



## Measuring the Long-Term Relationship between the Money Supply (M2) and Public Spending, and its Impact on Economic Growth

MUSTAFA KAMIL SHKEER

Department of Economics, College of Administration and Economics, University of Babylon, Iraq  
*bsc.mustafa.kamel@uobabylon.edu.iq*

**Abstract.** This study focuses on analyzing the causal relationship between selected macroeconomic variables—namely public expenditure, money supply (M2), and economic growth in Iraq—over the period 1988 to 2014. The research employs modern econometric techniques such as time series analysis, cointegration tests, the two-step Engle-Granger methodology, and the Johansen-Juselius cointegration and error correction approach, in addition to Granger causality tests. The study aims to address key questions: Is there a causal relationship between these variables and economic growth in Iraq? What is the nature and direction of these relationships? Which variable has the most significant impact on growth rates?

To answer these questions, the study is based on several hypotheses, the most important of which is the existence of a long-run, bidirectional relationship between the selected variables and economic growth, with the specific nature of the Iraqi economy playing a major role in shaping this relationship.

The study arrives at several important findings, including:

- The growth trajectory of the Iraqi economy exhibits significant volatility during the study period (1988–2014), reflecting the fragile structure of the economy and its dependence on limited and rapidly changing resources, which hinders the sustainability of growth.
- Despite a notable increase in both public expenditure and growth rates, the money supply (M2) proved to be the most volatile variable and the most influential in determining growth rates.
- The results show a unidirectional causal relationship from public expenditure to money supply (M2), but

not the reverse. Meanwhile, a bidirectional (reciprocal) causal relationship was found between money supply (M2) and gross domestic product (GDP).

- The study reveals an important empirical insight: the rentier nature of the Iraqi economy accounts for the deviations from conventional economic theory regarding the relationship between these variables and GDP.

Based on these findings, the study recommends improving the management of these macroeconomic variables through structural reforms, enhancing their role in stimulating economic growth, implementing fiscal reforms to support future growth prospects, and exerting greater efforts to mitigate external shocks by diversifying income sources within the Iraqi economy.

**Keywords:** Broad Money Supply (M2), public spending, Economic Growth.

### Research Problem

The research problem centers on the unique nature of the Iraqi economy and the various economic challenges and crises it has faced—particularly since the 1980s—which have had a direct impact on several key macroeconomic variables, most notably public expenditure and money supply. These factors, in turn, are closely linked to economic growth, which is considered a fundamental indicator of economic development and a measure of a country's advancement or underdevelopment.

Unlike in many regional and global economies, these variables in Iraq do not function in a typical or stable manner.

This abnormal behavior underscores the urgent need to examine the long-run relationship between these variables and economic growth in Iraq, as well as to forecast the future trajectory of this relationship.

#### Significance of the Study

The significance of this study stems from the importance of the aforementioned macroeconomic variables and their relationship to economic growth in Iraq.

Determining the nature and direction of the relationship between macroeconomic variables and economic growth is of particular importance in shaping fiscal and monetary policies in the Iraqi economy. It also enables policymakers to make informed decisions based on the findings and insights derived from the research.

#### Research Hypothesis

This study is based on the following hypotheses:

1. There is a long-term, bidirectional relationship between public expenditure and economic growth.
2. There is a long-term, bidirectional relationship between money supply and economic growth.
3. The nature and structure of the Iraqi economy influence the pattern of the relationship between macroeconomic variables and economic growth.

#### Research Objectives

This study aims to achieve the following objectives:

1. To determine the long-term relationship between macroeconomic variables (public expenditure and money supply) and economic growth in Iraq.
2. To forecast the trajectory of macroeconomic variables and economic growth in Iraq.
3. To identify which of the macroeconomic variables has the greatest impact on economic growth.

#### Structure of the Study

To test the research hypothesis, the structure of the study has been divided into three main sections:

- The first section presents the conceptual framework, focusing on the money supply (M2), public expenditure, and gross domestic product (GDP).

- The second section examines the relationship between these variables and their impact on economic growth.
- The third section is dedicated to forecasting the trajectory of these variables.

The study concludes with a set of findings and recommendations.

### Chapter One: The Conceptual Framework of Money Supply, Public Expenditure, and Economic Growth

#### First: Money Supply

The volume of expenditure corresponding to the current production of goods and services is considered the central point in monetary economic analysis. This volume significantly affects economic welfare through its impact on the levels of output, employment, and prices.

From a monetary perspective, this volume of expenditure is represented by the product of the money balance and the velocity of money circulation.

#### 1- The Concept of Money Supply

The concept of money supply refers to the stock of instruments used as a medium of exchange. Within this framework, various definitions of money supply have emerged.

Money supply is defined as "the currency in circulation plus various types of bank deposits" ( ), or as "the total amount of money circulating in a given society during a specific period, represented by all forms of means of payment" ( ).

Another definition states that it is "the total currency in circulation in addition to certain types of deposits that constitute liabilities on banking and financial institutions".

Due to differing views among economists on which types of deposits should be included, multiple definitions of money supply have emerged. The central bank controls the supply of money and, in turn, influences the inflation rate in the medium and long term.

#### 2- Monetary Aggregates

Due to the variation in forms of money resulting from economic and social development, as well as the evolution of banking habits in different societies, monetary aggregates can be classified as follows:

### A. Base Money (BM)

Base money consists of the legal currency issued by the central bank, including both banknotes and coins. It is characterized by its full liquidity and is subject to strict control by the monetary authority over its issuance. Several other factors also influence base money, such as the movement of foreign assets, which play a significant role in money creation.

However, when calculating the money supply, not all of the base money (BM) is included. Only the portion circulating outside the banking system—that is, the part held by the public (denoted as CC)—is considered. The remaining portion constitutes bank reserves, which are either held in the commercial banks' reserve accounts or as demand deposits at the central bank.

In other words:

$$BM = CC + R \quad \text{BM} = \text{CC} + \text{R}$$

Where:

- BM = Base Money
- CC = Currency held by the public
- R = Bank reserves (commercial banks' holdings at the central bank)

### B. Aggregate (M1)

This aggregate, commonly referred to as M1, represents the total stock of monetary payment instruments. It includes, in addition to the circulating legal tender (E), the demand deposits, which consist of current account balances held by the public at commercial banks and postal check centers.

It has been noted that M1 comprises the full range of means of payment that allow economic units to directly choose between all goods and services available in the market and to settle debts arising from transactions.

