

Interaction Among Economic Growth and Some Macroeconomic Variables in Jordan

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Abstract

This research explores the interaction between economic growth and some Macroeconomic Variables in Jordan (public expenditures, trade openness, foreign direct investments, gross capital formation, Labor force, inflation rates), annual time series from 1980 to 2022 employed, utilizing the auto-regressive distributed lag (ARDL) bounds testing method for cointegration to provide policy recommendations regarding the effectiveness of macroeconomic factors both in the short and long term. The empirical findings show that gross domestic product (GDP) cointegrated with macroeconomic variables. The outcomes of the long-run analysis indicate that public expenditures, gross capital formation, and the labor force positively influence Jordan's economic growth. In the short run, public expenditures, gross capital formation, and low inflation rates, have a favorable impact on economic growth in Jordan. However, trade openness has negative impact on Jordan's economic growth in short run. The study suggests that Jordanian policymakers should focus on enhancing gross capital formation levels, maintaining low inflation rate, reviewing trade liberalization policies.

Jel: H54, Oi, H4, P33. L9, C32

Keywords: Economic growth, inflation, public expenditures, FDI, ARDL.

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1. INTRODUCTION

Globalization has led to a notable rise in economic integration, trade openness and foreign investments characterizing the current stage. Economic growth is closely linked to a country's ability to efficiently allocate its economic resources in line with a strategic plan aimed at achieving sustainable growth. Economic openness is viewed as a crucial element in attracting foreign investments. A nation that boasts a high degree of economic freedom and fosters an investment-friendly environment is more likely to develop effective planning policies geared toward sustainable growth (Hye and Lau, 2015). The influx of foreign investments, particularly those focused on productivity, aids other sectors of the economy in supplying essential inputs, which in turn propels economic growth. Amid global competition, human resources have become increasingly significant to the production process. The labor force currently serves as the foundation of economic productivity. Recently, several nations have adopted a new Keynesian perspective, emphasizing that governments must significantly contribute to economic growth by increasing public expenditures. The linkage between public expenditures and economic growth has been formed by theoretical concepts introduced by Wagner and Keynes. Wagner contended that economic growth drives public expenditure, while Keynes defended the notion that public spending fuels economic growth. In his analysis of various 19th-century countries, Wagner (1883) observed a consistent rise in public expenditures, which he attributed to the evolving responsibilities of the state within economic and social realms. Wagner proposed that societal advancement exerted pressure, prompting modifications in the economic roles of both the public and private sectors (Musgrave and Peacock, 1958). Conversely, Keynes posited that public spending acts as an external instrument that can be employed as a policy measure aimed at influencing economic growth and addressing short-term fluctuations.

Unlike Wagner, Keynes (1936) maintained that public expenditures do not emerge from economic growth, but rather that economic growth arises from elevated public expenditure. The pursuit of sustained and equitable economic growth remains a primary objective of public expenditure policy. Numerous public initiatives are specifically designed to foster sustained and equitable economic growth. Over time, public expenditures can play a vital role in the formation of both physical and human capital. Well-structured public spending can also effectively enhance economic growth, even in the short term, when constraints on infrastructure or skilled labor become significant barriers to production increases. Low inflation and exchange rate stability will sustain economic growth, Fischer (1993) ensure that high inflation has negative impact on economic growth by decreasing investment and reducing productivity.

Economic growth in Jordan is viewed as a critical issue that economic decision-makers aim to resolve. Investigating the connection between economic growth and various macroeconomic factors in Jordan is a crucial topic that has captured the researcher's interest in this study. Nowadays, economic growth has experienced a notable decline, presenting a substantial obstacle to economic development. This research examines several key factors, exploring how their interactions with other variables might positively influence growth. The primary aim of this study is to analyze the long and short run relationships between economic growth and various macroeconomic variables in Jordan from 1980 to 2022 by utilizing autoregressive distributed lag (ARDL) model developed by Pesaran et al. (2001).

