


“The nature of the relationship between the money supply and inflation in the Jordanian economy (1980–2019)”

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THE NATURE OF THE RELATIONSHIP BETWEEN THE MONEY SUPPLY AND INFLATION IN THE JORDANIAN ECONOMY (1980–2019)

Abstract

This study aims to investigate the relationship between the money supply (M1) and inflation in the Jordanian economy during the period of 1980–2019.

To achieve the goal of the study, the methodology of econometric analysis of time series was used through the following tests: Augmented Dickey-Fuller (ADF) test – to test the stability of the study variables, Johansen's Cointegration Approach – to determine the long-term equilibrium relationship between the study variables, and the Granger Causality Test – to determine the direction of the causal relationship if it exists in the short term.

The study results demonstrate that inflation has stabilized at the level, while the money supply M1 was unstable at the level and stabilized after taking the first difference. The Cointegration test results indicated that there was no causal link between the money supply M1 and inflation in the long term. Finally, the results of Granger Causality presented a unidirectional causality running from the money supply M1 to inflation in the short term, meaning that money supply causes inflation, not vice versa; this means that the money supply M1 can explain the changes that occur in the consumer price index (CPI) in the Jordanian economy.

The study recommends that the monetary authority in Jordan should have greater control over the money supply due to its impact on the stability of the general level of prices, in order to avoid a repeat of the 1989 crisis represented by the sharp decline of the dinar exchange rate against other currencies and an increase in inflation that year to 25.6%.

Keywords

money supply M1, inflation, ADF test, causality test, co-integration test, Jordanian economy

JEL Classification

E31, E51

INTRODUCTION

Inflation is considered as one of the major economic topics that have attracted the interest of researchers, as their interpretations and views on this problem have multiplied, especially because it affects all layers of society.

Economic literature points to many theories that have tried to explain the phenomenon of inflation. Some support the principle that “inflation is a purely monetary phenomenon” (Friedman & Schwartz, 1963) in the sense that an increase in money supply causes inflation. Moreover, Friedman believes that the money supply is an external variable that is not affected by internal factors such as prices and output, but it rather affects them. Meanwhile, other theories demonstrate that inflation is caused by other reasons rather than an increase in the money supply.

The importance of this study lies in understanding the relationship between money supply controlled by Jordanian monetary authorities and prices, the growth of which affects all layers of society, especially people with low incomes. Thus, the aim of this study is to investigate and analyze the nature and direction of the relationship between money supply and inflation in the Jordanian economy using the Augmented Dickey-Fuller (ADF) stability test, Johansen's Cointegration Approach, and the Granger Causality Test.

1. THEORETICAL BACKGROUND AND LITERATURE REVIEW

Economic literature indicates that sources of inflationary forces leading to a continuous rise in the price level can be explained by the following three types of theories: demand theories, supply theories, and structural theories.

Demand theories focus on interpreting inflation from the demand side and assume that excess demand is the cause of inflation. The proponents of this trend are Classical and Modern Monetary Theory and Keynesian theory.

The Classical Monetary Theory demonstrates that "there is a close relationship between the amount of money and inflation and that the excessive increase in the amount of money is the main reason for the occurrence of the phenomenon of monetary inflation" (Dewett & Chand, 1993). The Fisher equation is one of the oldest formulas that dealt with money and the interpretation of its fluctuations. The equation refers to "the direct relationship between the amount of money and the general level of prices through the formulation of the following exchange equation:

$$MV = PT, \quad (1)$$

where M is the quantity of money during a period of time, V is the velocity of money in circulation, P is the general price level, and T is the size of transactions" (Fisher, 1911).

The direct relationship referred to is based on the assumption that there is no compactness and velocity of money in circulation V , the size of transaction remains constant in the short run (AlNaif et al., 2018), and the increase that occurs in the amount of money directly goes to spending; this

means that the changes in the value of money are inversely proportional to the change in its quantity in the sense that price stability depends on spending and velocity of money in circulation.

Fisher's theory assumes that monetary authorities can influence prices and output by controlling the money supply by increasing or decreasing in the short term.

Later, Alfred Marshall of the Cambridge School developed the formulation of the Fisher equation by substituting the change in demand for money in the place of velocity of money in circulation and substituting the national product instead of the size of transactions to obtain the Cambridge equation as follows (Parkin, 2016):

$$M = KPY, \quad (2)$$

where K – is the percentage of money for individuals who desire to hold liquid cash from their incomes for transaction purposes, and Y is the real national product (Froyen, 1990). The Keynesian theory focuses on direct demand for money (liquidity preference) and its relationship with the national expenditure. In addition, it focuses on studying the relationship between the level of national expenditure and national income instead of researching "the relationship between the amount of money and the general level of prices" (Shadeed, M, 2018). Keynesians believe that the money supply is determined within the system and is an internal variable that is affected by output, interest rate, and prices.