In formulaic terms:

$$M1 = E + \text{Demand Deposits} \quad M1 = E + \text{Demand Deposits}$$

Where:

- E = Currency in circulation (outside the banking system)
- Demand Deposits = Balances in current accounts available for immediate withdrawal or payment

#### 1- Aggregate M2

Aggregate M2 is referred to as domestic liquidity or the sum of temporary holding instruments of

purchasing power. It includes all components of M1, in addition to various types of time deposits, such as:

- Fixed-term deposits,
- Interest-bearing deposits,
- Allocated or special-purpose deposits,
- Treasury bonds,
- Passbook savings accounts, and other similar instruments.

These are elements that can be converted into cash or demand deposits either without loss or with minimal loss in value. These deposits, recorded on the liability side of a bank's balance sheet, represent funds that the customer agrees not to withdraw before a specified maturity date.

Thus, Aggregate M2 is considered the most comprehensive monetary aggregate, as it significantly influences economic activity and inflation. It also reflects the direct substitution relationship between money on one side and goods and services on the other.

This aggregate is the broadest measure of money supply that the monetary authority can monitor and control effectively, given that the majority of its components are held within the banking system, which is under the close supervision of the central bank.

The broad money supply is defined as:

$$M2 = C + D + T \quad M2 = C + D + T$$

Where:

- C = Currency in circulation
- D = Demand deposits
- T = Time deposits

### C. Aggregate M3

This aggregate is referred to as domestic liquidity or the set of value-storing instruments. In addition to time deposits with non-bank financial institutions—such as those held with savings and pension funds—M3 also includes public and private treasury bonds held by non-financial entities.

Since these institutions do not belong to the official banking and monetary sectors and are not closely monitored by the monetary authority, it is difficult to include these deposits fully in the calculation of the money supply. However, their role in influencing the overall money supply should not be overlooked.

### Factors Influencing the Money Supply

The money supply is determined by five main factors:

A. Non-Borrowed Reserves (NBR):

Determined by the central bank.

B. Borrowed Reserves (BR):

Also determined by the central bank.

C. Excess Reserves (ER):

Set by commercial banks based on their liquidity preferences and lending strategies.

D. Currency in Circulation (C):

Determined by the public's demand for cash holdings.

E. Required Reserve Ratio (RR):

Established by the central bank as a regulatory tool to control liquidity in the banking system.

In addition, there is another factor that influences the money supply, namely the net foreign assets (NFA).

This component consists of the following elements:

- Convertible foreign currencies.
- Monetary gold.
- Deposits held in foreign banks.
- Special Drawing Rights (SDRs).
- The reserve position in the International Monetary Fund (IMF).
- Foreign investments.

## 2. Public Expenditure:

Public expenditure plays a significant and prominent role in managing economic activity, as it constitutes the largest and most important component of the Gross Domestic Product (GDP). Due to its great importance and substantial weight in the economy, it will be examined as follows:

### 1- The Concept of Public Expenditure

Public expenditure is defined as a monetary amount spent by a public authority to satisfy a public need.

It is also defined as a sum of money paid by the public treasury, after being approved by the legislative authority, to be spent by a public entity to provide public goods and services and achieve economic and social objectives.

Alternatively, it can be described as a sum of money spent by the state or a legal public entity to achieve a public benefit.

There are other formulations of the definition of public expenditure, but they all generally refer to funds spent by the government or any public entity to satisfy a public need.

## 2. Theories Explaining the Phenomenon of Public Expenditure Growth

The phenomenon of public expenditure growth has attracted the attention of economists, as it is a continuous trend observed in both developed and developing countries. Based on their statistical studies, economists have been able to formulate general laws to explain this phenomenon. Among the most important of these are Wagner's Law and the Peacock-Wiseman theory, as both address the fundamental causes behind the increase in public expenditures. These theories will be studied as follows:

### A. Wagner's Law:

Also known as the Law of Increasing State Activity, Wagner's Law was first fundamentally observed by the German economist Wagner in 1883. Its main idea revolves around the notion that any increase in the average income per capita will be reflected in a corresponding increase in the growth rates of public expenditure ( ). This is because the size of the public sector in the economy grows alongside national income. This relationship implicitly results from the fact that economic growth leads to structural changes in various economic and social variables, as well as an increase in aggregate demand, part of which is met by the public sector, thereby causing an increase in public expenditures in the economy.

Accordingly, Wagner's Law indicates a long-term causal relationship between public expenditure and national income, where the elasticity of public expenditure with respect to income is greater than one. Thus, the increase in per capita public expenditure is greater than the increase in per capita national income. This can be illustrated in the following graph:

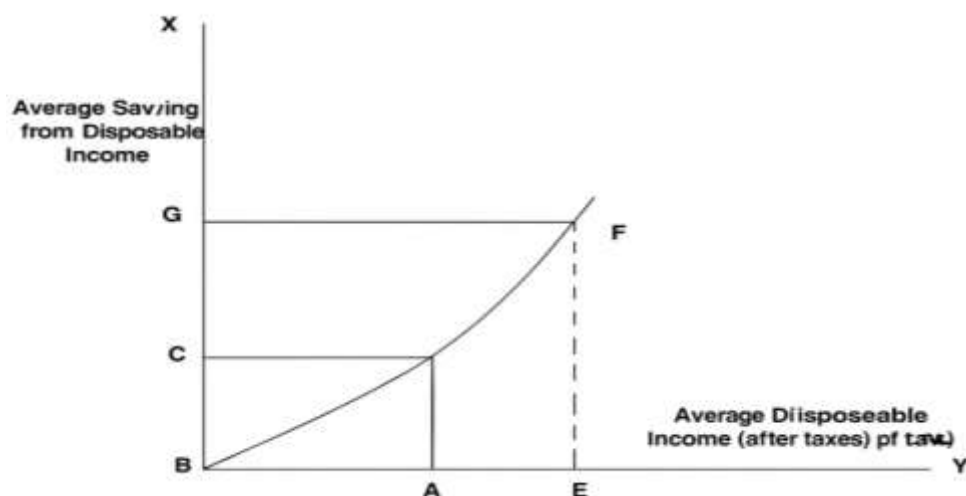


Figure (1): Wagner's Law

**Source:** Ali Lotfi, Public Finance: An Analytical Study, Ain Shams Library, Egypt, 1955, p. 55.

From the figure, point (D) represents the relationship between the average real income and the average real expenditures per individual in a given year (t), while point (F) represents this relationship after a certain period (). It is evident from the figure that the relationship between the two variables was  $AB/CB$  and changed during the year to  $EB/GB$  (t+1).

The diagram also shows that the distance EA is smaller than the distance GC, indicating that the average real expenditures per individual increase at a higher rate than the increase in average real income per individual ().