2. LITERATURE REVIEW

Today global economy marked by significant interconnections among macroeconomic variables, particularly due to economic globalization and increased openness between nations. National economies are rapidly affected by international changes, such as investment, inflation, and labor force. Countries that can effectively manage the interplay of these variables with economic growth are those that have succeeded in sustaining economic development while also mitigating the adverse impacts of globalization. Numerous studies have examined the strong interrelations between macroeconomic indicators and growth. Aydın et al. (2016) employed dynamic panel data to explore the link between inflation and economic growth across five countries (Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, and Turkmenistan). The results revealed a nonlinear relationship between the growth rate and inflation. Švigir et al. (2017) analyzed the correlation between inflation and economic growth in Austria and Italy from 1980 to 2016, two nations with historically low inflation rates. Results indicated that while low inflation is essential, it alone does not guarantee economic growth.

Raghutla (2020) investigated the effect of trade openness policy on economic growth in five developing economies using panel data from 1993 to 2016. The empirical findings, confirm the existence of long-term relationships among trade openness, financial development, inflation, labor force participation, technology and economic growth. The results of the panel non-causality tests further reveal a unidirectional causal relationship between short-term financial development and trade openness, as well as a bidirectional connection between inflation and economic growth. Ultimately, the findings indicate that in these five developing economies, trade openness policies play a crucial role in boosting economic growth.

Nguyen and Hung (2020) analyzed how Vietnam's labor force and various macroeconomic elements influence the nation's economic growth. Leveraging a secondary time series data set spanning 1998 to 2018, the researchers employed an empirical model to conduct regression and correlation analyses the effects of the labor

force, foreign direct investment, exports, and inflation on Vietnam's economic growth. The results indicate that both the labor force and foreign direct investment positively impact economic growth, exports of goods and services also have a positive effect, while the annual inflation rate negatively influences economic growth.

Meyer and Sanusi (2019) examined the relationships between employment, gross fixed capital formation and economic growth in South Africa. Using data from 1995Q1 to 2016Q4, the study utilized Johansen cointegration and Vector Error Correction Models (VECM). Findings reveal a long-term connection among employment, domestic investment, and economic growth. Additionally, the results indicate that investments positively affect employment in the long run. The data also suggests a unidirectional causal relationship from investment to employment, alongside a bidirectional relationship between employment and economic growth.

Pasara and Garidzirai (2020) examine the causal relationships among Gross Capital Formation, Unemployment, and Economic Growth in South Africa by utilizing time series data spanning from 1980 to 2018 within a Vector Autoregressive (VAR) framework. Their findings show a favorable long-term correlation between gross capital formation and economic growth, additionally suggesting that unemployment has no effect on economic growth (GDP) in the short term.

Miku et al. (2023) examined the relationship between economic growth and trade openness in Tanzania, annual time series data from 1970 to 2021 used, Vector Autoregressive employed, the findings revealed that trade openness has a substantial and positive effect on Tanzania's economic growth, Additionally, there is a statistically significant negative correlation between GDP growth rates and gross national savings.

Burange et al. (2019) utilized analysis as an econometric method to investigate the causal relationship between trade openness and economic growth for BRICS member countries. Annual time series used since the late 1980s, results revealed that a growth-led trade in India services sector, growth-led export and import hypotheses for China and South Africa; however, no clear causal relationship was established for Brazil and Russia.

