International Journal of Economics and Financial Research
ISSN(e): 2411-9407, ISSN(p): 2413-8533
Vol. 4, Issue. 9, pp: 292-296, 2018
URL: http://arpgweb.com/?ic=journal&journal=5&info=aims

Academic Research Publishing Group

Original Research Open Access

An Empirical Study on Inflation and Economic Growth in Qatar

Abdulla S. Al-Khulaifi
Former President, Qatar University, Former Minister of Labour and Social Affairs,
Ph.D. in Economics, Southern Illinois University, Il. USA

Abstract

This paper studies the causal relationship between inflation and economic growth in Qatar for the period of 1980 to 2016. A time series analysis of unit roots tests, Johansen cointegration method and Granger causality tests were applied on data. The variables were found to be cointegrated, hence a long run-relationship between them exists. Granger causality test found causality runs from inflation to economic growth.

Keywords: Economic growth; Inflation; Cointegration; Granger causality; Qatar.
JEL: C13; C22; E31.

1. Introduction

The relationship between inflation and economic growth is one of the most important macroeconomic problems. Inflation and economic growth are considered the most closely watched economic variables by policy makers and practitioners. The controversy in both theoretical and empirical literature is far from being resolved. This issue originally evolved from controversial notion between the structuralists and the monetarists. The structuralists argue that inflation is necessary for economic growth, while monetarists argue the opposite, which is inflation is detrimental for economic progress (Malik and Chowdhury, 2001). The debate on this topic in economic literature has proposed different conclusions. While there is an agreement among many economists, central bankers and policy makers in developed and developing economies that one of the more important objectives is to sustain high rate of economic growth with low rate of inflation. There is less agreement about the exact relationship between inflation and economic growth, the mechanism by which inflation affect economic progress at macroeconomic level. Some studies have found no relationship between inflation and economic growth; other studies have found a negative relationship. A third group of studies have found a positive relationship between inflation and economic growth (Chimobi, 2010; Ruzima and Veerachamy, 2016).

Qatar has experienced a steady and high rate of economic growth in its recent history. Economic growth averaged about 19.5% per annum for the period 2001-2010. Inflation rate on the other hand was not a major problem for Qatar economy. The average rate of inflation ranged about 5.5% for the same period. Table (1) shows the rate of economic growth and inflation for selected years. Inflation is considered by Qatar Central Bank (QCB) as well as other central banks, one of the most important economic indicator in economic policy, and more so for its monetary policy. Much of what Qatar consumes is imported. The cost of imported consumption will therefore depend on trends in global prices and on movements in the nominal effective exchange rate of the US dollar (to which the Qatari riyal is pegged).

Qatar economic growth is driven by successful development of its hydrocarbon resources. The huge North Field the world's largest non-associated gas field was first discovered in 1971, but it was not until 1992 when its potential was realized. Large financial dividends that followed from Qatar's investment in oil and gas, led to the growth of economy to rates that are faster than any other economy (Ibrahim and Harrigan, 2012). This growth was not associated with high inflation except for the years 2005-2008, when Qatar economy has experienced double digit inflation rate.

Table-1. Economic Growth and Inflation rate in Qatar for Selected Years

Variable 2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
GDP Growth	-3.6	11.1	3.6	34.8	33.8	33.7	25.5	40.9	-15.1	27.9
Inflation 1.4	0.2	2.3	6.8	8.9	11.9	13.8	15.1	-4.8	-2.4	
Variable2011	2012	2013	2014	2015	2016					
GDP Growth	37.0	11.9	7.0	4.2	-20.2	-7.4				
Inflation 1.9	1.9	3.1	3.0	1.8	2.6					

Source: Qatar Central Bank , Annual Reports, Various Issues. Ministry of Development Planning and Statistics

The purpose of this paper is to investigate the relationship between inflation and economic growth in the economy of Qatar. To the best of author's knowledge, there has not been a study of this relationship for Qatar in empirical literature. The rest of the study is organized as follows. Section two we review relevant empirical work on the relationship between inflation and economic growth in developing economies. Model is specified in section three, followed by data definition, sources and results of model in section four. Section five concludes with a summary of findings.

2. Literature Review

The literature examining the relationship between inflation and economic growth in developed and developing economies are numerous. Both theoretical and empirical research on this relationship is extensive. This section will briefly review relevant work in developing economies.

Malik and Chowdhury (2001) have examined the relationship between inflation and economic growth for four South Asian countries, Bangladesh, India, Pakistan and Sri Lanka. Cointegration and error correction model were estimated. A long-run relationship was deducted through and the variables were found to be cointegrated. Inflation was found to be positively related to economic growth for the four countries, and the sensitivity of inflation to changes in growth was found to be larger than that of growth to changes in inflation. Ahmed S. and Mortaza (2005) on the other hand, found the relationship between inflation and economic growth to be negative in Bangladesh for the period 1980-2005. Ahmed M. S. (2010) used a quarterly data for Bangladesh, and found the relationship between inflation and economic growth to be negative. Granger causality was tested, and unidirectional causality from inflation to economic growth was found.