## B. The Peacock-Wiseman theory

According to the Peacock-Wiseman theory, this theory is based on the hypothesis proposed by Peacock and Wiseman known as the displacement effect. It explains the reasons behind the divergence of the general agreement over time, which follows a pattern similar to leaps. This can be illustrated as follows:

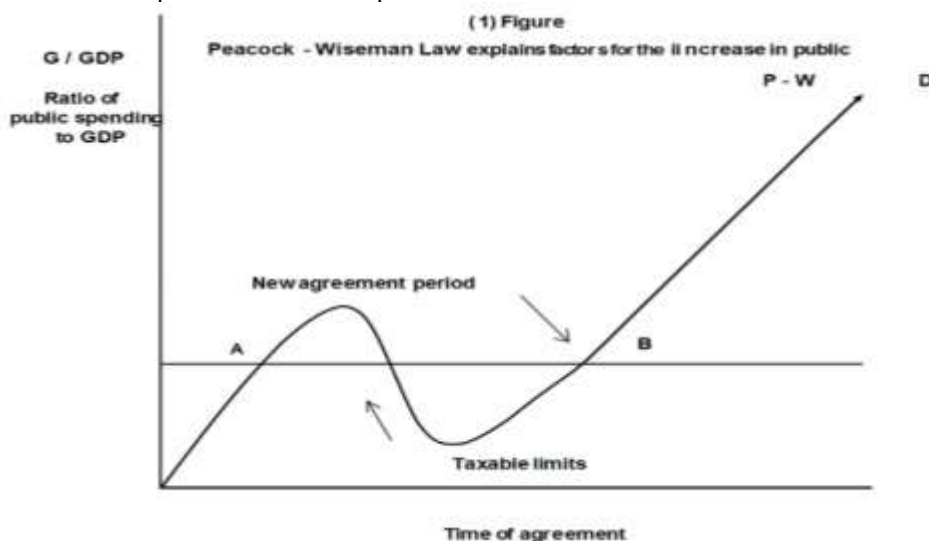


Figure 2: Peacock-Wiseman Law

**Source:** Ali Lotfi, Public Finance: An Analytical Study, Ain Shams Library, Egypt, 1955, p. 55.

The W-P curve represents the evolution of the ratio of public expenditure to Gross Domestic Product (GDP) over time. The figure illustrates that social disturbances lead to an increase in this ratio up to point A, driven by the displacement effect.

While the ratio is expected to move from point B to point C, the effects of concentration and inspection prevent this transition, causing the ratio to rise further to point D

The concentration effect reflects the government's desire to accelerate the process of economic development and achieve balance. Meanwhile, the inspection effect results from the expanded role of the state and its growing intervention in various sectors, in addition to wars and economic crises.

### Third: Economic Growth

Interest in studying the phenomenon of economic growth began to increase, particularly after the Industrial Revolution in Western Europe. This period was marked by continuous technological advancements and capital accumulation, which led to fundamental transformations in societies—shifting from a primitive, traditional subsistence economy to a focus on the quantity and quality of production.

Their studies concentrated not only on the factors of production, but also on production relations.

From a capitalist perspective, economic growth was seen as the process of increasing the production of goods and services to meet society's needs, while the surplus was considered essential for achieving higher levels of welfare. The focus was placed on society as a whole, linked to macroeconomic variables such as total output and national income. Gross Domestic Product (GDP) and the trade balance were regarded as key indicators of growth, with any resulting surplus or deficit being particularly significant.

Economic studies and development thought literature have shown that the phenomenon of economic growth is structurally complex and requires a precise analysis of its fundamental factors. It is difficult to define economic growth with a single, unified definition within a specific time frame, as it is a dynamic process influenced by numerous and highly complex variables. The concept of economic growth often overlaps with several related but distinct terms, such as development, industrialization, expansion, evolution, and advancement, making it one of the concepts that require further clarification.

Perhaps the term most closely intertwined with growth is development, as both refer to the continuous increase in individuals' income share. For example, when the average income per capita rises in advanced industrial countries such as the United States, this is considered economic growth. On the other hand, when income per capita increases in less developed countries, it is considered a sign of economic development. However, development refers to the realized improvements in income per capita and is associated with structural changes in the financial sectors that contribute to the composition of GDP.

Thus, growth refers to an actual increase in real per capita income, not nominal income. Economic growth does not occur unless there is a sustained increase in income. For instance, when aid is provided to a country, resulting in a rise in real income for a year or two, it is considered a temporary increase rather than genuine growth.

In any case, economic growth is necessary, but not sufficient for economic development. What matters is not only the amount of growth but also how it is distributed, as this is essential for achieving economic welfare. According to the 1996 Human Development Report, growth may eliminate jobs rather than create them, and it may benefit the powerful instead of reducing poverty.

Others consider economic growth as an indicator of economic welfare, as it increases individuals' share of real national output. Some define it as the continuous increase in output accompanied by quantitative and qualitative changes in various economic and social structures.

Edward Shapiro defines economic growth as a quantitative variable that measures the change in the productive capacities of the economy. The more these capacities are utilized, the greater the quantity of goods and services available to meet society's needs. It is commonly measured based on the Gross Domestic Product (GDP) of a society.

Alfred Marshall focused on the concept of external economies in his definition of economic growth, where the availability of production factors in adequate quantities leads to a steady increase in national output, which consequently increases in per capita income. Thus, the foundation of economic growth lies primarily in the scientific and technological progress achieved by a country, in addition to population growth, savings, and capital stock (investment) as incentives for attracting more technological innovations. This indicates that the

optimal and efficient use of available natural resources, rather than their sheer quantity, is the key to economic growth.

On the other hand, Simon Kuznets defined economic growth as a process that ensures continuous increases in the production of material wealth and the expansion of a country's capacity to produce goods and services, accompanied by technological advancements and institutional and ideological adjustments.

Despite the multiple and overlapping definitions of economic growth, all agree that it is a fundamental indicator of economic welfare. Therefore, efforts should focus on increasing its rate as it leads to a rise in the average individual's access to goods and services and can elevate the living standards of society.

## 1. Types of Economic Growth

Various types of economic growth differ according to the mechanisms through which the economic system operates, including:

### Automatic Growth

Automatic growth is the growth that occurs spontaneously due to the inherent forces of the national economy without government intervention. This type of growth requires a high degree of flexibility to enable the transition from one sector to another through the multiplier effect or the accelerator effect.

This type of growth is found in market economies and stems from the interaction of the economy's forces. It is typically slow, gradual, and sequential, despite occasionally experiencing short-term sharp fluctuations. This pattern has characterized advanced capitalist countries since the Industrial Revolution, where the phenomenon of automatic growth historically occurred as societies transitioned from feudalism to capitalism.

