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### Causal relationship between money supply and real gross domestic product in the Libyan economy

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#### Abstract

This paper focused on studying the relationship between real Gross Domestic Product and the amount of money supply in the Libyan economy during the period 1980 to 2014, where modern standard methods were used, and the study reached a set of results, the most important of which is the existence of a direct relationship affecting in the short term between Gross Domestic Product and supply Money, and the existence of an adverse effect in the long run between economic growth represented in Gross Domestic Product and money supply.

**Keywords:** money supply, gross domestic product, Libyan economy

#### Introduction

Money is the focus of monetary policy, which is an important tool of the state's general economic policy, and an essential element of the reform programs that most countries follow in the context of their orientation towards economic liberalization and openness to the outside world, especially in modern economies that are considered monetary economies in the first place. The monetary policy is seen as an important tool on which various countries depend in drawing their economic policy, through the various tools and means that they depend on in managing liquidity and controlling the size of the monetary mass in the economy, in order to achieve its objectives, such as monetary stability and influence the volume of economic activity

Economic theories have been concerned with analyzing monetary policy and its effectiveness in affecting economic activity by analyzing the factors determining the value of money and the price level. The study of the relationship between money supply and growth in Gross Domestic Product (GDP) and the price level has been the focus of attention of many scholars at the local and global levels, as economic theories confirm that many economic variables such as income, investment, spending, prices and others are affected by what happens to the cash circulation in. Therefore, the study focuses on measuring the relationship between money supply and gross domestic product in the Libyan economy.

#### Problem Statement

The gross domestic product is one of the sources of financing for the amount of money supply, and the money supply is one of the most important tools of monetary policy applied for the stability of the economy, and according to economic theory that the gross domestic product is the effect on the money supply, and by looking at the data for the study, we find that the gross domestic product In a steady increase until it reached its highest level in 2010, in the years following 2010, output decreased to its lowest level, while the money supply was also steadily increasing even after the decline in output to its lowest level until it reached its highest value in 2013. Through the previous simple presentation, we find that it is difficult to determine the relationship between the gross domestic product and the amount of money supply in the Libyan economy, especially in light of the inverse relationship, that is, a decrease in the main funded output and an increase in the money supply.

#### Purpose of the Study

The study aims to clarify the extent of the impact of the gross domestic product on the amount of money supply, in such a way that monetary policy makers in the Libyan economy in particular and those interested in the Libyan economic affairs in general can benefit from

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the results obtained to contribute to the building and stability of the economy.

**Hypothesis of the Study**

There is no causal relationship between real GDP and the quantity of money supply

**Methodology**

This study adopted the quantitative approach to clarify the relationship between real GDP and the quantity of money supply, as modern standard methods were used, including the time-series static test and joint integration tests to find out whether there is a long-term equilibrium relationship or not, the error correction test, and finally the test Granger of the causal relationship to determine the direction of the relationship between the economic variables under study.

**Limitations of the Study**

The spatial limits of this study included the Libyan economy, while the temporal boundaries included the period from 1980 to 2014.

**Previous Studies**

Abdullah, (2013) <sup>[1]</sup> studied the effect of money supply in a broad sense on the official exchange rate of the Libyan dinar against the US dollar, using two variables, namely the money supply as an independent variable and the exchange rate as a dependent variable during the period 1970-2010. The results of the study indicated that there is a causal relationship in two directions between the variables.

Wang, (2012) <sup>[5]</sup> focused on the relationship between money supply and economic growth, and inflation in China 1998-2007 with joint integration and the Granger test, and the results showed that there is no joint complementarity relationship between money supply, inflation and economic growth, but there is a joint complementary relationship between money supply and inflation, While there is no co-complementarity relationship between the money supply and economic growth. And that there is a contradiction between the goal of economic growth and price stability in China.

Similarly, Pradana, (2013) <sup>[4]</sup> examined in the short and long

term, the relationship between economic growth and inflation in three Asian countries during the period 1980-2010. The methodology used in this study is cointegration and causation testing. The results showed that there is a negative and significant long-term relationship between economic growth and inflation in Sri Lanka. While there is no statistically significant relationship between the variables in China and India, the relationship in the short term is negative and important for China. The causality findings reveal that there is a one-way causal relationship that runs from economic growth to inflation in China. Nabil (2015) <sup>[3]</sup> also studied the relationship between the money supply and the current gross domestic product in the Iraqi economy during the period 1980-2012, and the study found that there is a balanced relationship in the short and long term between the money supply and the gross domestic product.

**Description of the Standard Model**

To find the causal relationships between different phenomena, Liner Regression is one of the advanced statistical methods that ensure the accuracy of the recognition in order to improve the results of the research through the optimal use of data, in addition to it is a mathematical equation that expresses the relationship between several variables, and is used to estimate the regression of the dependent variable (Y) has many independent variants X1, X2,... XK (Cohen & Holliday, 1996). In this study, a linear regression model was used to determine the nature of the relationship between money supply and real GDP according to the following model:

$$\Sigma GDP_t = \alpha + \beta \Sigma MS_t + \varepsilon \dots \dots \dots (1)$$

$$\Sigma MS_t = \beta \Sigma GDP_t + \varepsilon \dots \dots \dots (2)$$

Where: GDP is real GDP  
MS Money Show.

