

The causal relationship between inflation and economic growth in Jordan

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Abstract

This study aims to examine the causal relationship between economic growth and inflation in Jordan using the Granger methodology in order to determine the direction of the relationship between the two variables during the period 2000-2012.

The study found that there is a causal relationship going from the inflation to economic growth, and not vice versa. Based on the outcome of causality tests, the changes in the inflation help explain the changes that occur in the economic growth.

Keywords: inflation, economic growth, the causal relationship, GDP, Granger, Jordan.

1. Introduction

The long-run relation between growth and inflation is a key topic in macroeconomics. There is a high level consensus among economists that one of the fundamental objectives of macroeconomic is to sustain high economic growth together with low inflation. However, there has been considerable debate on the nature of the inflation and growth relationship.

There were numerous definitions that explain inflation one of them that the inflation is a lot of money chasing few goods. Or is the incident increase in prices as a result of increased monetary issuance or increase bank credit. Thus, the previous definitions linked between inflation and the amount of money (the quantity theory of money). with the financial crisis the economic thought expansion on the definition of inflation by introducing other factors beside the cash, such as a lack of supply of goods. Although there were many definitions of inflation we supply here that definition provided by Emile James that inflation is continue upward movement of prices caused by excess demand in excess of supply capacity.

1.1 Types of Inflation

We can distinguish between the types of inflation in several ways for the division, as follows

First, in terms of state supervision on prices:

1 - Open inflation Open Inflation: is the continuing rise in prices in response to excess demand, without interference from the authorities. This means that prices are rising freely to equalize between supply and demand without being hampered by any hindrance from the authorities.

2 - Repressed Inflation: - kind of hidden inflation, which price can not expand or rise because of government restrictions which designed to direct and control the rising prices, Such as Price Control System and Rationing System.

Second - in terms of economic sectors:

1 - Commodity Inflation Commodity Inflation is happening in the field of consumer goods, which leads to a Windfall Profits in the production of consumer goods industries.

2 - Capital Inflation is happening in the field of investment goods, which leads to a Windfall Profits in the industries producing these goods.

Thirdly - in terms of inflation:

1 - hyperinflation or Galloping Inflation is the significant increase in prices , which followed a similar increase in wages , increasing production costs and reduced profitability of the business , necessitating a new increase in prices .. The increase in wages, and so on, which affects the economy, including known malicious cycle of inflation, "Helix Almrhdul " Vicious Circle of Inflation.

2 - Creeping Inflation is rising in prices caused by rising wages at a higher rate of increase in production , and is inflated gradually slow and moderate combined forces of natural economic growth , but the continuance and combine effects could lead to runaway inflation .

Fourth - in terms of international economic relations:

1 - Imported Inflation is higher prices as a result of the flow of global inflation through imports.

2 - Exported Inflation is higher prices as a result of increased cash reserves of the central banks of dollars, and caused by the presence of so-called "base payment in dollars.

Fifthly - in terms of the source of inflationary pressure:

1 - Demand-Pull Inflation is the situation in which to raise their prices due to the presence of a surplus in the overall demand for aggregate supply, both in the market for goods or factors of production, when access to full employment result in increase in demand and increase total spending to attract higher rates to meet the surplus production capacity of the community.

2 - Cost-Push Inflation: is inflation, which arises when consumer prices continue to rise and industrial production as a result of expenses and special factor prices and wages in particular, where it is known that the inflation to Wage-Push Inflation.

The study is carried out to examine the relationship between inflation and growth in Jordan. To achieve this, the study is structured into 3 sections: section (1) deals with the literature review; section (2) discusses methodology and data; while analysis of results, conclusion and recommendations are presented in section (3).

1.2 Previous studies:

Several studies address the importance of inflation on economic growth. We can summarize some of these studies that have addressed the issue of causality between inflation and economic growth as follows:

Kasidi and Mwanemela (2013) examined the impact of inflation on economic growth in Tanzania for the period 1990 -2011. They found that inflation has a negative impact on economic growth, and there was no co-integration between inflation and economic growth during the period of study, so there was no long-run relationship between inflation and economic growth in Tanzania.

Ayyoub, Chaudhry and Farooq (2011) re-examined the relationship between inflation and growth in Pakistan and the impact of inflation on GDP growth of the economy for the period 1972 to 2010. They found a negative and significant inflation growth relationship, so inflation is harmful to the GDP growth after a certain threshold level.

Jha and Dang (2011) examined the effect of inflation variability and economic growth using annual data on both developing and developed countries for the period 1961-2009. They found that for developing countries, there was significant evidence that when the rate of inflation exceeds 10 percent inflation variability has a negative effect

on economic growth, and for developed countries, there was no significant evidence that inflation variability was determined growth.