Automatic growth takes place in a series of processes that succeed one another, much like natural historical processes, and these processes can be summarized in four main points:

- a. The progression in the social division of labor, which transitioned from the agricultural stage to large-scale industrial mechanization, passing through manual industry.
- b. The process of capital accumulation, which initially focused on serving foreign trade during the era of

merchants when trade was the source of state power, and later shifted to serve the industry.

c. The production of commodities aimed not at satisfying the producer's own needs but at selling in markets, utilizing monetary exchange instead of barter.

d. The formation of the domestic market, where each product has a market composed of supply and demand, thus establishing the foundation for the formation of a broad national market.

### Transient or Unstable Growth

This is a temporary growth that lacks continuity, occurring due to external factors that quickly dissipate along with the growth they caused. This type of growth is common in oil-exporting developing countries as a result of sudden changes in their trade, such as spikes in energy or raw material prices, which lead to a surge in the economic growth rate. However, its impact is limited in the environment where it originates due to the lack of interaction with the economic and social forces in developing countries.

### Directed or Planned Growth

This type of growth can only be achieved through comprehensive planning of available economic resources and societal needs. The strength and effectiveness of this type depend on the planners' capabilities, the suitability of the formulated economic plans to the economic reality, the efficiency of implementation and follow-up, and the participation of the general public at all levels in the planning process.

Achieving this type of growth requires fundamental changes in institutions and the legal environment to establish a central economic authority with the competence to make decisions regarding the management and mobilization of economic resources by the interests of society.

## Section Two: Estimating the Long-Term Relationship Between Money Supply (M2), Public Expenditure, and Economic Growth During the Period Under Study

### First: Augmented Dickey-Fuller (ADF) Test

Table (1) presents the results of the Augmented Dickey-Fuller (ADF) test for the economic variables under study (Gross Domestic Product, Public Expenditure, and Broad Money Supply - M2) in their logarithmic forms and according to the three models (with constant, with constant and trend, and without both). The table shows that the variables are non-

stationary at level, as the calculated tau (t) values are greater than their corresponding critical values at the 1%, 5%, and 10% significance levels. Therefore, the null hypothesis cannot be rejected.

However, all the series are non-stationary at the level and become stationary at their first differences. The test applied to the first differences of the non-stationary variables at the level revealed no presence of a unit root, since the calculated tau (t) values were lower than the corresponding critical values.

Accordingly, it can be concluded that the time series under study are non-stationary at the level but become stationary at first differences, meaning each variable is individually integrated of order one, as long as the first difference of each is integrated of order zero.

These results are consistent with standard econometric theory, which suggests that most economic variables are non-stationary at the level but become stationary after first differencing.

**Table (1)** Results of the Dickey-Fuller (ADF) Unit Root Test for Macroeconomic Variables with Gross Domestic Product (GDP) over the Time Series Period

| First Difference |                    |               | Level     |                    |               | Time Series               |
|------------------|--------------------|---------------|-----------|--------------------|---------------|---------------------------|
| None             | Constant and Trend | Constant Only | None      | Constant and Trend | Constant Only |                           |
| -5.906998        | -5.735576          | -5.828741     | -0.445083 | -2.565235          | -2.146070     | <b>L Y</b>                |
| -2.660720        | -4.374307          | -3.724070     | -2.656915 | -4.356068          | -3.711457     | <b>Critical Value 1%</b>  |
| -1.955020        | -3.603202          | -2.986225     | -1.954414 | -3.595026          | -2.981038     | <b>Critical Value 5%</b>  |
| -1.609070        | -3.238054          | -2.632604     | -1.609329 | -3.233456          | -2.629906     | <b>Critical Value 10%</b> |
| -6.572909        | -7.066096          | -6.429671     | -0.940380 | -2.891170          | -1.490488     | <b>L G</b>                |
| -2.660720        | -4.374307          | -3.724070     | -2.660720 | -4.396068          | -3.724070     | <b>Critical Value 1%</b>  |
| -1.955020        | -3.603202          | -2.986225     | -1.955020 | -3.595026          | -2.986225     | <b>Critical Value 5%</b>  |
| -1.609070        | -3.238054          | -2.632604     | -1.609070 | -3.233456          | -2.632604     | <b>Critical Value 10%</b> |
| -5.687632        | -3.771299          | -3.745058     | -1.256718 | -1.525576          | -1.677525     | <b>M<sub>2</sub></b>      |
| -4.374307        | -2.660720          | -3.724070     | -2.656915 | -4.356068          | -3.711457     | <b>Critical Value 1%</b>  |
| -3.603202        | -1.955020          | -2.986225     | -1.954414 | -3.595026          | -2.981038     | <b>Critical Value 5%</b>  |
| -3.238054        | -1.609070          | -2.632604     | -1.609329 | -3.233456          | -2.629906     | <b>Critical Value 10%</b> |

*Source: Researcher's work based on the statistical software (Eviews 11).*

## Secondly: Kwiatkowski–Phillips–Schmidt–Shin (KPSS) Test

When conducting the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) unit root test for the variables included in the model (Gross Domestic Product Y, Government Expenditure G, and Broad Money Supply M<sub>2</sub>), according to the levels (constant, constant and trend, and none), it was found that these variables are non-stationary at their levels but stationary at their first differences, as shown in Table (2).

The results indicate that the estimated test statistics Lm are smaller than the critical values at significance levels of 10%, 5%, and 1%. This implies that the null hypothesis  $H_0: \beta=0$  cannot be rejected, indicating the absence of a unit root in the series (i.e., the time series are stationary).

Therefore, the unit root tests for the time series of the variables under study at their levels and first differences show that these series move together over time, suggesting the existence of a long-term equilibrium relationship.

