0
1987	-118.3	-198.4	-336.4	0	0
1988	-105.5	-341.0	-133.5	0	0
1989	104.9	-137.1	-275.1	1	0
1990	-272.8	-94.5	-634.5	1	0
1991	-288.1	-147.8	-463.2	1	0
1992	-587.7	67.5	-1,106.8	1	0
1993	-446.4	69.5	-1,145.6	1	0
1994	-279.2	44.6	-966.6	1	0
1995	-179.8	15.2	-892.2	1	1
1996	-157.4	16.6	-1,164.5	1	1
1997	20.8	-263.4	-816.8	1	1
1998	15.5	-327.3	-696.0	1	1
1999	287.1	-140.4	-852.4	1	1
2000	19.5	-119.8	-1,414.2	1	1
2001	-17.7	-155.5	-1,360.4	1	1
2002	355.7	-205.1	-1,003.9	1	1
2003	849.8	-79.0	-1,355.9	1	1
2004	27.7	-116.7	-2,146.8	1	1
2005	-1,610.6	-40.5	-3,360.2	0	1
2006	-1,223.8	-391.4	-2,964.7	0	1
2007	-2,038.0	-568.8	-3,657.8	0	1
2008	-1,457.2	-338.2	-4,294.6	0	1
2009	-882.6	-1,509.2	-2,323.7	0	1
2010	-1,336.3	-1,045.2	-2,851.9	0	1
2011	-2,098.8	-1,382.7	-3,983.4	0	1
2012	-3,344.9	-1,824.0	-4,331.0	1	1
2013	-2,487.7	-1,318.0	-5,742.1	1	1
2014	-1,851.7	-583.5	-6,132.3	1	1
2015	-2,463.3	-925.9	-5,175.1	1	1
2016	-2,734.4	-878.6	-4,766.2	1	1
2017	-3,118.6	-747.9	-5,454.5	1	1
2018	-2,103.1	-727.7	-4,826.6	1	1
2019	-548.7	-1,058.4	-2,986.4	1	1
2020	-1,778.5	-2,182.5	-3,399.4	1	1
2021	-2,639.5	-1,730.6	-4,900.2	1	1
2022	-2,944.6	-1,552.6	-4,170.6	1	1
Average (1980-2022)	**-879.4**	**-505.0**	**-2,236.2**		

Source: - For CAB and BB, The Central Bank of Jordan, annual statistical bulletin, several issues.
- For PSGAP, The World Bank, and The IMF databases and researcher calculations.
- D1 for the IMF-supported program, D2 for pegging the exchange rate of Dinar with the US Dollar.