Chen et al. (2020) scrutinized the relationship between government expenditures and Vanuatu's economic growth between 1981 and 2016. Results confirms that fiscal variables and investment growth have causal influences on economic growth in Vanuatu in short run. Emrah et al. (2019) checked the Granger-causal relationships between trade openness and economic growth in Turkey from 1950 to 2014. Findings show that there is a strong relationship between trade openness and economic growth

Fatima et al. (2020) investigated the effects of trade openness on GDP growth. Generalized method of moments (GMM) estimator used, specifically designed for dynamic panel data models. Study data encompasses both developed and developing

countries from 1980 to 2014. The results revealed an interesting indirect relationship between GDP growth and trade openness. Wuladari et al. (2020) examined the relationship between economic growth and macroeconomic factors such as export, investment, and E-money transactions in Indonesia. The quarterly time series from 2010 to 2017 used. The Vector Error Correction Model (VECM) to identify short- and long-run relationships. Results revealed that Economic growth in Indonesia influenced positively by investment in long and short run, however, influenced negatively by export and E-money transactions.

Haque et al. (2019) conducted a study that explores the connection between the labor force participation rates of both genders, gross fixed capital formation, and economic growth in Bangladesh, utilizing annual time series data from 1991 to 2017. The findings reveal two bidirectional links: one between overall labor force participation and economic growth, and the other between gross fixed capital formation and economic growth. Additionally, the results indicate a unidirectional causal relationship between female labor force participation to economic advancement in Bangladesh. The study also demonstrates that both total and female labor force participation has significant positive effects on economic development in the short run, but negative effects in the long run. Conversely, gross fixed capital formation shows significant short-term negative implications for economic growth, while it has a clear positive impact on Bangladesh's economic development in the long term.

Dinh et al. (2019) examined how foreign direct investment (FDI) impact on economic growth in developing countries within the lower-middle-income group from 2000 to 2014. To ensure the reliability of the findings, a range of econometric methods were employed, such as the Johansen cointegration test, Fully Modified OLS (FMOLS), Vector Error Correction Model (VECM), and panel-based unit root test. The results of the study suggest that although FDI has a negative short-term effect on the country's economic growth analyzed. In the short run, an increase in money supply promotes growth, while a rise in the overall credit extended to the private sector has the opposite effect. Moreover, factors such as money supply, human capital, total domestic investment, and domestic credit for the private sector are identified as the primary drivers of long-term economic growth.

Rahman et al. (2023) explored the relationship between government expenditure and economic growth in the SAARC nations (Bangladesh, India, Pakistan, Sri Lanka, and Bhutan). panel data from 2011 to 2020 employed. random effects panel OLS model technique used; results indicated that government spending in SAARC countries has a significant positive effect on GDP

Fazaalloh (2024) analyzed sectoral data at the provincial level across Indonesia's 33 provinces to study the role of foreign direct investment (FDI) in economic growth from

2010 to 2019. Results indicate that FDI generally exerts a significant positive influence on economic growth in Indonesian provinces. Furthermore, the findings indicate that foreign direct investment (FDI) substantially enhances economic growth in manufacturing sector, mining, water, gas, electricity, hotels, restaurants, and real estate sectors.

Nguyen et al. (2023) examined the connection between trade openness and the three main components of macroeconomic from 2011 to 2019 in 20 Asian countries stability—growth, inflation, and exchange rate. The autoregressive distributed lag (ADRL). The results indicated that, in the short term, exchange rate stability was positively associated with trade openness, while growth stability in Asian countries was negatively associated with it. However, no correlation was found between trade openness and inflation stability, which suggests a need for further investigation. Through an analysis of labor, capital stock, and trade openness as determining variables.

Keho (2017) explored the relationship between trade openness and economic growth in Cote d'Ivoire from 1965 to 2014. It utilized Granger causality along with the Autoregressive Distributed Lag Bounds test for cointegration. The results indicate that trade openness fosters economic growth both in the short and long term. Additionally, the findings highlight a strong and positive relationship between trade liberalization and the capital accumulation in promoting economic growth. Poku et al. (2022) analyzed data from 1970 to 2016, utilizing the ARDL econometric estimation technique to explore the relationship between government expenditure and economic growth in Ghana. The empirical findings reveal a short-term positive association between government spending and economic growth. Moreover, the results exhibit a robust positive correlation between GDP and foreign direct investment in both the short and long term. Conversely, an inverse relationship was observed between population growth and GDP growth.