**Table (2)** Results of the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) Unit Root Test for the Macroeconomic Variables under Study for the Period (1988 – 2014)

| First Difference |                    |               | Level   |                    |               | Time Series               |
|------------------|--------------------|---------------|---------|--------------------|---------------|---------------------------|
| None             | Constant and Trend | Constant Only | None    | Constant and Trend | Constant Only |                           |
| -5.906           | -5.738             | -5.828        | -0.3307 | -2.356             | -2.142        | <b>L Y</b>                |
| -2.6607          | -4.374             | -3.7240       | -2.656  | -4.35606           | -3.711        | <b>Critical Value 1%</b>  |
| -1.955           | -3.6032            | -2.9862       | -1.954  | -3.59502           | -2.981        | <b>Critical Value 5%</b>  |
| -1.609           | -3.238             | -2.632        | -1.609  | -3.2334            | -2.629        | <b>Critical Value 10%</b> |
| -6.572           | -7.245             | -6.429        | -1.215  | -2.935             | -1.898        | <b>L G</b>                |
| -2.6607          | -4.374             | -3.724        | -2.656  | -4.3560            | -3.7114       | <b>Critical Value 1%</b>  |
| -1.9550          | -3.603             | -2.986        | -1.954  | -3.595             | -2.981        | <b>Critical Value 5%</b>  |
| -1.609           | -3.238             | -2.632        | -1.609  | -3.233             | -2.629        | <b>Critical Value 10%</b> |
| -3.842           | -5.644             | -3.818        | -1.271  | -1.851             | -1.741        | <b>LM<sub>2</sub></b>     |
| -2.6607          | -4.374             | -3.724        | -2.656  | -4.356             | -3.711        | <b>Critical Value 1%</b>  |
| -1.9550          | -3.603             | -2.986        | -1.954  | -3.595             | -2.981        | <b>Critical Value 5%</b>  |
| -1.609           | -3.238             | -2.632        | -1.609  | -3.233             | -2.699        | <b>Critical Value 10%</b> |

*Source: Researcher's work based on the statistical software (Eviews 11).*

### Thirdly: VAR Test (Vector Autoregression Test)

Before conducting the cointegration test to examine the existence of a long-term equilibrium relationship among the variables, it is necessary to determine the optimal lag length.

The optimal number of lags was identified using the Vector Autoregression (VAR) model, which includes four criteria: Akaike Information Criterion (AIC), Schwarz Criterion (SC), Final Prediction Error (FPE), and Hannan-Quinn Criterion (HQ).

The lag lengths for the variables under study can be observed from the results presented in the following table:

**Table (3)**

| VAR Lag Order Selection Criteria |           |           |           |           |           |     |
|----------------------------------|-----------|-----------|-----------|-----------|-----------|-----|
| Endogenous variables: Y G M2     |           |           |           |           |           |     |
| Exogenous variables: C           |           |           |           |           |           |     |
| Date: 10/23/24 Time: 15:04       |           |           |           |           |           |     |
| Sample: 1988 2014                |           |           |           |           |           |     |
| Included observations: 25        |           |           |           |           |           |     |
| HQ                               | SC        | AIC       | FPE       | LR        | LogL      | Lag |
| 59.84240                         | 59.94809  | 59.80183  | 1.88e+22  | NA        | -744.5229 | 0   |
| 57.56600*                        | 57.98879* | 57.40373  | 1.72e+21  | 65.48014* | -705.5466 | 1   |
| 57.57942                         | 58.31930  | 57.29544* | 1.61e+21* | 14.90910  | -695.1930 | 2   |

\* 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

**Source:** Researcher's work based on the statistical software (Eviews 11).

### Fourth: Johansen–Juselius Test Table

**Table 4:** Results of the Cointegration Test Using the Johansen–Juselius Method

| 1-λ_trace (Trace Test)            |             |                     |          |                        |                 |
|-----------------------------------|-------------|---------------------|----------|------------------------|-----------------|
| Relationships                     | Eigenvalues | Critical Value      | λ_trace  | Alternative Hypothesis | Null Hypothesis |
| LY,LG,LM2                         | 0.665074    | 29.79707            | 35.72534 | r > 0                  | r = 0           |
|                                   | 0.186387    | 15.49471            | 8.379213 | r > 1                  | r ≤ 1           |
|                                   | 0.120937    | 3.841466            | 3.222458 | r > 2                  | r ≤ 2           |
| -λ_max — Maximum Eigenvalue Test2 |             |                     |          |                        |                 |
| Relationships                     | Eigenvalues | Critical Value (5%) | λ_max    | Alternative Hypothesis | Null Hypothesis |
| LY,LG,LM2                         | 0.665074    | 21.13162            | 27.34613 | r = 1                  | r = 0           |
|                                   | 0.186387    | 14.26460            | 5.156755 | r = 2                  | r = 1           |
|                                   | 0.120937    | 3.841466            | 3.222458 | r = 3                  | r = 2           |

**Source:** Researcher's work based on the statistical software (Eviews 11).

Unit root tests have confirmed that the time series of the variables in the first equation — Government Expenditure G, Money Supply M, and Gross Domestic Product Y — contain a unit root at their levels and become stationary after taking their first differences. This indicates that these variables are integrated of order one,  $I(1)$ .

This implies that the time series of the studied variables are integrated of the same order, suggesting the possibility of the existence of a cointegration relationship among them.

Cointegration has an important economic meaning, as it indicates the existence of a long-term equilibrium relationship between the series.

The cointegration will be tested using the Johansen–Juselius methodology, which is considered one of the best methods for estimating the cointegration vector and validating its properties. It can be applied to models with more than two variables as well as to models with only two variables, allowing for the mutual interaction effects between the variables under study.

Table (4) presents the results of the Trace Test ( $\lambda_{\text{trace}}$ ) and the Maximum Eigenvalue Test ( $\lambda_{\text{max}}$ ) used to analyze the long-run relationship among government expenditure, money supply, and gross domestic product.

The Trace Test ( $\lambda_{\text{trace}}$ ) indicates that the computed maximum likelihood value is 35.725, which exceeds the critical value of 29.797 at the 5% significance level. This result leads to the rejection of the null hypothesis  $H_0: r=0$ , which states that there is no cointegrating vector.

Accordingly, it can be concluded that there is at least one cointegrating equation among the variables mentioned above.

The Maximum Eigenvalue Test ( $\lambda_{\text{max}}$ ) also confirms the existence of a single cointegrating vector. Table (4) shows that the computed  $\lambda_{\text{max}}$  value is 27.346, which is greater than the critical value of 21.131 at the 5% significance level.

Therefore, the null hypothesis  $H_0: r=0$ , which states that there is no cointegrating vector, is rejected, and the alternative hypothesis  $r=1$ , which suggests the presence of a single cointegrating vector, is accepted. However, the null hypothesis  $r \leq 1$  cannot be rejected at the 5% significance level. The Trace Test indicates that there is no evidence for the existence of a second cointegrating vector.

The results show that the computed value of the maximum likelihood statistic is 8.379, which is less than the critical value of 15.494 at the 5% significance level. This implies that the null hypothesis of at most one cointegrating vector ( $r = 1$ ) cannot be rejected, while the alternative hypothesis is rejected.

Therefore, only one cointegrating equation exists, which suggests the presence of a long-run equilibrium relationship in one direction among Gross Domestic Product (Y), Government Expenditure (G), and Broad Money Supply (M).

