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Causality Relationships among Inflation & Macroeconomic Variables in Iraqi

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Abstract:

This study examines the relationship and possible influences between inflation and macroeconomic factors. The dependent variable in this study was the consumer price index (CPI) to represent inflation, whereas the independent variables were the macroeconomic factors, namely the growth domestic product (GDP), stock of narrow (M1), interest rate (IR), and workforce (WF). The autoregressive distributed lag co-integration approach was used to test the aforementioned relationships based on data from the annual bulletin of the Central Bank of Iraq and statistical data obtained from the report of the United Nations Conference on Trade and Development on the Iraqi economy for 1990–2009. The findings indicate that correlation, co-integration, and long-term relationships exist between CPI and GDP, M1, and WF. In addition, these three macroeconomic factors significantly influence CPI. However, CPI and IR demonstrate no co-integration, a weak correlation, and an inverse relationship. Keywords: consumer price index, GDP, economic growth, stock of narrow, interest rate, workforce, economy

1. Introduction

The Iraqi economy experienced a significant development in the 1970s, however, dramatically it declined during the first Gulf War in the 1980s (Almsafir, 1993). In 1990, the Iraqi invasion of Kuwait (Second Gulf War) led to military strikes and economic sanctions by multinational forces against Iraq. Moreover, U.S. forces and its allies occupied Iraq in 2003 (third Gulf war). These events changed the infrastructure of the Iraqi economy (Sanford, 2003). During these events, inflation played a main role (Almsafir, 1993; Sanford, 2003; Ozlu, 2006). Though it had no direct correlation with the war, inflation was linked with macroeconomic variables. This study examines the relationships among inflation (represented by CPI), growth domestic product (GDP), stock of narrow (M1), interest rate (IR), and workforce (WF) of the Iraqi economy in the period of 1990–2009. Almsafir (1993) studied the cause of inflation in Iraq for the period of 1980–1992, and determined its relationship with the political structure. Sanford (2003) discovered that many Iraqis sought to transfer their liquid assets into other forms, real estate, and gold. Goods were purchased when available and then bartered for other goods. Another consequence of inflation is capital flight; money left the country to avoid further erosion in its value. This scenario and the declining confidence in the Iraqi currency further weakened the economy and led to a new cycle of inflation and its consequences. According to Grigorian and Kock (2010), inflation became one of the most challenging aspects of economic management in Iraq.

Eihsan (2010) reported that the main cause of inflation is related to the deficit in product supply compared with aggregate demand, which reflects negatively on the Iraqi government reform. This paper examines the relationships between customer price index (CPI) and macroeconomic factors (GDP, IR, M1, and WF). Data are based on the annual bulletin of the Central Bank of Iraq (CBI) as well as the statistical data from the United Nations Conference on Trade and Development (UNCTAD). This paper uses autoregressive distributed lag (ARDL) co-integration approach (Pesaran, 1999). Results indicate that a long-term and co-integration relationship exists between the CPI and the factors GDP, M1, and WF. No co-integration was observed between CPI and IR. The correlation test reveals the interaction among variables. CPI correlated the highest with M1, and lower with GDP and WF. CPI and IR demonstrated no interaction, and instead revealed an inverse relationship.

The remainder of the paper is arranged as follows. Section 2 briefly reviews related literature. Section 3 describes the data and methodology used. The results obtained are similarly described. Finally, Section 4 concludes the paper, summarizes the work, as well as suggests policy implications and possible future research.

2. Material and Methods

2.1. Inflation

2.1.1. Global perspective

Globally, inflation impacts the economy. Dwyer and Jr. (2001) reported that monetary growth helps predict nominal income, which assists in forecasting inflation. Hebbel and Tapia (2002) suggested that inflation targeting is a viable and solid policy choice for a developing country, thereby representing an effective regime to enhance monetary credibility and reduce stabilization costs. Kontonikas (2004) demonstrated a relationship between previous inflation rate and uncertainly inflation. According to Nelson (2008), inflation is rapidly resolved in favor of the monetary view, thereby leading to an avoidance of nonmonetary approaches to inflation control. Milani (2010) discovered an important effect of global output on aggregate demand, which could affect the inflation rate of countries. Global output could affect the relationship between aggregate supply and demand through endogenous factors that lead to inflation. Matthes and Wangc (2012) studied the significance of labor share among the considered variables (output growth and unemployment).

