Al-Zaytoonah Journal of Business, Vol. 01 No. 03, November 2025

The long run cointegration Relationship among Macroeconomic Variable and Total Investment In Jordan

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Abstract
This study aimed to identify the cointegration relationship among macroeconomic variables (economic growth rate, inflation rate, income and profit tax rate, budget deficit after grants, balance of payments deficit) and investment volume in Jordan using time series data from 1990 to 2025 and Autoregressive Distributed Lag Model (ARDL) will be used to analyze the cointegration relationship between selected economic indicators. The results show that there existence of both long-term and short-term relationships between the selected macroeconomic indicators and the investment volume in Jordan. The policy makers must pay more attention to the importance of size of investment in Jordan, Intensifying the efforts by the relevant authorities to facilitate the process of obtaining approvals and licenses, and providing greater incentives for investors, in order to create a secure investment environment, encourage investment, and increase its rates.

1 Introduction

The world today faces many successive changes that affect the economy in one way or another, in addition to the environmental and political disasters that the world is witnessing, which have impacted the macroeconomic indicators of countries. As a result, the economy under these changes has become a single interconnected entity that influences and is influenced by these changes. Consequently, macroeconomic indicators reflect the economic outlook and are considered an essential part of economic data. Economic analysts also resort to using these indicators to interpret the standards and potential of current and future investments (Bekhet and Al-smadi, 2015)

Investment is considered one of the main economic factors that contribute to the performance and stability of the Jordanian economy and can positively contribute to the utilization of available resources, as well as economic and social growth. Consequently, it helps increase production and productivity levels, as investment contributes to improving the economic situation and is an important factor for development and driving the Jordanian economy. Therefore, governments seek, through a series of economic reforms, to provide a stimulating and suitable environment for investment and to facilitate procedures and policies related to investment in order to achieve economic advancement (Bekhet and Al-smadi, 2015; Bekhet and Al-smadi, 2017). Hence, this study was conducted to identify the impact of selected macroeconomic indicators on the growth of investment size in Jordan.

The problem of the study lies in the weak overall investment in Jordan, which is mainly due to the nature of the changes associated with the selected macroeconomic indicators (economic growth rate, inflation rate, income and profit tax rate, budget deficit after grants GDR%, balance of payments deficit).

The Jordanian economy faces many difficult challenges such as unemployment, inflation, and budget deficits, among many others, all of which negatively affect the Jordanian economy as a whole. Since macroeconomic indicators play a major role in encouraging or limiting these investments, this study attempts to clarify the nature and direction of the causal relationship between macroeconomic indicators and the growth of Jordanian investment.

2 Literature Review and Hypotheses

The main objective of the current study is to measuring the relationship between selected macroeconomic indicators and the volume of investment in Jordan in the short and long term. However, several empirical studies have examined the relationship between macroeconomic indicators and the volume of investment, the study of Megaravalli, & Sampagnaro (2018) aimed to examine the long-term and short-

term relationships between India, China, and the Japanese stock markets, as well as key macroeconomic variables such as exchange rates and inflation (based on the Consumer Price Index in the economies of India, China, and Japan). Monthly time series data from January 2008 to November 2016 were used. Unit root tests, cointegration tests, and Granger causality tests were conducted. The study's results indicate that the exchange rate has a positive and significant long-term effect on stock markets, while inflation has a negative and insignificant long-term effect. In the short term, there is no statistically significant relationship between macroeconomic variables and stock markets.

Abidin, & Haseeb (2018) his study aimed to investigate the impact of macroeconomic indicators such as GDP per capita, inflation, and the real exchange rate. A panel time series from 1990-2017 was applied. The gravity model approach was used as a theoretical support. The results of the fixed and random effects show that all the variables are statistically significant. However, variables such as the real exchange rate, inflation, and distance were found to be negatively significant, meaning that as these variables increase, the total bilateral trade between Malaysia and the GCC countries will decrease. Also, Nyangarika et al. (2019) this study aimed to investigate the impact of oil price shocks on Russian economic indicators using time series data for the period 1991-2016 to cover all oil price shocks. An autoregressive vector and the Dickey-Fuller test were used to examine the long-term and short-term relationships between the variables. The results show that one of the most important external influencing factors is the global oil price, and there is a significant long-term positive relationship between oil prices and the dynamics of Russian GDP.

Javid, M. (2019) This study aimed to investigate the relationship between investment in infrastructure and economic growth at both the aggregate and sectoral levels, namely the industry, agriculture, and services sectors of Pakistan during the period from 1972 to 2015. It also compares the analysis of different compositions of infrastructure investments, including public versus private investment and investment in infrastructure in sub-sectors such as energy, roads, and telecommunications. The Fully Modified Ordinary Least Squares (FMOLS) method was used to address the issue of reverse causality. The main conclusion of this study is that both public and private infrastructure investments have positive but different effects on economic growth.