Hasanov (2010) examined the effect of inflation on economic growth over the period of 2000-2009 in Azerbaijan. The study indicated that there was a non-linear relationship between economic growth and inflation in the Azerbaijani economy and threshold level of inflation for GDP growth was 13 percent. Below threshold level inflation had statistically significant positive effect on GDP growth, but this positive relationship became negative one when inflation exceeded 13 percent.

Chimobi (2010) investigated the relationship between Inflation and economic growth in Nigeria for the period 1970 to 2005. The result of the study showed that for the periods 1970-2005, there was no co-integrating relationship between Inflation and economic growth for Nigeria data.

Further test was made to check the causality relationship between the two variables by employing the VAR-Granger causality at two different lag periods. The results showed the same at different lags. In the result unidirectional causality was seen running from Inflation to economic growth.

Sweidan (2004) explored the relation between inflation and economic growth in Jordan for the period 1970-2000. He showed that the structural breakpoint effect occurs at inflation rate equal to 2% and after this level the effect turns to be negative, and the central bank of Jordan should pay attention to the inflation phenomenon while conducting the new monetary policy.

Mallik and Chowdhury (2001) examined the relationship between inflation and GDP growth for four South Asian countries (Bangladesh, India, Pakistan and Sri Lanka). A comparison of empirical evidence was obtained from the cointegration and error correction models using annual data collected from the IMF International Financial Statistics. The authors found evidence of a long-run positive relationship between GDP growth rate and inflation for all four countries. There were also significant feedbacks between inflation and economic growth.

Faria and Carneiro (2001) investigated the relationship between inflation and output by analyzing the case of Brazil, they found that inflation did not impact real output in the long run, but that in the short run there was a negative effect from inflation on output.

Burdekin, Denzau, Keil, Sitthiyot, and Willett (2000) examined the effect of inflation on growth for different economies. They found that the effects of inflation on growth change substantially as the inflation rate rises. Moreover the nonlinearities were quite different for industrial economies than for developing countries, and the threshold at which inflation first begins to seriously negatively affect growth was around 8% for industrial economies but 3% or less for developing countries. Marginal growth costs for developing countries then declined significantly above 50% inflation.

2.Data and Methodology

2.1 Data

The data used for this study are basically time series data for Jordan covering the period 2000- 2012. The two economic variables included in this study are the Consumer Price Index and the Real Gross Domestic Product at Market Prices (GDP) is an indicator to measure economic growth. Data were sourced from The Central Bank of Jordan and The Department of Statistics.

2.2 Method

In this paper, the statistical properties of both economic growth and Inflation were investigated, using the unit root test. Causality among variables, using

Granger causality test, was utilized to determine the directional causality between variables. Then, a long-term relationship was estimated, using Johansen cointegration test.

The model showing the relationship between economic growth and Inflation is specified thus:

$$GDP = f(CPI) \text{-----} (1)$$

$$d(GDP) = \alpha + \beta d(CPI) + \varepsilon \text{-----} (2)$$

Where

d(GDP) is change in the Real Gross Domestic product used as a indicator for economic growth

d(CPI) is change in the annual Consumer Price Index used as a indicator for inflation

α is the constant term, and ' ε ' is the random error term

2.3 The Unit Root Test

Macroeconomic time series data are generally characterized by a stochastic trend which can be removed by differencing. Some variables are stationary on levels, others become stationary after one differencing, and some may become stationary by more than one differencing. To test for the stationary of the variables, the Augmented Dickey-Fuller (ADF) technique was utilized. The ADF equation was performed for the case when it includes intercept only in addition to the case when it includes both intercept and time trend.

The results indicate that both variables, the d(CPI) and the d(GDP), are not stationary on their levels. In other words, they have a unit root. Then, we repeated the unit root test for the first difference for both variables. The results point out that the d(CPI) and the d(GDP) became stationary after the first difference. Since the computed values (in absolute value) are greater than the critical values (in absolute value) at a 1% level of significance, the null hypothesis of the unit root or nonstationary variable can be rejected. (Shaw table (1))

Table 1, Augmented Dickey-Fuller test

Variable			Level	First difference
	Critical values 1%	Critical values %5	ADF	ADF
D(GDP)	-4.2	-3.2	-2.9	-6.5
D(CPI)	-4.2	-3.2	-3.9	-7.1

2.4 Cointegration test

The findings for trace and maximum eigenvalue cointegration tests are presented in Table 2. These findings show both trace statistic and maximum Eigenvalue statistic indicated no cointegration at the 5 percent level of significance, suggesting that there is no cointegrating or long run relationship between Economic Growth and Inflation. Since the null hypothesis was accepted, there is no need to further subject the variables to error correction test which has lead us to examine the causality between Economic Growth and inflation.