2.1.2. Regional Perspective

Omran and Pointonb (2001) determined that inflation and stock market variables have long- and short term relationships, which impact market performance. Dibooglu and Kibritcioglu (2004) indicated the effect of the trade shock term on inflation within a short period, whereas monetary and balance of payment shocks dominate in the long-term. Budget deficits have a limited impact in the inflation process. Similarly, demand shocks have limited effects on output movements, which are mostly driven by terms of trade and supply shocks. O'zdemir and Fisunog'lu (2008) illustrated strong evidence in favor of a positive effect of a change in inflation on uncertainty inflation, as predicted by Friedman. However, weak evidence relating to the Cukierman–Meltzer hypothesis was observed in the Jordanian, Philippine, and Turkish economies. Jongwanich and Park (2009) revealed that the inflation in Asia arises from exogenous factors. One driver of inflation in the region is aggregate demand, which consists of domestic consumption, government expenditure, investment, and export, which all impact prices. This finding suggests that the monetary policy will remain a powerful tool in fighting inflation in Asia and in defusing the risks of deflation.

2.1.3. Domestic perspective

Almsafir (1993) focused on the cause of inflation in the Iraqi economy for the period of 1980–1992. The study explained the developments in the Iraqi economy and assessed the effect of inflation caused by price fluctuation. Almsafir related inflation to the political structure. Thus, Iraq requires a comprehensive economic program enhanced with political reform to eliminate inflation. Sanford (2003) reported that the inflation in the Iraqi economy led to a widespread dollarization. Many Iraqis attempted to convert their liquid assets into other forms, real estate, and gold. Goods were purchased and kept when available and then bartered for other goods. These patterns of behavior require changing if the economy is to recover. Grigorian and Kock (2010) reported that inflation became one of the most challenging aspects of economic management in Iraq. This paper posits that conventional and unconventional factors explain recent inflation dynamics. Since December 2005, adjustments of administered prices for fuel products have allowed for an interesting experiment to help study the above behavior. The findings indicated that shortages in fuel and non-fuel commodity supplies may have influenced inflation. Eihсан (2010) stated that the main cause of inflation is related to the deficit in product supply compared with aggregate demand, which reflects negatively on the Iraqi government reform. Moreover, reforms of monetary supply and policies in interest rate mitigate the excess of liquidity in the Iraqi market.

2.2. Inflation and Economic Growth

2.2.1. Global perspective

Jones and Manuelli (1995) focused on the correlation between the increase of money supply and the GDP growth rate. The rate of inflation was considered an important determinant of the rate of economic growth. Andres et al. (1996) illustrated that the costs of inflation on long-term growth are underestimated in samples that include countries and periods with fixed exchange rate regimes. Bruno and Easterly (1998) determined that growth sharply decline during separate high-inflation crises and then rapidly returns to its normal state after inflation decreases. Between inflation and economic growth, Ferreira (1999) developed a theoretical framework wherein government-financed expenditures positively affect productivity growth. The model was used to analyze the inflation tax for government expenditure, which finance the basic services and accelerate economic growth. Khan and Sendhadji (2000) reported the negative relationship under the threshold level of inflation. Therefore, maintaining the inflation rate at a single digit is necessary to ascertain progress. Faria and Carneiro (2001) investigated the relationship between inflation and economic growth in Brazil. The study reported that inflation does not affect real output in the long-term, but negatively affects output growth in the short-term. Burdekin et al. (2004) discovered that the threshold declines within single digits. Marginal growth costs for developing countries significantly declined at above 50% inflation. In addition, apart from high inflation, deflation is negatively affects economic growth. Banerjeea and Marcellinob (2006) stated that the outcomes denote a preference for simple forecasting tools with an effective relative performance of pure autoregressive models and substantial instability in the characteristics of the leading indicators. Therefore, determining the best method is important in measuring the forecast of inflation and GDP growth, as essential macroeconomic variables. Guerrero (2006)

similarly reported that the adverse effect of inflation on growth is economically significant. Xie et al. (2009) focused on the empirical analysis of the relationship among three variables: monetary supply, economic growth, and inflation in China from 1998 to 2007. The Granger causality test indicated no mutual integration among these three variables. However, monetary supply correlated with inflation and yet had no relation with economic growth. The relationships are thus inconsistent between the economic growth and the price stability in China. Villavicencio and Mignon (2011) reported that inflation produces a nonlinear impact on economic growth. Bittencourt (2012) determined that during their study period, inflation not only served as the main macroeconomic determinant of growth in the region, but also clearly caused a negative effect on economic growth.

2.2.2. Regional Perspective

Gylfason (2001) focused on determinants for export and economic growth in Bahrain. From 1985 to 1994, high inflation and an abundance of natural resources were associated with low exports and slow economic growth.