Ćorić, & Šimić (2021) this paper examines the long-term relationship between economic disasters and aggregate investment. We analyze data for a large number of developing and developed countries after World War II. The panel data analysis conducted indicates a negative effect of the likelihood of economic disasters on total investment. Also, Gavurova, et al (2021) this study aimed to investigate the relationships between macroeconomic indicators related to tourism and their impact on the economies of countries. The dataset consists of eight macroeconomic indicators, including four GDP-related indicators, two employment indicators, one investment indicator, and one expenditure indicator. The observed period covers the years from 1995 to 2019. Euclidean distance is used to assess the similarity between countries, and cluster analysis is applied to group them accordingly. Several patterns emerge from the analysis results. First, countries behave differently regarding the two sets of indicators, with Mexico ranking first. Second, some countries experienced significant changes during the observed period, with Greece at the extremes for GDP indicators and Hungary for the other economic indicators.

In order to achieve the objectives of the study and address its questions leading to a solution to the study problem, the following main hypothesis was formulated:

1. There is no statistically significant effect at the significance level ($\alpha \leq 0.05$) in measuring the relationship between selected macroeconomic indicators and the volume of investment in Jordan in the long term.
2. There is no statistically significant effect at the significance level ($\alpha \leq 0.05$) in measuring the relationship between selected macroeconomic indicators and the volume of investment in Jordan in the short term.

3 METHOD

The study relied on the descriptive analytical approach by describing the phenomenon under investigation, represented by the macroeconomic indicators, and analyzing the obtained data, including (economic growth rate GDP, inflation rate INF, and income and profit tax rate T, budget deficit after grants BD, balance of payments deficit BOP, and total public debt TIN) and the growth of the Jordanian investment volume. The current study measures Jordan's macroeconomic indicators and the growth of investment in Jordan based on data issued by the Central Bank of Jordan.

In previous years, many prior studies discussed the relationship between selected macroeconomic indicators GDP, INF, T, BD, BOP and investment size (Tin) (Bahriddinovich, 2020; Al-smadi, and Al-smadi, 2024). In this study, the research model will be built based on prior studies that relied on economic theories. However, the study model can be constructed as shown in Equation No. (1)

$$LTINt = \alpha + \beta 1LGDPt + \beta 2LINFt + \beta 3LTt + \beta 4LBDt + \beta 5LBOPt + \text{Ɛ}t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where, α is intercept; βIS (1,5) are Variable coefficients; natural logarithms is L; and tƐ Random error TIN is Investment size; GDP is Economic growth rate; INF is Inflation rate; T is Income and profit tax rate; BD is Budget deficit after grants and BOP is Balance of payments deficit.

In this study, time series data from 1990 to 2025 will be used to analyze the cointegration relationship between selected economic indicators (GDP, INF, T, BD, BOP) and the investment volume TIN in Jordan. The following data were collected: GDP, INF, T, BD, BOP) from the Central Bank, and data related to investment volume (TIN) from the Ministry of Investment, as shown in the following table 1.

Table 1. Is Sources of study variables.

Variables	sources
TIN	Ministry of Investment https://www.moin.gov.jo
GDP	Central Bank :https://www.cbj.gov.jo/
INF	Central Bank :https://www.cbj.gov.jo/
T	Central Bank :https://www.cbj.gov.jo/
BD,	Central Bank :https://www.cbj.gov.jo/
BOP	Central Bank :https://www.cbj.gov.jo/

Based on the above discussion, this study examines the long and short term relationship among the variables (GDP, Inflation, Trade, Budget Deficit, Balance of Payments) in Jordan by using Autoregressive Distributed Lag Model (ARDL) (Al-smadi, and Al-smadi, 2024; Bekhet and Al-smadi, 2015)., as shown in equation number (2).

$$\Delta LTIN_t = \mu_1 + \sum_{j=1}^{k} \beta_{11}\Delta LTIN_{t-j} + \sum_{j=0}^{k} \beta_{12}\Delta LGDP_{t-j} + \sum_{j=0}^{k} \beta_{13}\Delta LINF_{t-j} + \sum_{j=0}^{k} \beta_{14}\Delta LT_{t-j} + \sum_{j=0}^{k} \beta_{15}\Delta LBD_{t-j} + \sum_{j=0}^{k} \beta_{16}\Delta LBOP_{t-j} + \text{Ŋ}_{11}LTIN_{t-1} + \text{Ŋ}_{12}LGDP_{t-1} + \text{Ŋ}_{13}LINF_{t-1} + + \text{Ŋ}_{14}LT_{t-1} + \text{Ŋ}_{15}LBD_{t-1} + \text{Ŋ}_{16}LBOP_{t-1} + \varepsilon_t \quad (2)$$

Where μ is intercept, βijs = (i, j = 1, ...) are short-term relationship coefficients and Ŋijs = (i, j = 1, ...) are the long-term relationship coefficients and εt is represent the error term.