### Fifth: Vector Error Correction Model (VECM) Test

**Table (5):** Results of the Vector Error Correction Model

| Dependent Variable: D(Y)                                                                                                                                                                    |                       |            |             |                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------|-------------|--------------------|
| Method: Least Squares                                                                                                                                                                       |                       |            |             |                    |
| Date: 10/23/24 Time: 13:55                                                                                                                                                                  |                       |            |             |                    |
| Sample (adjusted): 1991 2014                                                                                                                                                                |                       |            |             |                    |
| Included observations: 24 after adjustments                                                                                                                                                 |                       |            |             |                    |
| $D(Y) = C(1)*(Y(-1) + 6.50180145946*G(-1) - 8.41799083014*M2(-1) - 15155.8635027) + C(2)*D(Y(-1)) + C(3)*D(Y(-2)) + C(4)*D(G(-1)) + C(5)*D(G(-2)) + C(6)*D(M2(-1)) + C(7)*D(M2(-2)) + C(8)$ |                       |            |             |                    |
| Prob.                                                                                                                                                                                       | t-Statistic           | Std. Error | Coefficient |                    |
| 0.5738                                                                                                                                                                                      | -0.574272             | 0.142388   | -0.081770   | C(1)               |
| 0.3419                                                                                                                                                                                      | -0.979423             | 0.236995   | -0.232119   | C(2)               |
| 0.2999                                                                                                                                                                                      | 1.071382              | 0.294255   | 0.315260    | C(3)               |
| 0.5523                                                                                                                                                                                      | 0.607097              | 1.068511   | 0.648689    | C(4)               |
| 0.7497                                                                                                                                                                                      | 0.324605              | 0.841750   | 0.273236    | C(5)               |
| 0.1765                                                                                                                                                                                      | 1.413979              | 1.463338   | 2.069129    | C(6)               |
| 0.2862                                                                                                                                                                                      | -1.103410             | 1.272032   | -1.403573   | C(7)               |
| 0.8825                                                                                                                                                                                      | 0.150181              | 2050.990   | 308.0194    | C(8)               |
| 21.43095                                                                                                                                                                                    | Akaike info criterion |            | 9565.666    | S.E. of regression |
| 21.82363                                                                                                                                                                                    | Schwarz criterion     |            | 1.46E+09    | Sum squared resid  |
| 21.53513                                                                                                                                                                                    | Hannan-Quinn criter.  |            | -249.1714   | Log likelihood     |
|                                                                                                                                                                                             |                       |            | 1.664926    | Durbin-Watson stat |

**Source:** Researcher's work based on the statistical software (Eviews 11).

After confirming the existence of cointegration, the next step involves specifying the Vector Error Correction Model (VECM), which has the ability to test and estimate both the short-term and long-term relationships among the variables.

From the results shown in the table above, it is observed that the estimated coefficient of the error correction term (C1) is negative and statistically significant at the 1% level, with a value of (-0.0817).

This indicates the presence of a long-run relationship between money supply and government expenditure on one hand, and between government expenditure and gross domestic product on the other.

In other words, changes in both government expenditure and money supply help explain the variations in gross domestic product.

The coefficient C8 indicates the existence of a short-term relationship among the variables. From this, it can be concluded that there is both a short-run and long-run equilibrium relationship between broad money supply (M2), government expenditure, and gross domestic product (GDP).

### Section Three: Forecasting the Path of the Variables Under Study Using the VAR Model and the Vector Error Correction Model (VECM)

#### Prediction Using the Vector Autoregression (VAR) Model

VAR models provide a very simple forecasting method and are closer to economic reality because their internal and explanatory variables interact with each other. Therefore, they must be incorporated into the economic system. Dealing with the components of VAR simultaneously means that the model becomes more concise and involves fewer lags, since prior information from the variables is utilized. Nevertheless, forecasts from the VAR model are accurate only under certain conditions, which are difficult to specify precisely to avoid errors. Moreover, as the number of lags increases, the number of parameters to be estimated also increases, resulting in fewer degrees of freedom.

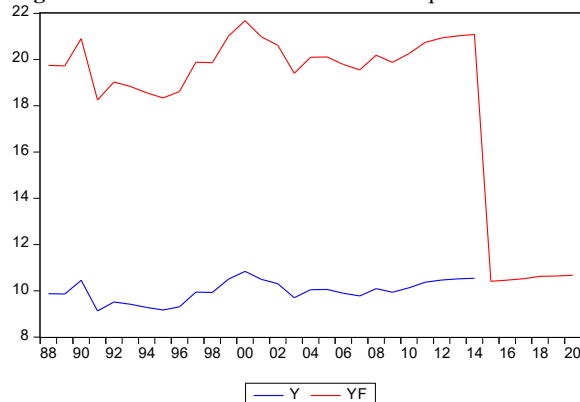
The forecasting process for the macroeconomic variables under study (Gross Domestic Product, money supply M2, and public expenditure) requires predicting the response functions of these variables over the study period. This is necessary to understand the direction of change in the expected values obtained from the estimated models and to determine whether these changes follow the same trend as the phenomenon under investigation during the study period.

#### First: Forecasting Using the Vector Error Correction Model (VECM).

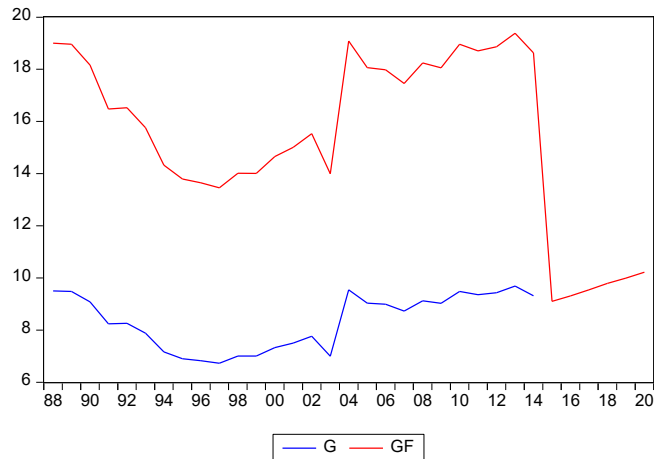
The Error Correction Model (VECM) was used as one of the forecasting methods. In this approach, the explanatory variables are first forecasted, then substituted into the estimated relationship, allowing for the prediction of expected changes in the dependent variable. This method results in obtaining unbiased forecasts, as the mean forecast error is zero. However, this does not necessarily imply that the forecasts exactly match the actual values of the variables due to errors inherent in both the forecasts and the observed data.