Finally, structuralisms attribute inflation to "structural factors such as supply bottleneck (i.e., food scarcity due to imbalance between the demand for money and supply of food); resources bottleneck (i.e., shortage of capital, higher unemployment rate, and lack of oil); foreign exchange bottleneck (i.e., deficit of balance of payment and

huge colossal import bill”); and finally, social and political constraints (Lado, 2015).

In short, it can be said that theories of demand ignored the inflationary forces caused by the supply side, including general production costs and wages costs. Therefore, other theories emerged that explain inflation based on the supply side, including cost push inflation considering that the main cause of inflation is the high costs of production (AlNaif et al., 2018).

The relationship between the money supply and inflation has received great attention in economic literature, and this is evidenced by the multiplicity of applied studies in developed and developing countries, which have reached conflicting results in this field. Below are a number of studies reviewed: Crowder (1998) examined “the long-term relationship between inflation and the money supply in the USA”; the study found that there was a strong long-term relationship between the money supply and inflation, and the trend or components of the growth of (CPI) were attributed to the components of the growth of monetary base. Pinga and Nelson (2001) tested “the direction of causality between changes in money supply and aggregate prices”, using pooled country evidence. The results demonstrated that the evidence of structural inflation was found only in Chile and Sri Lanka, and the evidence of money supply erogeneity was found in Kuwait. Benbouzian and Benamar (2004) examined “the relationship between money supply and prices in the Arab Maghreb Countries, Tunisia, Morocco, and Algeria, through the use of Co-Integration analysis. The results showed a unidirectional causation from money supply to prices” in the case of Tunisia and Morocco, and the apparent absence of causality in the case of Algeria. Ghazali et al. (2009) tested the “relationship between money supply and prices for the period from 1974 to 2006 in Malaysia. They concluded that there is a long-term equilibrium relationship between money supply and prices and there is a unidirectional causality running from money supply to prices in the short term”. Indalmanie (2011) tested “the hypothesis that there is a causal link between the rate of inflation and the growth rate of money supply by using quarterly data series for Jamaica during the period of 1961–2006. The results revealed that there is a feedback effect

between inflation and narrow money M1 and there is a unidirectional causation running from inflation to a broad money M2”. Yan-Liang (2012) investigated “the relationship among money supply, economic growth, and inflation in China for the period from 1998 to 2007”, and they used Co-Integration and Granger Causality Tests, the results of which “revealed that there is no cointegration relationship among money supply, inflation, and economic growth, but there is cointegration relationship between money supply and inflation, and there is no cointegration relationship between money supply and economic growth”.

Kiganda (2014) tested the relationship between inflation and money supply in Kenya through the use of annual time series data during the period of 1984–2012. The results indicated that “there is a significant positive long-run relationship between inflation and money supply, and inflation is significantly error correcting at 68% annually.” Moreover, the study found that a unidirectional causality was running from money supply to inflation and concluded that money supply is a significant determinant of inflation in Kenya.

Mishal and Abu-Dallow (2014) examined “the effect of money supply on real output and prices by using quarterly data for the period from 1990 to 2010 in Jordan”. They presented that there was a lack of integration between the joint variables of the study and showed a one-way causality from the money supply M2 to the real output, and a two-way causal relationship between the real output and the price level in Jordan. Meanwhile, Diermeier and Goeke (2016) investigated “the connection between money supply and inflation in various countries of the EuroZone, despite the variation in time lag through utilizing Granger Causality and Correlation in VAR Approach”. They found “disconnection between the growth of monetary aggregates and inflation”. Besides, Sasongko and Huruta (2018) utilized a Granger Causality model for the monthly data from January 2007 to July 2017. “They found a unidirectional causality connection of money supply to the price level in Indonesia.” In addition, Amassoma et al. (2018) adopted a Co-Integration and ECM approach on the annual time series from 1970 to 2016. They “found no causality from money supply to inflation and vice versa in the Nigerian

economy". AlNaif et al. (2018) analyzed the relationship between the money supply and inflation during the period of 1968–2015 in Jordan. They used a methodology of econometric analysis of time series. The results indicated that “there was no causal link between the money supply and the price index in the long term, and money supply causes inflation not vice versa in the short term in Jordan.” Sultana et al. (2019) checked the “relationship between money supply and inflation in Bangladesh” using monthly data from May 2010 to December 2017, the Co-Integration, and Vector Error Correction Techniques. They demonstrated that the money supply did not affect inflation in the short term, not vice versa. They also found a bidirectional causal relationship between money supply and inflation in the long term.