4 RESULTS

In this part, the impact of selected macroeconomic indicators (GDP, T, BD, BOP, INF) and the volume of investment in Jordan (TIN) for the period 1990-2025 was analyzed. The results of the statistical analysis and hypothesis testing were presented by following the following statistical procedures: First: descriptive analysis of the variables, Second: unit root test, Third: co-integration test, Fourth: analysis of the long-term and short-term relationship between the variables, Fifth: stability analysis.

The independent variables of the selected economic indicators (GDP, T, BD, BOP, INF) and the investment volume in Jordan (TIN) were measured during the selected period (1990-2025). The first procedure in this section is the descriptive statistical analysis of the data by calculating the mean and standard deviation of the data, as shown in Table (2).

Table (2). Descriptive statistical analysis

indicators	TIN	GDP	T	BD	BOP	INF
Mean	21.38	22.10	0.134	-1064.8	-426.33	3.674
Median	23.34	23.00	0.139	-737.5	-298.45	3.320

indicators	TIN	GDP	T	BD	BOP	INF
Maximum	21.85	22.19	0.207	841.60	422.10	16.19
Minimum	19.38	21.73	0.067	-3354.9	-2282.4	-0.876
Std. Dev.	0.695	0.82	0.028	1152.6	523.90	3.685
Skewness	0.398	-0.03	0.041	-0.3267	-1.5564	1.809
Kurtosis	1.994	1.52	3.222	1.8988	3.9731	3.847
Jarque-Bera	2.194	2.92	0.075	2.1861	4.7106	3.119
Probability	0.333	0.23	0.963	0.3351	0.2400	0.124

Source: Output of the Eviews 7.2 econometric software

Table 2 show that the mean of the dependent variable, Investment Size TIN, is 21.38 (with a standard deviation of 0.6959), the minimum value is 19.38, and the maximum value is 21.859. The highest value among the independent variables is the Gross Domestic Product (GDP), with a mean of 23.10356 and a standard deviation of 0.821. Also Table 2 show that the results of the J.B test confirm that all selected variables (GDP, T, BD, BOP, INF) are normally distributed, which means that there is no problem of multicollinearity and no dispersion in the data (Gujarati, 2021).

The result of stationarity in time series is one of the important aspects of analysis that relies on temporal data, particularly financial and economic data. This is because non-stationary data produces incorrect or misleading results, which is called spurious regression. There are statistical methods used to test data stationarity, the most important of which is the unit root test, which aims to examine the properties of the time series for each variable (Gujarati, 2021). To test the stationarity of time series, the most important unit root test used is the Augmented Dickey-Fuller (ADF) test, as shown in Table 3.

Table 3. Unit root test result Augmented Dickey-Fuller (ADF) test

Regressor	I(0)	I(1)
TIN	-2.425763	4.818766*
GDP	-1.854567	-3.906338**
T	-3.997470	-8.90344*
BD	-1.646876	-5.448223*
BOP	-1.654070	-5.576050*
INF	-4.947654	-8.042392*

Notes: (1) * and ** denotes statistically significance at 1%, 5% levels.
Source: Output of the Eviews 7.2 econometric software

In this section, the cointegration model was used, as this test aims to determine whether there is cointegration among the study variables. The existence of cointegration between the study variables indicates that there is a long-term relationship between them (Bekhet and Smadi 2016; Bekhet and Mugableh 2012). A decision regarding the presence of cointegration among the study variables can be made based on comparing the calculated value of (F value) with the Pesaran 2001 table. If the calculated F value is higher than the I(1), this indicates that there is a cointegration relationship between the study variables; whereas if the calculated F value is lower than the I(0) table value, this means that there is no cointegration relationship between the study variables, as shown in Table 4.