When plotting the actual and predicted values of the macroeconomic variables, including the Gross Domestic Product (GDP) in its logarithmic form over the period (1988–2020), the graphical representations show that the predicted values exhibited a fluctuating pattern between rises and falls as follows:

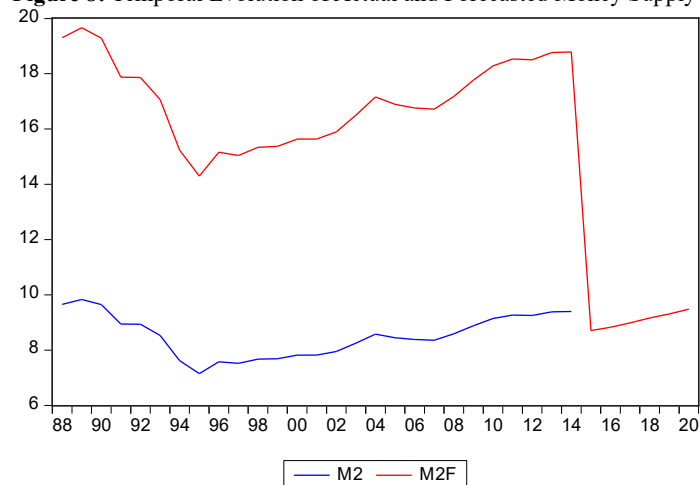
**Figure 6:** Time evolution of the actual and predicted values of the GDP for the period (1988–2020).



**Figure 7:** Time evolution of the actual and predicted values of public expenditure for the period (1988–2020).



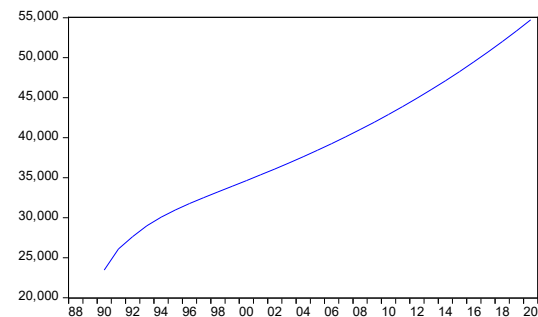
**Figure 8:** Temporal Evolution of Actual and Forecasted Money Supply Values for the Period (1988–2020).



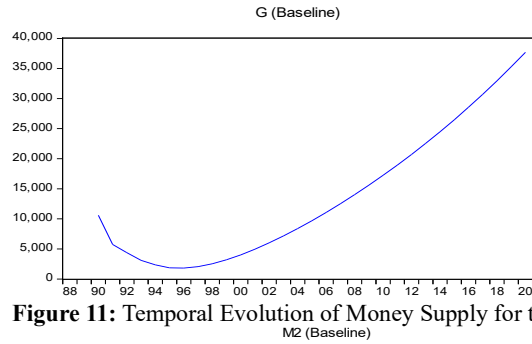
**Second: Forecasting Using the Vector Autoregression (VAR) Model.**

After confirming the predictive capability of the variables, we can now use the VAR model for forecasting, which will illustrate the direction of the economic variables over the period (1988–2020). The trend of the economic variables has been demonstrated using graphical representations that show the direction of the predicted values of the variables based on the Vector Autoregression (VAR) model, as follows:

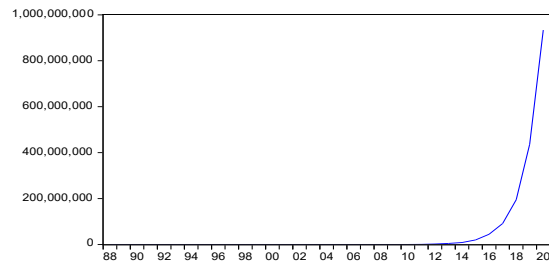
**Figure 9:** Temporal Evolution of Gross Domestic Product for the Period (1988–2020).  
Y (Baseline)



**Figure 10:** Temporal Evolution of Public Expenditure for the Period (1988–2020).



**Figure 11:** Temporal Evolution of Money Supply for the Period (1988–2020).



**Table 6:** Logarithmic Values of Macroeconomic Variables for the Period (1988–2014).

| Year | Y        | G        | m2       |
|------|----------|----------|----------|
| 1988 | 9.874687 | 9.500245 | 9.652208 |
| 1989 | 9.862582 | 9.480992 | 9.83437  |
| 1990 | 10.45432 | 9.082042 | 9.643906 |
| 1991 | 9.125942 | 8.239606 | 8.939915 |
| 1992 | 9.514976 | 8.262058 | 8.932879 |
| 1993 | 9.418853 | 7.878838 | 8.531483 |
| 1994 | 9.280374 | 7.162334 | 7.616315 |
| 1995 | 9.168838 | 6.897477 | 7.147375 |
| 1996 | 9.30698  | 6.823546 | 7.578813 |
| 1997 | 9.942059 | 6.726617 | 7.520684 |
| 1998 | 9.930645 | 7.007218 | 7.671095 |
| 1999 | 10.5115  | 7.004589 | 7.688177 |
| 2000 | 10.83929 | 7.327605 | 7.817277 |
| 2001 | 10.49258 | 7.503605 | 7.818547 |
| 2002 | 10.30888 | 7.766284 | 7.948284 |
| 2003 | 9.700057 | 6.997146 | 8.251997 |
| 2004 | 10.04877 | 9.543447 | 8.579898 |
| 2005 | 10.05727 | 9.031954 | 8.446289 |
| 2006 | 9.892802 | 8.991347 | 8.38108  |
| 2007 | 9.777617 | 8.728351 | 8.358195 |
| 2008 | 10.09407 | 9.122011 | 8.59072  |
| 2009 | 9.938537 | 9.028163 | 8.882533 |
| 2010 | 10.1298  | 9.480433 | 9.142559 |
| 2011 | 10.36876 | 9.353735 | 9.266491 |
| 2012 | 10.46678 | 9.432526 | 9.252241 |
| 2013 | 10.51263 | 9.690365 | 9.383853 |
| 2014 | 10.54235 | 9.313513 | 9.395859 |

**Table 7:** Forecasted Logarithmic Values of Macroeconomic Variables for the Period (2015–2020).

| Year | Y        | G        | m2       |
|------|----------|----------|----------|
| 2015 | 10.40836 | 9.099717 | 8.705544 |
| 2016 | 10.46224 | 9.306453 | 8.824584 |
| 2017 | 10.51855 | 9.545649 | 8.984402 |
| 2018 | 10.62697 | 9.788811 | 9.16079  |
| 2019 | 10.64115 | 9.994433 | 9.310783 |
| 2020 | 10.67674 | 10.21913 | 9.480527 |