3. Model specification and Methodology

Production function represented the framework for classical and neoclassical growth theories, interaction between economic growth and macroeconomic variables presented in extended production function as follow:

$$\text{Traditional production function } Q = AF(L, K) \quad (1)$$

By extending production function by introducing some macroeconomic variables, foreign direct investment (FDI), trade Openness (OP), inflation rate (INF), gross capital formation(K), and public expenditures (PEX), it become:

$$Q = C L^\beta, K^\alpha, OP^\delta, FDI^\gamma, INF^\theta, PEX^\theta \quad (2)$$

By applying the natural logarithm to both sides of equation (2), estimation function become as follows:

$$\ln GDP = C + \beta \ln L + \alpha \ln K + \delta \ln OP + \gamma \ln FDI + \phi \ln INF + \theta \ln PEX + e \quad (3)$$

$$f_K \geq 0, f_L \geq 0, f_{op} \geq 0, f_{INF} \geq 0, f_{FDI} \geq 0, f_{PEX} \geq 0$$

Where \ln denotes natural logarithm, C represents a constant parameter, e is the error term, $\beta, \alpha, \delta, \gamma, \phi, \theta$, denote constant elasticity coefficients of output.

3.1 ARDL Procedures

This research utilizes the ARDL bounds testing method for cointegration introduced by Pesaran, Shin, and Smith (2001) to analyze the empirical connections between the study variables. The ARDL model provides reliable outcomes, especially when dealing with small sample sizes.

$$\ln GDP = C + \beta \ln L + \alpha \ln K + \delta \ln OP + \gamma \ln FDI + \phi \ln INF + \theta \ln PEX + e$$

$$\begin{aligned} \Delta GDP_t = C + \eta GDP_{t-1} + \beta L_{t-1} + \alpha K_{t-1} + \delta OP_{t-1} + \gamma FDI_{t-1} + \phi INF_{t-1} + \\ \theta PEX_{t-1} + \sum_{i=1}^p \eta_2 GDP_{t-i} + \sum_{i=0}^p \beta_2 L_{t-i} + \sum_{i=0}^p \alpha_2 K_{t-i} + \sum_{i=0}^p \delta_2 OP_{t-i} + \\ \sum_{i=0}^p \gamma_2 FDI_{t-i} + \sum_{i=0}^p \phi_2 INF_{t-i} + \sum_{i=0}^p \theta_2 PEX_{t-i} + \varepsilon_t \quad (4) \end{aligned}$$

In this context, Δ denotes the first difference operator; C represents an intercept, ε_t error term, the long-run coefficients are labeled as $\eta, \beta, \alpha, \delta, \gamma, \phi, \theta$, whereas $\eta_2, \beta_2, \alpha_2, \delta_2, \gamma_2, \phi_2, \theta_2$ indicate the short-run coefficients that form the underlying ARDL model.

Subsequently, the short-run dynamics can be derived through the error-correction model (ECM) presented in Equation (5), which is outlined as follows:

$$\begin{aligned} \Delta GDP_t = C + \sum_{i=1}^p \eta GDP_{t-i} + \sum_{i=0}^p \beta L_{t-i} + \sum_{i=0}^p \alpha K_{t-i} + \sum_{i=0}^p \delta OP_{t-i} + \sum_{i=0}^p \gamma FDI_{t-i} + \\ \sum_{i=0}^p \phi INF_{t-i} + \sum_{i=0}^p \theta PEX_{t-i} + \mu ECM_{t-i} + \varepsilon_t \quad (5) \end{aligned}$$

3.2 Data definition and sources

This article utilizes secondary data primarily gathered from the World Bank. The econometric analysis focuses on an annual time series spanning from 1980 to 2022. Various proxy indicators have been identified to assess the dynamic relationship

between the selected variables and their impact on economic growth in Jordan. Gross domestic product (GDP) at current prices serves as a proxy for economic growth.