2. METHOD

This study is based on annual time series data issued by the CBJ for money supply in a narrow sense (M1) and the consumer price index (CPI) during the period from 1980 to 2019. For the purpose of “econometric analysis of the relationship between money supply and inflation” (Doan Van, 2019), the first step is to ensure the stability of time series of the study variables and to verify the degree of their integration at the level or when taking the differences by using the Augmented Dickey-Fuller (ADF) test. Moreover, the study used the Cointegration Test (Johansen & Juselius, 1990) to estimate the cointegration vectors (long-term relationship) if there is a relationship among the study variables, and used the Granger Causality Test (1969) to determine the direction of the relationship among the study variables.

The study includes the following two variables: inflation, which is measured by the growth of the CPI, and the money supply M1, which consists of money in circulation (outside the banking system) in addition to demand deposits. Table 1 shows that the average growth of money supply M1 has reached 8.1%, while the average growth of CPI has reached 4.6% during the study period (1980–2019).

To study the behavior of the variables, the research period is divided into four periods (see Table 2).

Table 2 shows that the average growth rates of money supply M1 are higher than the average growth rates for CPI for all periods.

3. RESULTS

If you look at the first period (1980–1990), you will find that the average growth rate of CPI is 7.8%, which is the highest indicator during the study period (1980–2019). This is attributed to the suffering of the Jordanian economy from many crises, the most important of which was the depreciation of the dinar exchange rate against other currencies in 1989. The inflation rate in that year reached 25.6% as shown in Table 1.

As for the period from 2001 to 2010, the average growth rate of the money supply M1 reached the highest level of 12.5% due to the expansion of the monetary authorities in money supply to keep up with the economic growth rates that reached 8.2 on average during that period (Batarseh, 2017).

As for the period from 1991 to 2000, the average growth rates of two variables came very close, reaching 3.77% of the money supply, while CPI reached 3.48% due to Jordan’s adoption of the economic reform program (1992–1998), which was one of the goals of achieving a balance between the growth of the money supply and credit on one hand and the development of the national economy on the other hand (El-Issa, 2007).

If you look at the last period from 2011 to 2019, you will find that the average CPI growth rate has reached the lowest value (3.1%) during this period, while the average growth rate of money supply M1 is 5.3%. These rates can be explained by “monetary policy, which focused on achieving monetary stability and meeting the challenges that Jordan faced and keeping abreast of development. The CBJ injected liquidity in the economy by the equivalent of 2.4 billion dinar in order to influence the size of surplus reserves and controlled the interbank lending rate at the desired level of monetary policy” (Al-Zararee & Batarseh, 2019). There is another reason for the low average growth rate of the CPI in that period, which is the drop in oil prices globally, especially at the end of this phase, which had a positive impact on the most of the macroe-

Table 1. Money supply M1 and consumer price index (CPI) (1980–2019) in Jordan, million JD

Source: CBJ (2015, pp. 8, 9, 78), CBJ (2019, p. 5).

Years	Money supply M1	M1 growth rate, %	Consumer price index (CPI)	CPI growth rate, %	Years	Money supply M1	M1 growth rate, %	Consumer price index (CPI)	CPI growth rate, %
1980	594.8	25.8	29.3	10.9	2001	2119.7	4.5	85	1.7
1981	701.7	17.9	31.6	7.8	2002	2316.2	9.2	86.6	1.9
1982	787.5	12.2	33.9	7.2	2003	2919.9	26	88.6	2.3
1983	869.4	10.4	35.6	5	2004	3192.9	9.3	90.9	2.6
1984	878.4	1	37	3.9	2005	4061.3	27.2	94.1	3.5
1985	848.2	-3.4	38.1	2.9	2006	4566.5	12.4	100	6.3
1986	897.1	5.7	38.1	0	2007	4833.1	6.5	104.7	4.7
1987	979.8	9.2	38	-0.26	2008	5573	15.3	119.3	13.9
1988	1181	20.5	40.6	6.8	2009	6039.5	8.3	118.5	-0.67
1989	1326.5	12.2	51	25.6	2010	6550	6.4	124.5	5.1
1990	1432.7	8	59.2	16.1	2011	7271.5	11	130	4.4
1991	1600.4	11.7	64.1	8.2	2012	7211.1	-0.82	136	4.6
1992	1716.1	7.2	66.6	3.9	2013	8408.4	16.5	143.3	5.3
1993	1730.1	0.81	68.8	3.3	2014	9231.7	9.7	147.5	2.9
1994	1746.1	0.92	71.3	3.6	2015	9880.2	7	148.9	0.9
1995	1745.6	-0.057	72.9	2.2	2016	10386.9	5.1	150.1	0.8
1996	1539.2	-11.8	77.7	6.5	2017	10135.2	-2.4	155.2	3.3
1997	1642.4	6.6	80	2.9	2018	9676.3	-4.5	162.6	4.5
1998	1613.9	-1.7	82.5	3.1	2019	10322.8	6.6	163.9	0.8
1999	1777.1	10.1	83	0.6	-	-	-	-	-
2000	2026.7	14.0	83.5	0.6	-	-	-	-	-