2.2.3. Domestic Perspective

Salih (2008) articulated the causes of inflation in the Iraqi economy. The lack of numerous industrial and agricultural products in the local market contributes to the increase in CPI level. In addition, the sharp increase in housing demand similarly increased the inflation rate. Hence, its correlation with economic growth increases inflation.

2.3. Inflation and Monetary Supply

2.3.1. Global Perspective

Smith (1984) stated that fiscal policy is crucial in determining the inflation level that occurs in an economy. Bagliano and Morana (2003) determined the core inflation rate can offer useful information in assessing the trend behavior of inflation for purposes of monetary policy. Hung (2003) reported that the initial inflation rates are important in determining the effects of monetary policy. Granville and Mallick (2006) demonstrated that the official interest rate reacted more to exchange rate changes compared with inflation, which thereby continues as a persistent problem. Hence, the better solution is to adopt a flexible inflation-targeting program to maintain the inflation rate at acceptable rates. Ascari and Ropele (2007) determined that increasing the inflation level caused a progressive loss in the ability of monetary policy in stabilizing the inflation trend. Hu and Zhang (2009) indicated that monetary policy influences economic growth. In addition, an excess in monetary supply can lead to inflation, which influences economic growth in the long-term but has an uncertain influence in the short-term. Canovaa and Ferroni (2012) mentioned that changes in the variance of monetary shocks cause inflation volatility.

2.3.2. Regional Perspective

Kia (2006) considered fiscal policy as one of the monetary instruments that could lower the high inflation rates in developing countries. Akyurek et al. (2011) approved the impact of monetary policy on lowering the inflation rate. Mandler (2012) indicated strong evidence of nonlinearities in the effects of monetary policy shocks on output and inflation dependent on inflation rate. Karahan (2012) presented significant implications of the relationship between inflation and inflation uncertainty in Turkey, as well as with the adoption of inflation targeting policy.

2.3.3. Domestic Perspective

Eihsan (2010) studied the expansion of monetary supply in the Iraqi economy. The expansion aims to subsidize items of the rationing system and to fill the requirements of government expenditures, which caused the inflation phenomenon in the Iraqi economy from 2007 to 2009. In addition, the total demand for exported and domestic products increased. Hence, monetary supply is linked to inflation, with the quantity of money as the main cause. Shandy and Naaem (2011) focused on monetary supply as a variable of monetary policy and verified its impact on inflation rate in Iraq for the period of 1970–2008. Their findings indicated that monetary supply produces a 75% impact on inflation and the previous monetary policy of particular economy, mainly caused by the bias of monetary policy with political trends at that time.

2.4. Inflation and Interest Rate

2.4.1. Global Perspective

Nagayasu (2002) provided supportive evidence on the relationship between nominal interest spreads and future inflation changes, although such relationship seems to be stronger prior to the structural shift in 1988. Laatsch and Klein (2003) demonstrated a relationship between nominal interest rate and expected inflation. Berument et al. (2004) reported that both structural and steady-state inflation uncertainties increase the interest rate spreads. However, the empirical evidence for impulse uncertainty is not conclusive. Linnemann (2005) revealed that income taxes have been used for government balances. Based on the sticky-price model, increasing the nominal interest rate reduces demand, but balancing the budget through income taxes reduces supply. Tillmann (2008) demonstrated that higher interest rates lead to higher marginal costs of production and inflation. Holmes et al. (2009) investigated the time-series properties of Australian and New Zealand real interest rates within a Markov-switching framework. This methodology considered the real interest rate differential between Australia and New Zealand and identified the differing regimes based on

volatility rather than on persistence of the inflation. Jareño and Navarro (2010) determined a strong relationship between the sensitivity of stock returns to changes in nominal interest rates and the flow-through capability, that is, the ability of firms to transmit inflation shocks to the prices of their products and services. Mallik and Bhar (2011) discovered that long-term effects of inflation on interest rates are less than the unity for the post-inflation targeting period, thus implying that the Central Bank is successful in targeting inflation. Kimbrough (2012) reported that the nominal interest rate positively responds to forecasts of future inflation. The key to this result is a variable velocity of money that positively responds to changes in the nominal interest rate.

2.4.2. Regional Perspective

Telatar et al. (2003) learned that the interest rate structure is limited as source of information in forecasting inflation. Akyurek et al. (2011) determined that interest rate policy effectively control inflation through aggregate demand management. Kose et al. (2012) stated that monetary policy rates depend on inflationary expectations, and affect long-term interest rates. Thus, monetary policies influence the interest rate based on the inflation level.