Table 1. Descriptive Statistics (1980-2022)

	LOG(GDP)	LOG(FDI)	LOG(L)	LOG(OP)	LOG(INF)	LOG(PEX)	LOG(K)
Mean	23.22347	-1.466093	7.065491	4.318535	0.920980	8.339034	1.443994
Median	22.91780	-1.019069	7.090721	4.333969	1.250957	8.004733	1.316408
Maximum	24.60799	1.265258	8.009396	4.720162	3.246986	9.598435	2.246015
Minimum	22.08681	-6.607795	6.040255	3.871549	-6.907755	7.349745	0.565314
Std. Dev.	0.874359	2.098723	0.604045	0.185545	1.590257	0.764281	0.507600
Skewness	0.345045	-0.545550	-0.143221	-0.088585	-2.874027	0.343919	0.121944
Kurtosis	1.545925	2.216786	1.941132	3.161985	14.83518	1.493604	1.637307
Jarque-Bera	4.641416	3.232033	2.155825	0.103252	310.1584	4.913375	3.433576
Probability	0.098204	0.198689	0.340305	0.949684	0.000000	0.085718	0.179642
Sum	998.6094	-63.04201	303.8161	185.6970	39.60214	358.5785	62.09173
Sum Sq. Dev.	32.10914	184.9948	15.32457	1.445930	106.2145	24.53329	10.82162
Observations	43	43	43	43	43	43	43

Source: Author's own computation.

4. EMPIRICAL RESULTS

4.1 Stationary tests

The Autoregressive Distributed Lag (ARDL) approach can be used even if there is uncertainty about whether the underlying regressors are stationary at I(1) or I(0); however, the bounds test is not applicable for I(2) processes (Ouattara, 2004). Therefore, unit root tests were conducted using the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test to ensure that none of the study variables are integrated at I(2). The results of the unit root tests are presented in Table 2.

Table 2. Results of stationarity

ADF Unit Root Test			Phillips-Perron (PP) Test		Conclusion
Variable	Level	Ist Difference	Level	Ist Difference	
GDP	-1.630	-4.369***	2.022	3.0778**	Stationary :I(1)
K	-1.284	-5.561***	-1.288	-5.535***	Stationary :I(1)
FDI	-1.671	-6.233***	-1.759	-6.230***	Stationary :I(1)
L	-1.104	-3.446**	2.107	-3.416***	Stationary :I(1)
INF	-3.917***	-7.309***	-3.717***	-18.094***	Stationary :I(0) I(1)
PEX	2.693	6.587***	-2.364	-5.390***	Stationary :I(1)
OP	-2.886	-3.541**	-2.338	-4.880***	Stationary :I(1)

Source: Author's own computation.

Based on the data presented in Table 2, the null hypothesis of nonstationarity for the variables GDP, K, FDI, L, PEX, and OP cannot be rejected at their level values; however, it can be rejected at the first differenced level at a significance level of 1%. This suggests that these variables follow an integrated I(1) process, indicating that the variables are integrated of both I(0) and I(1) processes. Given these findings, the ARDL approach can be appropriately utilized to examine the cointegration relationships among the variables in the time series.

4.2 Lag Selection

Wooldridge (2015) proposed that with annual data there should be optimal lags which should be selected correctly. Schwarz information criterion (SIC) eliminates the uncertainly problem in model selection (Yang, 2005), based on Table 3, optimal lag is 4.

Table 3. Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-81.29815	NA	2.18e-07	4.528110	4.826698	4.635241
1	141.6533	354.4357	3.04e-11	-4.392478	-2.003775	-3.535432
2	217.4421	93.27851	9.89e-12	-5.766263	-1.287443	-4.159301
3	303.2149	74.77626	3.19e-12	-7.652045	-1.083110	-5.295168
4	439.5570	69.91902*	2.57e-13*	-12.13113*	-3.472076*	-9.024334*

*indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

4.3 Bounds test

The bounds test provides a comprehensive insight into the long-term relationship between variables. The F-statistics from the cointegration analysis using the ARDL model exceed the upper values of the bounds, indicating that the condition for cointegration among the model variables has been met. Table 4 illustrates these results as follows.