Table 2. Average growth of the study variables divided into four periods

Source: Calculated by the researcher according to Table 1.

Variables	1980–1990	1991–2000	2001–2010	2011–2019
Money supply M1	10.9	3.77	12.5	5.3
Consumer price index (CPI)	7.8	3.48	4.1	3.1

conomic variables in the Jordanian economy (CBJ, research about the impact of low oil prices on the national economy 2015).

3.1. Unit root test

The results of the ADF Test in Table 3 demonstrate that the estimated value of the ADF Test for the money supply growth variable is -2.676, which is less than the absolute value of the corresponding Critical Mackinnon (1990) at the 0.05 level of sig-

nificance, which is -2.927, as the probability value is 0.086. Therefore, the null hypothesis is accepted that the unit root exists, meaning that the money supply M1 series is unstable at the level. After taking the first differences, the estimated value of ADF Test for M1 is -6.360, which is greater than the Critical P-value of Mackinnon (1990), which is equal to -2.925 as the probability is 0.002. Thus, the null hypotheses is rejected, and it is concluded that the time series of the money supply M1 is stable at the first difference (first-order integration

Table 3. ADF results for stationarity

Variables	At level			At 1st difference		
	Estimated value	Probability	Decision	Estimated value	Probability	Decision
Money supply in narrow sense M1	-2.676	0.086	Not stable	-6.36	0.002	Stable I (1)
Consumer price index (CPI)	-4.328	0	Stable	-8.746	0	Stable

Note: Critical value at the 0.05 level of significance is -2.925, Mackinnon (1990) one-side p values.

I (1)). As for the CPI variable, the estimated value of the ADF Test is -4.328 , which is greater than the absolute value of the corresponding Critical Mackinnon (1990) at a significance level of 0.05, which is equal to -2.927 as the probability is 0.002; this means that the null hypothesis that the unit root exists (the series being stable at level) cannot be rejected. It is concluded that the series of the two variables are not in the same order of integration.

3.2. Co-integration test

Although the results of the time series stability test for the study variables showed that the two series are not in the same order of integration, the Johansen-Juselius technique of the Cointegration Test was conducted to test and evaluate the existence of a long-term relationship between the growth of money supply M1 and the indicator of the prices (CPI). This was done to know the number of vectors and the nature of the equilibrium relationship between them in the long run based on the Trace Test and Maximum-Eigenvalue, to test that there is no cointegration relationship between the variables in the long term (cointegration vectors do not exist), and then to test the null hypothesis that there is one relationship (one vector) or the presence of two vectors, etc.

Table 4 presents the results of Johansen's cointegration test between money supply M1 and CPI, which

show that it is not possible to reject the null hypothesis that there is no cointegration vector between the study variables, since the estimated value of the trace statistic is 12.741, which is less than the critical value of 15.494 and it is insignificant at 0.05 level or less.

Table 4 also indicates that the estimated value of the Maximum-Eigenvalue statistic is 9.150, which is less than the critical value (14.264), and it is insignificant at 0.05 level or less. This result supports the result of the Trace Test, and thus it is concluded that "there is no long-term relationship between the study variables" (Hicham, 2020).

This result is consistent with the finding of Mishal and Abu-Dallow (2014), which covered the period from 1990 to 2010 in Jordan, and is inconsistent with the findings of Crowder (1998) in the USA and Ghazali et al. (2009) in Malaysia. Furthermore, this result can be attributed to the fact that the effect of fiscal policy is stronger than the effect of monetary policy on the economic activity in Jordan, as indicated by several studies (Awad, 1995; Fodeel & Megalwi, 2010).