Table 4. Cointegration between the study variables

Models	F-statistic	Bound Critical Values	Decisions
		1% → I(0): 2.61 , I(1): 3.86 **5%** → I(0): 3.50 , I(1): 5.12	
TIN	4.91	2.61, 3.86, 3.50, 5.12	Cointegration
GDP	4.87	2.61, 3.86, 3.50, 5.12	Cointegration
T	3.79	2.61, 3.86, 3.50, 5.12	Cointegration

Models	F-statistic	Bound Critical Values	Decisions
BD	4.82	2.61, 3.86, 3.50, 5.12	Cointegration
BOP	4.47	2.61, 3.86, 3.50, 5.12	Cointegration
INF	4.11	2.61, 3.86, 3.50, 5.12	Cointegration

Source: Output of the Eviews 7.2 econometric software

In this section, the long-term relationship between macroeconomic variables (GDP, T, BD, BOP, INF) and the volume of investment in Jordan (TIN) was analyzed using the ARDL model, which allows examining the explanatory variables for long-term dynamics across all the study variables. Table (5) shows the long-term relationship between the study variables.

Table 5. Long-term relationship

Regressor	Coefficient	Prob
C	5.8308	0.000*
GDP	.98973	0.001*
T	-8.1708	0.00*
BD	-19460.0	0.004*
BOP	-9574.8	0.003*
INF	-9.4807	0.002*

Notes: (1) * denotes statistically significance at 1% levels.
Source: Output of the Eviews 7.2 econometric software

The results in the long-term relationship analysis between the size of investment (TIN) and the selected macroeconomic indicators (GDP, T, BD, BOP, INF) showed that there is a long-term relationship among the study variables. There is a significant positive relationship with the investment size indicator (TIN) and GDP. This means that working on investment laws and regulations and making them characterized by clarity, transparency, and attractiveness leads to the availability of a suitable investment environment and improves economic conditions. Generally, this will necessarily lead to an improvement in the level of economic growth, which will positively reflect on the increase in investment size (Al-Quraan, 2020).

In addition, the results showed that there is a significant negative relationship between the size of investment (TIN) and each of (T, BD, BOP, INF). This is consistent with economic theories and previous studies, such as the study by Qadi (2006), which suggested an inverse relationship between the size of investment (TIN) and the income and profit tax index (T). This means that the higher the tax rate on income and profits, the higher the costs associated with investing, which leads to a decrease in the size of investment. The results also showed that there is a significant negative relationship between the size of investment (TIN) and the inflation rate (INF), as these results are consistent with economic theories and previous studies, such as the study by Fatkhurrozi, (2024), which assumed the existence of an inverse relationship between the size of investment (TIN) and the inflation rate (INF), indicating that as the inflation rate rises, it leads to a decrease in the size of investment.

The results in of the short-term relationship between selected macroeconomic indicators (GDP, T, BD, BOP, INF) and the investment volume in Jordan (TIN) in table 6 that showed there is a short-term relationship between the study variables .

Table 6 short-term relationship

Regressor	Coefficient	Prob
C	6.7308	0.000*
GDP	.88973	0.003*
T	-6.5608	0.00*

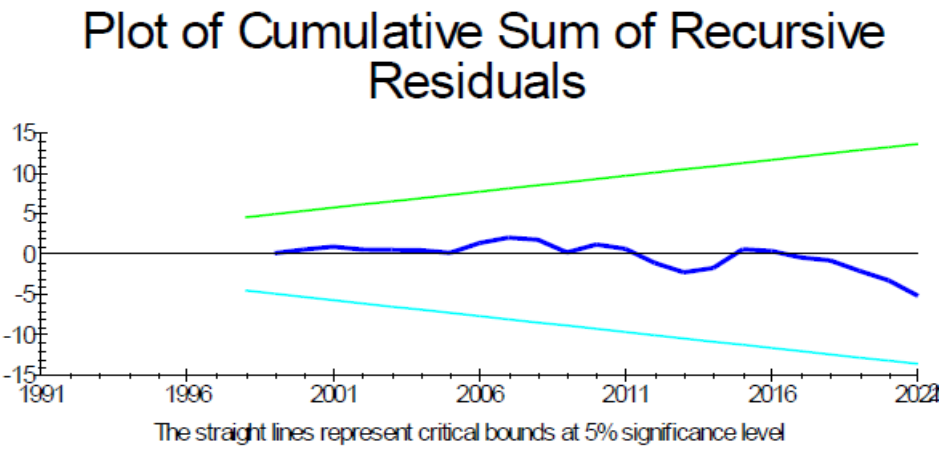
Regressor	Coefficient	Prob
BD	- 414630	0.002*
BOP	-803208	0.001*
INF	-9.4009	0.004*
ECM (-1)	-0.80	0.000