2.4.3. Domestic Perspective

Hassoun (2005) explained the importance of the interest ladder in determining the appropriate interest rate for bank deposits. The importance underlies the impact of interest rate on economic growth and inflation (maintained at low rate). Therefore, using the interest ladder provides the proper level of interest that would not negatively affect other macroeconomic variables.

2.5. Inflation and Unemployment

2.5.1. Global Perspective

Guha and Visviki (2001) used post-war data to investigate the relationship between inflation and unemployment rate in the United States. Inflation and job growth were strongly associated, which suggests that the relatively slow job growth in recent years may partly explain the small inflation in spite of low unemployment rates. Karanassou et al. (2005) discovered the presence of inflation and unemployment in monetary shocks on the slope of a Philips curve. Mansoorian and Mohsin (2006) stated that the permanent and temporary increase in inflation rates reduces the consumption rate and labor supply. Moreover, a reduction in the labor force decreases capital productivity and investment. Pallis (2006) concluded that the application of “common” policies across economies may be questionable because of the different effects of these policies on inflation and unemployment. Karanassou et al. (2008) reported that the monetary policy may produce highly important and long-lasting effects on real macroeconomic activity, particularly on unemployment. Sánchez (2012) learned that the monetary policy setting affect the unemployment rate. The Central Bank optimally solves the dilemma posed by this tradeoff by opting to disclose the inflation target to the public while being ambiguous about the target economic activity.

2.5.2. Domestic Perspective

Salih (2007) stated that the service sector that dominated the Iraqi economy prevents the labor force from becoming suitable for the current economic situation. Thus, increasing government expenditures faces un-elastic production system, thereby causing inflation and unemployment. Ane (2011) examined and confirmed the positive relationship between unemployment rate and inflation. The structural distorting of the economic sectors leads to difficulty in embedding the labor force. Hassan (2011) implies the dynamic analysis of the three economic variables of inflation, unemployment, and expected rate of inflation based on the empirical data of the Iraqi economy for the period of 1994–2002. Results indicated the ability in forecasting macroeconomic trends and in improving the relationship among these variables.

2.6. Methods

2.6.1. Research Hypothesis

1. H1a: GDP has a significant impact on CPI.
H1b: A significant co-integration exists between GDP and CPI.
2. H1a: IR has a significant impact on inflation.
H1b: A significant co-integration exists between IR and CPI.
3. H1a: M1 has a significant impact on inflation.
H1b: A significant co-integration exists between M1 and CPI.
4. H1a: WF has a significant impact on inflation.
H1b: A significant co-integration exists between WF and CPI.
5. $CPI = C(1) + C(2)GDP + C(3)IR + C(4)M1 + C(5)WF + e$.

2.6.2. Research Method

The ARDL co-integration approach is used to examine the relationship among the research variables (Pesaran et. al., 1999).

3. Calculation & Result

3.1. Correlation Test

	CPI	GDD	IR	M1	WF
CPI	1.0000				
GDD	0.5773	1.00000			
IR	-0.037	0.15377	1.0000		
M1	0.9003	0.49081	0.0830	1.0000	
WF	0.1389	0.35179	0.1464	0.059	1.000

Table 1: shows the Correlation between CPI and four dependent variables

(CPI & GDD $r = .577$) it refers to the significance of independent variable to influence the dependent variable. Whereas, (CPI & M1 $r = .90$) takes the highest value of correlation between the two variables, In other words, the highest influence of M1 on CPI (strong positive relationship). The figure shows there is a positive relationship (CPI, WF $r = .13$) it is positive relationship between CPI & WF; however, it is not strong as much as M1. In addition the figure shows that (CPI & IR $r = -0.03$) which refers to the inverse relation between CPI and IR also the relationship is weak between them.

3.2. Co-Integration & Long Run Relationship Test

3.2.1. First Hypothesis (CPI & GDP)

Wald Test: Equation: Untitled			
Test Statistic	Value	df	Probability
t-statistic	2.791366	9	0.0210
F-statistic	7.791722	(1, 9)	0.0210
Chi-square	7.791722	1	0.0052
Normalized Restriction (= 0)		Value	Std. Err.
C(3)		0.225135	0.080654
Restrictions are linear in coefficients.			

Table 2: shows (t, F) the test for first hypothesis

3.2.2. Second Hypothesis (CPI & IR)

Wald Test: Equation: Untitled			
Test Statistic	Value	df	Probability
t-statistic	-0.122688	9	0.9051
F-statistic	0.015052	(1, 9)	0.9051
Chi-square	0.015052	1	0.9024
Null Hypothesis: C(5)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(5)		-1.037500	8.456412
Restrictions are linear in coefficients.			