After the results of the Johansen cointegration test showed that there is no cointegration vector for any long-term co-integration relationship between the two study variables, it is now required to estimate the direction of the causal relationship

Table 4. Johansen cointegration test results

Hypothesis: Number of cointegration vectors	Statistical values of the test	Critical value at 0.05 level of significance	Probability value	Decision
Trace statistic				
There is no cointegration vector	12.741	15.494	0.127	Accept the null hypothesis
There is only one cointegration vector	3.58	3.841	0.068	Accept the null hypothesis
Maximum-Eigenvalue statistic				
There is no cointegration vector	9.15	14.264	0.271	Accept the null hypothesis
There is only one cointegration vector	3.581	3.841	0.066	Accept the null hypothesis

Note: Mackinnon-Haug-Michelis (1999) p values.

Table 5. Granger causality test result

Null hypothesis	Number of observations	F-test	Probability	Result
M1 does not cause CPI	40	4.330	(0.020)*	Reject the null hypothesis
CPI does not cause M1	40	0.518	(0.626)	Accept the null hypothesis

Note: * Significance at 0.05.

between the variables in the short term using the Granger causality test as shown in Table 5.

The results of the Granger causality test demonstrate that the value of F statistic to test the null hypothesis that M1 does not cause CPI is equal to 4.330 and statistically significant at the level less than 0.05. Thus, the null hypothesis is rejected; this means that there is a causal relationship that goes from M1 to CPI in the short term. As for the Granger causality test for the second hypothesis that says CPI does not cause M1, the results indicate that the value of F statistic is 0.518, which is not statistically significant at the level of 0.05. Therefore, the null hypothesis that says CPI does not cause M1 cannot be rejected. Table 5 shows that there is a unidirectional causality running from the money supply M1 to

CPI, meaning that the money supply M1 causes inflation, not vice versa, in the short term in the Jordanian economy.

This result is consistent with the findings of each of the following studies: Kiganda (2014) in Kenya, Benbouzian and Benamar (2004) in Tunisia and Morocco, Ghazali et al. (2009) in Malaysia, Khaled AlNaif et al. (2018) in Jordan, and Sasongko and Huruta (2018) in Indonesia.

On the other hand, this result is not in agreement with the following studies: Amassoma et al. (2018) in Nigeria, Diermeier and Goeke (2016) in various countries of the EuroZone, and Mishal and Abdalallow (2014) in Jordan, which showed the existence of insignificant causal relationship at 0.05 level between money and prices.

CONCLUSION

The time series of money supply M1 is not stable in its level, but it is stable in the first difference, while the time series of the consumer price index (CPI) is stable at the level. Thus, it is concluded that the two series are not in the same order of integration.

There is not any cointegration vector between the money supply M1 and CPI. Therefore, this study concludes that there is no long-term relationship between the study variables. There is no causal relationship from CPI to M1 in the short term.

A unidirectional causality from M1 to CPI exists in the short term, which means that the money supply M1 causes inflation in Jordan, not vice versa, and the money supply can explain the changes that occur in the CPI in the Jordanian economy.

At the level of the study variables' actual behavior, the average growth rate of the money supply M1 has reached 8.1%, while CPI has reached 4.6% during the study period (1980–2019), since the average growth rate of money supply reached its highest level during the period of 2001–2010 to keep pace with the economic growth rates reached 8.2% on average in the same period in Jordan. In contrast, the average CPI growth rate reached its highest level (7.8%) in the period 1980–1990, when the economy faced many crises, the most important of which was the depreciation of the dinar exchange rate against other currencies in 1989, when the inflation rate reached 25.6% that year.

Building on previous results, the study recommends that the Jordanian monetary authorities have more control over the money supply due to its impact on the stability of the general level of prices and the economic stability in the country.

AUTHOR CONTRIBUTIONS

Conceptualization: Atif Batarseh.

Data curation: Atif Batarseh.

Formal analysis: Atif Batarseh.

Funding acquisition: Atif Batarseh.
 Investigation: Atif Batarseh.
 Methodology: Atif Batarseh.
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 Supervision: Atif Batarseh.
 Validation: Atif Batarseh.
 Visualization: Atif Batarseh.
 Writing – original draft: Atif Batarseh.
 Writing – reviewing & editing: Atif Batarseh.

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