Table 4. Results of Cointegration

Dependent variable	Cointegration Hypothesis	F-statistic	Decision
GDP	F(GDP/FDI, OP,K,L, PEX,INF)	5.618***	Cointegration
FDI	F(FDI/ GDP, OP, K, L, PEX, INF)	4.733***	Cointegration
PEX	F(PEX/GDP, OP, K, L, INF, FDI)	6.650***	Cointegration
K	F(K/GDP, OP, FDI, INF, PEX, L)	5.828***	Cointegration
Bounds	Significance		
	10%	5%	1%
Lower I(0)	1.99	2.27	2.88
Upper I(I)	2.94	3.28	3.99

Source: Author's own computation

The F-statistics higher than the upper bound at the 5% significance level, indicating that the necessary conditions for cointegration among the model variables have been met. As a result, we reject the null hypothesis of no cointegration in favor of the alternative hypothesis, which suggests long-term interrelationships among the variables when GDP is treated as the dependent variable. Consequently, this model is suitable for analyzing both short-term and long-term relationships among the variables.

4.4 Long and short Run Estimation

Achieving economic growth in long and short run affected by many macroeconomic variables, particularly in uncertainty environment, Table 5. Show that an increase in public expenditures by 1% will increase economic growth by 0.79%, this indicate that public expenditure plays significant effect in Jordan's growth in long run. Gross capital formation has a significant impact on Jordan's growth, an increase of 1% in gross

capital formation will lead to growth of 0.23%. Additionally, Labor in many economies plays an imperative impact in growth, according to our estimation, the labor force has a positive impact on growth, an increase of 1% in the labor force will lead to growth of 0.20%. However, trade openness inflation, and FDI do not have a real impact on Jordan's economic growth in the long run.

Table 5. long -run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Ln(PEX)	0.798327	0.083910	9.514108	0.0000
Ln(INF)	0.044464	0.038891	1.143317	0.2860
Ln(K)	0.231806	0.067120	3.453603	0.0086
Ln(FDI)	0.031901	0.019102	1.670013	0.1335
Ln(L)	0.202806	0.044794	4.527520	0.0019
Ln(OP)	-0.321461	0.244757	-1.313387	0.2255
C	16.30704	1.377979	11.83403	0.0000

Source: Author owns computation.

In order to know the effect of the interaction between economic factors on Jordanian economic growth in the short term, a short-term test was conducted as shown in the Table 6. Results Coefficients revealed that public expenditures, low inflation rate, Gross capital formation, Labor force, have significant impact on Jordan's economic growth. Nevertheless, trade openness has negative impact on Jordan's economic growth in short run, foreign direct investment not has significant impact on economic growth. While the ECM term is significant and displays a negative value. The rate of adjustment for deviations from equilibrium in the previous year's growth for Jordan is measured at a speed of 91%.

Table 6. Short-run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (PEX)	0.693753	0.047616	14.56982	0.0000
D (INF)	0.009057	0.003834	2.362028	0.0458
D (K)	0.177778	0.022075	8.053328	0.0000
D(FDI)	-0.000875	0.003395	-0.257734	0.8031
D(L)	0.272652	0.130053	2.096466	0.0693
D(OP)	-0.467360	0.064306	-7.267762	0.0001
CointEq(-1)*	-0.917407	0.099935	-9.180054	0.0000

Source: Author's own computation.