Table 3: shows (t, F) the test for second hypothesis

3.2.3. Third hypothesis (CPI & M1)

Wald Test: Equation: Untitled			
Test Statistic	Value	df	Probability
t-statistic	7.310114	9	0.0000
F-statistic	53.43777	(1, 9)	0.0000
Chi-square	53.43777	1	0.0000
Null Hypothesis: C(7)=0 Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(7)		1.945885	0.266191
Restrictions are linear in coefficients.			

Table 4: shows (t, F) the test for third hypothesis

3.2.4. Fourth Hypothesis (CPI & WF)

Wald Test: Equation: Untitled			
Test Statistic	Value	df	Probability
t-statistic	4.701759	9	0.0011
F-statistic	22.10654	(1, 9)	0.0011
Chi-square	22.10654	1	0.0000
Null Hypothesis: C(9)=0 Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(9)		96.34520	20.49131
Restrictions are linear in coefficients.			

Table 5: shows (t, F) the test for fourth hypothesis

4. Discussion

Research has examined the relationship between IV (CPI) and DVs (GDD, IR, M1, and WF). To realize the outcomes of the test, it is necessary to particulate the key point for each of the test above.

4.1. CPI & GDP.

The P value of the test is less than 0.05, it particulates the significant influence of GDD on CPI. Hence, it allows accepting the alternative hypothesis (H1a: GDD has a significant impact on CPI). Whereas, result shows that F calculated is larger than F tabulate (see table 2), which means there is co-integration and long run relation between the two variables. That leads to accept an alternative hypothesis (H1b: there is co-integration evidence between GDD and CPI). Correlation test shows the positive relationship between the two variables, in addition; the rate of bi-effect is 0.577. It means the strong impact for both. (See table 1)

4.2. CPI & IR

The P value of the test is larger than 0.05, which means there is no significant influence of IR on CPI. Hence, it allows rejecting the alternative hypothesis (H1a: IR has a significant impact on CPI). Whereas, result shows that F calculated is less than F tabulating (see table 3), which means there is no co-integration between the two variables. That leads to reject an alternative hypothesis (H1b: there is co-integration evidence between GDD and CPI). Correlation test shows there is negative relationship between the two variables, which reflects the inverse relation between IR and CPI. in addition; the rate of bi-effect is 0.03. It indicates to the weak correlation for both variables. (See table 1)

4.3. CPI & M1

P value of the test is less than 0.05; it means there is a significant influence of M1 on CPI. Hence, it allows accepting the alternative hypothesis (H1a: M1 has a significant impact on CPI). Whereas, result shows that F calculated is larger than F tabulate (see table 3), which means there is strong co-integration and long run relation between the two variables. That leads to accept an alternative hypothesis (H1b: there is co-integration evidence between M1 and CPI). Correlation test shows the positive relationship between the two variables, in addition; the rate of correlation is 0.900. That refers to the strongest correlation between M1 and CPI. (See table1)

4.4. CPI & WF

P value of the test is less than 0.05; it means there is a significant influence of WF on CPI. Hence, it allows accepting the alternative hypothesis (H1a: WF has a significant impact on CPI). Whereas, result shows that F calculated is larger than F tabulate (see table 4), which means there is strong co-integration and long run relation between the two variables. That leads to accept an alternative hypothesis (H1b: there is co-integration evidence between M1 and CPI). Correlation test shows the positive relationship between the two variables, in addition; the rate of correlation is 0.900. That refers to the strongest correlation between M1 and CPI. (See table 1). It is important to refer that data of workforce is related to the government sector employees. This sector does not being affected by fluctuate of CPI rates. Hence, correlation test shows the positive relationship between both variables.

5. Conclusion

Inflation has been distorting Iraqi economy progress for decades; moreover; it makes Iraqi economy not stabilized for decades. This study examines the relationships between inflation and macroeconomic variables. The research bases on annually bulletin of CBI data, also, the workforce data bases on UNCTAD static for the Iraqi economy duration 1990-2009. This study has used ARDL co-integration approach. The finding of this paper states that there is co-integration, correlation, long relationships. It found that GDP and CPI have co-integration and long run relationship and positive correlation between them. Furthermore, the strong co-integration and long run relationship has being found between CPI and M1, as well as the positive correlation has characterized this relationship. Moreover, the test has resulted to co integration, positive correlation and long relationship. However, this study has found there is no co-integration and long run relationship between IR and CPI. In addition, there is negative relation between IR and CPI, Which reflects the inverse relationship between two variables. This study involved four variables and its relationships with inflation. In addition, it has depended on row data that reflects the situation of Iraqi economy at that time.

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