## Conclusions

1. Economic growth is one of the most important indicators for measuring the progress of countries and achieving economic development.
2. The Iraqi economy has undergone different economic phases, each characterized by distinctive features that set it apart from other phases. This, in turn, has reflected on the overall macroeconomic policy and its economic components in particular. These phases reached their peak in terms of rapid transitions and fluctuations in their structures during the study period.
3. The relationship between Gross Domestic Product (GDP) and money supply is bidirectional causal; that is, GDP explains changes in money supply and vice versa. However, the relationship between GDP and public expenditure is not directly causal but explains changes in GDP through its effect on money supply (M2), which in turn explains variations in GDP.
4. The results of the Unit Root tests indicated that the time series data for the economic variables under study (GDP, public expenditure, and money supply) are non-stationary at their levels but become stationary at first differences according to the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (P-P) test. This implies that the time series under study are integrated of order one.
5. The cointegration test, using the Engle-Granger two-step method, indicates the existence of a long-term equilibrium relationship among all the variables under study and GDP.
6. The Error Correction Model (ECM) tests showed that the error correction parameters in the estimated equations are negative and statistically significant, confirming the existence of long-run causality running from GDP to public expenditure and money supply, with an acceptable speed of adjustment towards the equilibrium value.

The study, based on causality tests, concluded the presence of a positive bidirectional relationship among the variables under study. The results revealed a two-way causal relationship between GDP and money supply in the short run, and a one-way causal relationship running from public expenditure to money supply, but not vice versa.

## Recommendations

1. Work on improving the structure of the Iraqi economy and increasing its production flexibility in an attempt to achieve stable rates for its economic variables.
2. Expand the volume of foreign direct investments alongside the private sector to support and stimulate

real economic growth, achieving genuinely high rates rather than superficial increases.

3. Improve public expenditure management by restructuring its components in a way that raises the share of investment spending and directs it toward sectors that yield economic returns and benefits, which in turn reflect positively on growth rates.
4. Strive to achieve balance in the money market between supply and demand to eliminate imbalances that lead to disruptions in the local goods and services market and the balance of payments, and consequently in net foreign assets. Additionally, efforts should be made to create equilibrium between the money market and the goods market to avoid and address inflationary gaps.
5. The ultimate and sole objective of monetary policy in the Iraqi economy should be price stability, considering that achieving other objectives does not guarantee reliable results.
6. Develop advanced standard models to measure the complex relationships between internal and external macroeconomic variables, and deepen applied research and studies that rely on modern quantitative measurement techniques focusing on the practical aspect (data and results) as the basis for analysis.

## References

- Abdelkader, M. A. N., & Atiyah, I. N. (2003). *Modern trends in development*. Alexandria: Al-Dar Al-Jamia.
- Abidjman, M. (2010). *Macroeconomics*. Riyadh: Dar Al-Mareekh Publishing.
- Ahmed, A. M. (n.d.). *Brief in Microeconomics and Macroeconomics*. Khartoum: General Company for Printing and Publishing.
- Ali, A. M. S., & Al-Issa, N. S. D. (2004). *Money, Banking, and Financial Markets*. Amman: Al-Hasad Publishing and Distribution.
- Ali, L. (1995). *Public Finance: An analytical study*. Cairo: Ain Shams Library.
- Al-Dulaimi, A. F. I. (1990). *Money and Banking*. Mosul: Dar Al-Hikma Printing and Publishing Press.
- Al-Faris Al-Qutaifi, A. A. (1999). *Economic growth: Growth Theories, Dynamics and Mathematical approach*. Baghdad: Directorate of Books Printing and Publishing.
- Al-Hajjar, B. (2006). *Monetary and banking economics*. Beirut: Dar Al-Manahil Al-Lubnaniyah.
- Al-Jumard, W. A. J., & Al-Dabbagh, O. B. (2003). *Macroeconomics*. Amman: Al-Manahij for Printing and Distribution.

- Al-Man, M. A. (2003). Lectures in macroeconomic theory (Vol. 3). Algeria: University Publications Office.
- Al-Omr, S. N. (1981). Economics of Public Finance. Baghdad: Al-Aani Printing Press.
- Al-Qutaifi, A. A. (1999). Growth theories: Dynamics and mathematical approach. Baghdad: Directorate of Books Printing and Publishing.
- Al-Sharbini, F. A., et al. (1998). Economics of Machinery. Zagazig: Al-Maktaba Al-Ilmiya.
- Ben Ali, B. (2004). Lectures on monetary theories and policies. Algeria: University Publications Office.
- Blanchard, O. (1997). Macroeconomics. New Jersey: Prentice Hall.
- Dobb, M. (1979). Economic growth and underdeveloped countries (H. Metwally, Trans., 2nd ed.). Beirut: Dar Al-Tali'a.
- Haddad, A. M., & Hadhul, M. (2005). Money and banking: An analytical and theoretical approach. Amman: Wael Publishing and Distribution.
- Hamdani, M. (2009). Limits of sustainable development in addressing the challenges of the present and the future: A case study of Algeria (Doctoral dissertation). University of Algiers, Faculty of Economic Sciences and Management Sciences.
- Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52(2), 169–210. <https://doi.org/10.1111/j.1468-0084.1990.mp52002003.x>
- Karam, A. (1980). Economics of underdevelopment and development. Kuwait: Center for National Development.
- Kuznets, S. (1966). Modern economic growth (Translated by a group of economists). Beirut: Dar Al-Afaq Al-Jadida.
- Lamartina, S., & Zaghini, A. (2008). Public expenditures and Wagner's Law in OECD countries. Center for Financial Studies Working Paper, 13.
- Mehri-Quencher, H., & Sellami, F. (200X). Économie monétaire. Tunis: Centre de Publication Universitaire.
- Mithani, D. M. (1998). Modern public finance: Theory and practice. New York: Himalaya House.
- Shamiyah, A. Z., & Al-Khatib, K. (1991). Public finance. Amman: [Publisher not identified].
- Shapiro, E. (1974). Macroeconomic analysis. New York: Harcourt Brace Jovanovich.
- Sideris, D. (2007). Wagner's law in the 19th century. Bank of Greece Working Paper, 64.
- United Nations Development Programme. (2002). Arab Human Development Report 2002: Creating opportunities for future generations. New York: UNDP.
- Ben Sahha, M. (2009). The impact of non-oil export development on economic growth in Algeria: A case study of small and medium enterprises (Master's thesis). Algeria: Institute of Economic Sciences, Commercial Sciences and Management Sciences.