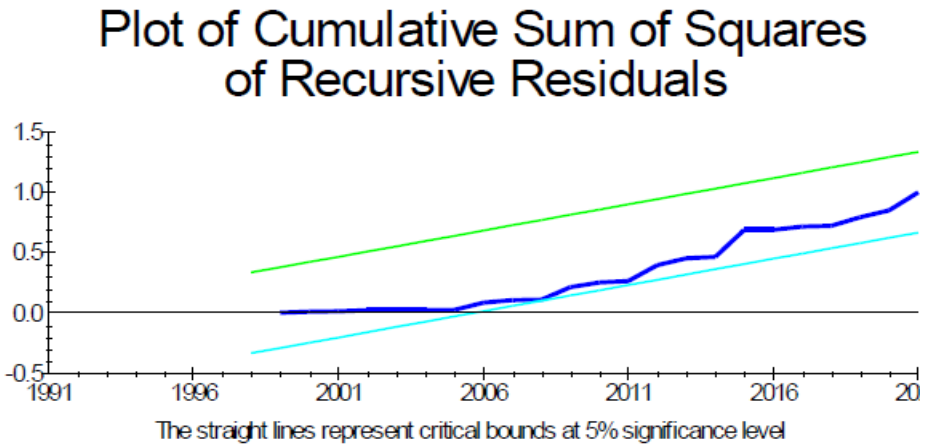
Notes: (1) * denotes statistically significance at 1% levels.
Source: Output of the Eviews 7.2 econometric software

Table 6 shows there is a significant positive relationship between the Investment Size Index (TIN) and Gross Domestic Product (GDP), which means that working on the laws and regulations governing investment and making them characterized by clarity, transparency, and attractiveness leads to a suitable investment environment and improves economic conditions. In general, this will necessarily lead to an improvement in the level of economic growth, which will positively reflect on the increase in investment size (Al-Quraan, 2020). The results of this study are consistent with the results of many previous studies, such as the study by Bekhet and Smadi (2016), which showed the existence of a short-term relationship between investment size and economic growth.

In addition, the results showed that there is a significant negative relationship between the size of investment (TIN) and each of (T, BD, BOP, INF). This is consistent with economic theories and previous studies such as the study by Qadi (2006), which suggested a negative relationship between the size of investment (TIN) and the tax rate index (T). This means that the higher the tax rate, the higher the costs associated with investments, which leads to a decrease in the size of investment. Also, the results shown in Table 6 indicate that the ECM (-1) is 0.80, which means that this model will achieve equilibrium from the short term to the long term at a rate of 80%. In other words, the long-term relationship corrected itself quickly within one year.

However, the Cumulative Sum of Recursive Residuals (CUSUM) test was used in the time series to ensure the long-term stability of the variables. The results showed that the data for the variables are stable in the long term, which means that all the variables in the study are stable in the long term, confirming the presence of cointegration among the study variables. These results are consistent with similar previous studies, such as the study by Bekhet and Smadi (2016).





5 Conclusion

This study aimed to identify the common integration among macroeconomic variables (economic growth rate GDP, inflation rate INF, income and profit tax rate T, budget deficit after grants BD, balance of payments deficit BOP, and investment volume in Jordan Tin), and to measure the indicators of the Jordanian economy and investment in a realistic manner based on statistical data related to the variables covered in this study.

Based on the analysis results showed there existence of both long-term and short-term relationships between the selected macroeconomic indicators (GDP, T, BD, BOP, INF) and the investment volume in Jordan (TIN). Thus, the results indicated the existence of a statistically significant effect between macroeconomic indicators (economic growth rate, inflation rate, income and profit tax, budget deficit after grants, balance of payments deficit) and the volume of investment in Jordan over the long term. The results of the first hypothesis showed a significant positive relationship between the economic growth rate and the volume of investment in Jordan. This result can be interpreted to mean that the economic growth rate positively affects the volume of investment, as higher growth rates act as a key factor in attracting and drawing investments, which ultimately leads to the prosperity and advancement of the national economy.

Also, the results showed a significant negative relationship between (inflation rate, income and profit tax, budget deficit after grants, and balance of payments deficit) and the size of investment in Jordan in the long term. This is interpreted to mean that these indicators have a negative impact on the level of investment, meaning that these indicators lead to an unstable environment for attracting investments, which consequently weakens the national economy. From this point of view, the policy makers must pay more attention to the importance of size of investment in Jordan, Intensifying the efforts by the relevant authorities to facilitate the process of obtaining approvals and licenses, and providing greater incentives for investors, in order to create a secure investment environment, encourage investment, and increase its rates. Also, giving more attention to laws and regulations that encourage the attraction of investments, whether local or foreign, as they have a clear impact on improving economic conditions, which in turn reflects on the overall standard of living.

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