**Unit Root Tests**

The modified Dickie Fuller test (ADF) and Phillips-Peron test (P.P) were used to verify whether the variables under study were static or not, and through the tables (1,2,3,4) the following results were obtained:

**Table 1:** Results of the modified DickFiller test (ADF-Level)

Test	Exogenous	%10	%5	%1	Calculated Value	Variable
ADF	By constant and temporal direction	-3.215267	-3.562882	-4.284580	-2.340312	GDP
	By constant only	-2.619160	-2.960411	-3.661661	-1.500470	
ADF	By constant and temporal direction	-3.207094	-3.548490	-4.252879	-0.310287	MS
	By constant only	-2.614300	-2.951125	-3.639407	2.244957	

**Table 2:** results of modified Dickeflair test (ADF-1st difference)

Test	Exogenous	%10	%5	%1	Calculated Value	Variable
ADF	By constant and temporal direction	-3.212361	-3.557759	-4.273277	-5.731123	GDP
	By constant	-2.619160	-2.960411	-3.661661	-2.652037	
ADF	By constant and temporal direction	-3.209642	-3.552973	-4.262735	-4.806482	MS
	By constant	-2.615817	-2.954021	-3.646342	-3.949805	

**Table 3:** Philips Piron PP - Level test results

Test	Exogenous	%10	%5	%1	Calculated Value	Variable
ADF	By constant and temporal direction	-3.207094	-3.548490	-4.252879	-2.865334	GDP
	By constant only	-2.614300	-2.951125	-3.639407	-2.134348	
ADF	By constant and temporal direction	-3.212361	-3.557759	-4.273277	1.393547	MS
	By constant only	-2.617434	-2.957110	-3.653730	4.444916	

**Table 4:** Philips Peyron test results (PP - 1st difference)

Test	Exogenous	%10	%5	%1	Calculated Value	Variable
ADF	By constant and temporal direction	-3.209642	-3.552973	-4.262735	-7.689652	GDP
	By constant only	-2.615817	-2.954021	-3.646342	-7.835116	
ADF	By constant and temporal direction	-3.209642	-3.552973	-4.262735	-4.798412	MS
	By constant only	-2.615817	-2.954021	-3.646342	-4.121751	

Through the developed Dickey-Fuller test (ADF), the results obtained showed that the original values of the time series of the two variables (GDP, MS) were not at the level, which indicates that the two variables are incomplete of the rank GDP (0), MS (0), but they stabilized when taking First difference: GDP (1), MS (1). For the purpose of making sure, the Phillips Perron Test (P.P) was applied, whose results shown in Tables (3 and 4) showed that the time series of the two variables (GDP, MS) were not stable at the level, and stabilized when the first difference was taken.

**The Co-integration Test**

By applying the Johansen Co-integration Test between the money supply and the real product as shown in Table (5),

**Table 5:** shows the results of the Johansen test for the common integration between the study variables

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.532271	34.38101	15.49471	0.0000
At most 1 *	0.245713	9.305411	3.841466	0.0023
Trace test indicates 2 cointegratingeqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.532271	25.07559	14.26460	0.0007
At most 1 *	0.245713	9.305411	3.841466	0.0023
Max-eigenvalue test indicates 2 cointegratingeqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

**ECM results**

After ensuring the existence of the joint integration, a Vector Autoregressive Model is designed. We display the results of the error correction model according to Table No. (6).

**Table 6:** shows the results of the self-regression model

Vector Error Correction Estimates		
Date: 06/02/16 Time: 12:14		
Sample (adjusted): 1982 2014		
Included observations: 33 after adjustments		
Standard errors in () & t-statistics in []		
Error Correction:	D(GDP)	D(MS)
CointEq1	-0.433152	0.190735
	(0.08929)	(0.04911)
	[-4.85089]	[ 3.88368]

Looking at the results in the previous table, it becomes clear that the value of the adjustment factor, i.e. the parameter estimated for the correction limit in the equation of real GDP, is significant and negative, as it reached (-0.433152). This means that the error correction limit helps explain changes in the quantity of money supply, which means that there is a causal relationship in The long-term trend is from real GDP to the quantity of money supply, and the speed of correcting the error in the money supply equation was significant and reached (0.190735), and through the results

where the results indicate based on the Trace Statistic and Max-Eigen tests at the level of 5%. To the rejection of the null hypothesis, which means the absence of any trend of joint integration, and the acceptance of the alternative hypothesis, that is, the existence of two equilibrium relationships between the study variables according to the impact statistic and the maximum value. Therefore, it can be said that there is a long-term equilibrium relationship between the real gross domestic product (GDP) and the quantity Money supply (MS), which means that the variables should have an error-correcting model representation to estimate the short and long-term effects between the variables.

shown, it is clear that the GDP increases the quantity of money supply.