Table 2, Cointegration test

Unrestricted Cointegration Rank Test (Trace)

Prob.**	0.05 Critical Value	Trace Statistic	Eigenvalue	Hypothesized No. of CE(s)
0.8759	15.49471	4.322593	0.274042	None
0.3712	3.841466	0.799702	0.070120	At most 1

Trace test indicates no cointegration at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Prob.**	0.05 Critical Value	Max-Eigen Statistic	Eigenvalue	Hypothesized No. of CE(s)
0.9060	14.26460	3.522891	0.274042	None
0.3712	3.841466	0.799702	0.070120	At most 1

Max-eigenvalue test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

2.5 Granger Causality Test

The Granger causality test was developed by Granger and according to him, a variable (in this case inflation) is said to Granger cause another variable D(GDP) if past and present values of Inflation help to predict Economic Growth.

A simple Granger causality test involving two variables, Economic Growth and Inflation is written as:

$$d(GDP)_t = \sum_{i=2}^n a_i d(CPI)_{t-i} + \sum_{j=1}^n B_j d(GDP)_{t-j} + U_{1t}$$

$$d(CPI)_t = \sum_{i=2}^n \eta_i d(CPI)_{t-i} + \sum_{j=1}^n \delta_j d(GDP)_{t-j} + U_{2t}$$

Testing null hypothesis: $H_0: \alpha = 0: j=1, \dots, p$, this hypothesis mean that inflation does not Granger cause economic growth against the alternative hypothesis $H_1: \alpha \neq 0: j=1, \dots, p$, this hypothesis mean that inflation does Granger cause Economic Growth.

Similarly, testing $H_0: \eta = 0: j=1, \dots, p$, this hypothesis means that economic growth does not Granger cause inflation against $H_1: \eta \neq 0: j=1, \dots, p$, this hypothesis means that Economic Growth does Granger cause inflation. If none of the null hypotheses is rejected, it means we accept the claims that inflation does not Granger cause Economic Growth and economic growth also does not Granger cause inflation. This indicates that the two variables are independent of each other. If the first hypothesis is rejected, it shows that inflation Granger causes economic growth. Rejection of the second hypothesis means that the causality runs from Economic Growth to inflation. If all hypotheses are rejected, there is bi-directional causality between inflation and economic growth.

The below table show that there is a causal relationship between Inflation and economic growth but in one direction so that changes in the Inflation have effects on economic growth and not vice versa.

Table (3) Granger causality test

Prob.	F-Statistic	Obs	Null Hypothesis:
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0.0412	10.7292	10	D(CPI) does not Granger Cause D(GDP)
0.2354	2.5039		D(GDP) does not Granger Cause D(CPI)

This means that an increase or a decrease in the Inflation can affect and causes the economic growth at 5% significant level. On the other hand, economic growth does not seem to Granger Cause Inflation. This suggests that information about economic growth in past periods cannot explain the behavior of Inflation in the present time.

2.6 Descriptive analysis of the variables of the study

Table (4) shows descriptive statistics for the variables of the study, the table shows that the variable economic growth does not far from the normal distribution using the test (Jarque-Bera), and to accept the null hypothesis that the data follow a normal distribution. As shown us from the results of the sprain values and through review of mean and median values, we find its close, so this indicating the absence of sharp fluctuations in the fluctuation of the economic growth data. In the other hand the D(CPI) is not normal distribution using the test Jarque-Bera .

Table (4): Descriptive analysis

D(CPI)	D(GDP)	
0.039404	0.118829	Mean
0.035238	0.103168	Median
0.139446	0.285375	Maximum
-0.006706	0.060864	Minimum
0.035800	0.063658	Std. Dev.
1.620782	1.503601	Skewness
5.861590	4.619877	Kurtosis
1.053623	6.319771	Jarque-Bera
0.590485	0.042431	Probability
13	13	Observations

3. Conclusion

This paper has examined the relationship between inflation and economic growth process in Jordan using causality tests for data over the period 2000 to 2012.

The methodology employed in this study is the cointegration and Granger causality test. We used the change in Consumer price index d(CPI) as a indicator for Inflation and the change in GDP as a perfect indicator for economic growth to examine the relationship. A stationarity test used the Augmented Dickey-Fuller test (ADF). The null hypothesis being that there is presence of a unit root was accepted at levels but rejected at first difference implying that the variables were found stationary at 1% and 5% level of significance.

We used the Johansen-Juselius cointegration technique proven to be superior to the Engle and Granger approach in assessing the cointegrating of variables. The result of the test showed that there was no cointegrating relationship between Inflation and

economic growth for Jordan data. Thus, we could not find any long-run relationship between Inflation and economic growth.

Furthermore, the causality between the two variables ran one-way from inflation to economic growth. Meaning that type of inflation which exist in Jordan is cost-push inflation. Further studies should include other variables in the model because this paper used only one explanatory variable (inflation) which was assumed to be one of the determinants of economic growth.

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