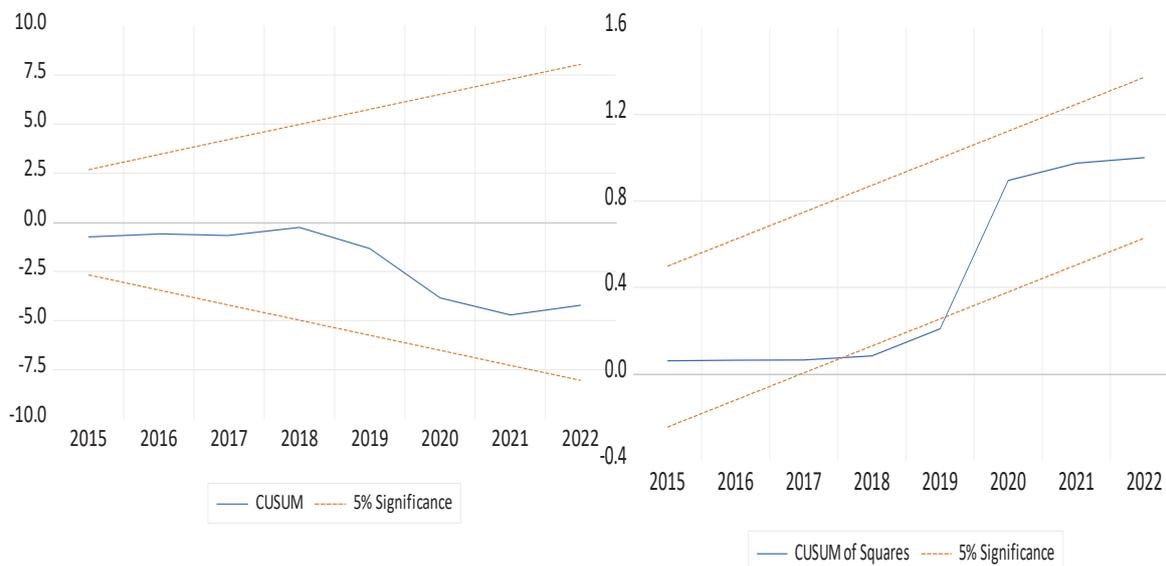
4.5 Diagnostic test results:

Table 7 presents the findings of the diagnostic assessments for the ARDL model. The Ramsy RESET test indicates that the model does not suffer from any misspecification issues. The Lagrange multiplier (LM) test shows that there is no presence of serial correlation. The Jacque-Bera test confirms that all residuals follow a normal distribution. Lastly, the Breusch-Pagan-Godfrey test concludes that our model does not exhibit a problem with heteroscedasticity. In summary, the results suggest that the model is robust, indicating the dynamic interrelationships among economic growth, public expenditure, gross capital formation, inflation, FDI inflows, labor force, and trade openness in Jordan over the years.

Table 7. Results of Diagnostic Tests

Test Statistics	F value	Prob.
RESET test	0.296	0.603
JB Test	0.373	0.829
LM Test	2.00	0.215
Breusch-Pagan-Godfrey	0.902	0.614

Stability Test:



5. CONCLUSION

The main aim of this study to test the interaction between economic growth and some macroeconomic variables (public expenditures, FDI, trade openness, gross capital formation, inflation, labor force), data from 1980 to 2022 employed, to achieve the study aim ARDL bounds test established that the study variables displayed long-run cointegration. According to the result of ARDL long run, interaction between economic growth and macroeconomic variables depicted in Table 5. Show that public expenditures, gross capital formation, labor force have positive impact on economic growth in Jordan within study period 1980-2022. This mean that the Jordan’s growth influenced by domestic macroeconomic variables, however, foreign direct investment and trade openness do not have impact on Jordan’s growth in long run.

Short run results that presented in Table 6. confirmed that public expenditures, low inflation rate, gross capital formation, labor force have positive impact on economic growth in Jordan over 1980-2022. Nevertheless, trade openness has negative impact on growth, this indicate that trade liberalization policies in Jordan leads to negative results. Finally, ECM sign is negative and statistically significant at 1% , it notifies us that 91% of all errors in short run is adjusted in next period.

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