Through the results obtained from diagnostic tests for the remainder of the error correction model according to Table No. (7), which indicated that the value of Obs.R2 = 9.305574, which indicates that the model does not suffer from the problem of the serial correlation between the remainder at a significant level (P-Value = 0.0095) with the “Breusch-Godfrey Serial Correlation LM” test.

**Table 7:** illustrates diagnosing the residual error correction model

Residual Diagnostic Tests	Obs.R <sup>2</sup>	Chi-Square	Result
Breusch-Godfrey Serial Correlation LM	9.305574	0.0095	No
Heteroskedasticity Test: Breusch-Pagan-Godfrey	16.19348	0.0028	No
Normality test	Jarque-Bera	0.400015	No
	1.832508		

In addition, the estimated model based on the results of the “Heteroskedasticity Test: Breusch-Pagan-Godfrey” does not suffer from the error limit variance problem, as its value reached (Obs.R2 = 16.19348 at the value of P-Value = 0.0028), as I explained. Results based on the (Jarque-Bera) test whose value was (Jarque-Bera = 1.832508) at the level of (P-Value = 0.400015), that the residues were distributed normally.

### Serial Correlation LM Test

When performing the (LM) test, it was found that the standard model is free from the problem of self-correlation, based on Table (8).

**Table 8:** illustrates the results of the autocorrelation problem test

Residual Diagnostic Test F	F- statistic	Probability	Result
Breusch–Godfrey Serial Correlation LM	5.301891	0.0114	No

### Granger Causality Tests

Since it is not known which of the two variables affects the other, or the one-sided or two-sided relationship, Table (9) shows the causation results between the two variables under study, namely money supply (MS) and real gross domestic product (GDP)

**Table 9:** shows the results of the Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
GDP does not Granger Cause MS	24	1.96831	0.1752
MS does not Granger Cause GDP		0.36884	0.5502

Where the results of the estimation of the causal relationship in the short term according to the previous table indicate that the one-way relationship between GDP and the quantity of money supply, as the F statistic reached (1.96831) at a significant level of (0.1752), thus accepting the hypothesis that the change in GDP According to Granger's concept, it causes changes in the money supply. As for the result of testing the hypothesis of a causal relationship moving from the quantity of money supply to the gross domestic product, the results of the estimate showed that there is no relationship between money supply (MS) and gross domestic product (GDP), that is, The one-sided relationship as it moves from GDP to the amount of money supply and this result is identical to the economic theory

### Results

The relationship between the real variables represented by the real domestic product and the monetary variables represented by the money supply was the subject of widespread debate among economic schools, and this study aimed mainly at determining the causal relationship between the real product and the quantity of money supply in the long and short term, so that the relationship in the two terms can be determined. Financial authorities use effective policies to try to create economic balance. The most important results can be presented as follows

1. The results of the stability tests using the unit root test showed that the economic variables are not Stable in level except that it is stable in the first differences.
2. The error correction model tests indicated that the error correction limit coefficient bears a negative and significant sign as the actual deviation of the exchange rate from the equilibrium is corrected every year by. (0.69).

Moreover, the statistical tests explained the existence of an adverse effect in the long term between economic growth represented by GDP and money supply on the one hand, and a positive relationship with both inflation and exchange rate levels on the other hand. The study also showed the existence of a positive relationship affecting, in the short term, between GDP and money supply. It is observed that the results obtained differ in the quality of the relationship

in the long and short term for all the variables under study. The relationship between the monetary variables represented by the money supply and the real variables represented by the real output was the subject of a wide debate between economic schools and economists. The classic school suggests that any change in the growth of money supply will simply lead to inflation. This means that real income (production) is determined by real economic factors and forces (such as savings and productivity) and not by monetary factors. This proposal stems from the lack of an effective transition mechanism between changes in money supply and production.

According to the classical theory, long-term interest rates are determined by the behavior of savers and investors, and as developed by the loanable funds theory. This suggests that the decisions of savers and investors and long-term interest rates are determined by long-term factors. The previous picture was disturbed by the emergence of Keynes's general theory and Keynes's interpretation of the relationship between monetary policy and production. According to Keynes, the nominal interest rate is determined by the demand for and supply of money, which in turn represents the vital link between the monetary and real sectors. On the other hand, any changes in nominal interest rates coincide with changes in real interest rates, which affects the real variables (production and employment). Thus, changes in money supply lead to changes in real interest rates, which in turn lead to real changes in the national economy. But Keynes did not stop there. He held that the demand for money and the supply of money are not independent of each other, and thus an increase in the money supply may not lead to the expected effect on nominal income. The increase in the money supply pushes the interest rates down, and this encourages an increase in the demand for money for fear of higher interest rates in the future. Thus, the rates of interest may not fall much to persuade people to carry the increase in money supply. This results in a small increase in investment as well as in nominal income. That is why Keynes called for reliance on fiscal policy to stimulate the economy

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