Mubarik (2005) estimated a threshold level of inflation for Pakistan, using annual data for the period 1973-2000. Granger causality was employed, and inflation was found to Granger cause economic growth, and the relationship between the two variables was found to be negative. Hussain and Malik (2011) in their study attempted at exploring the nexus between inflation and economic growth in Pakistan for the period 1960-2006. The study found inflation is positively related to growth and vice versa. It was also found unidirectional causality running from inflation to economic growth.

Saaed (2007) analyzed the relationship between inflation and economic growth for Kuwait. Annual data for the period 1985-2005 were used, and real GDP and consumer price index (CPI) were used as variables. The paper utilized Engle-Granger two stage cointegration procedure and error correction model. A long-run and negative relationship exists between inflation and economic growth for Kuwait.

Algaeed (2016) explored the relationship between inflation and economic growth in Saudi Arabia. Real growth of non-oil GDP measure used as a proxy for economic growth, and wholesale price for inflation. Annual data for the period of 1985 – 2015 was used. Cointegration technique was used to test short and long-run relationship. The results found a support of positive effect of inflation over economic growth, and a long-run causality was found to run from inflation to real growth of non-oil GDP.

Hossin (2015) empirically tested the relationship between inflation and economic growth for Bangladesh. Annual data for the period of 1961-2013 was used, and a cointegration and error correction model was performed on data. Evidence showed the existence of significant long-run relationship between inflation and economic growth in Bangladesh. A Granger causality test on variables shows there exist a long-run positive causality running from GDP to inflation.

Erbaykal and Okuyan (2008) investigated this relationship for Turkey. Quarterly data for the period 1987-2006 were used. A negative and statistically significant relationship between real GDP and CPI was found. Unidirectional causality from inflation to economic growth was found using Toda Yamamota approach.

Chimobi (2010) in a study of Nigerian economy examined the relationship between inflation and economic growth by employing cointegration and Granger causality technique. Annual data for the period 1970-2005 were used, and real GDP and CPI were the variables. No cointegration between the variables was found, and unidirectional Granger causality running from inflation to economic growth was detected. Ayo *et al.* (2012) examined the causal relationship between economic growth, government expenditure and inflation in Nigeria for the period 1970-2010. Johansen method of cointegration was performed, and found that there is at least one cointegrating vector among variables. Granger causality test was performed through vector autoregressive model (VAR). Unidirectional causality running from economic growth to inflation and from government expenditure to inflation was found.

Jayathileke and Rathnayake (2013) studied the link between inflation and economic growth of three Asian countries; China, India and Sri Lanka over the period 1980-2010. Time series analysis of unit root tests, Johansen cointegration approach, Bound test and error correction models were applied to data. The study found that there exists a long run negative and significant relationship between inflation and economic growth in Sri Lanka. No significant long run relationship was found for China and India in between inflation and economic growth. Short run negative relationship was found for China, unidirectional causality running from economic growth to inflation was detected in China.

Datta and Mukhopadhyay (2011) in a study explored the relationship between inflation and economic growth in the economy of Malaysia. Annual data for the period from 1971-2007 were used for real GDP and CPI data. Time series analysis of unit root test, vector error correction and VAR models were applied to data. The study found that in the short-run inflation plays a vital role affecting economic growth negatively. In the long-run it was found that economic growth leads positive change in inflation. The long-run causality was found to be unidirectional and runs from growth to inflation.

Ruzima and Veerachamy (2016) in a comprehensive paper reviewed thirty four theoretical and empirical studies. They found results mostly depend on assumptions adopted in the study. Results can be positive, negative and neutral between inflation and economic growth. Studies were also found to be influenced by model, statistical methods, data used and time period of the study that were implemented.

These divergent results confirm that there is a strong debate on the relationship between inflation and economic growth in the empirical literature. This study attempts at shedding some insight in this relationship for the economy of Qatar.

3. Methodology

This study employs the theory of cointegration and error correction model (ECM) to investigate the relationship between inflation and economic growth in Qatar. An econometric model is specified to examine the short-run and long-run relationship between real GDP and CPI by applying the Johansen cointegration test and the associated ECM. The Granger causality will then be tested to determine the direction of causality between the two variables.

The following cointegrating regression will be first considered:

$$LRGDP_t = \alpha_1 + \beta_1 LCPI_t + \varepsilon_t \quad (1)$$

$$LCPI_t = \alpha_2 + \beta_2 LRGDP_t + \mu_t \quad (2)$$

Where $LRGDP_t$ is the natural log of real GDP, $LCPI_t$ is the natural log of CPI, α_1, α_2 are constant terms, and ε_t and μ_t are random error terms. When cointgration exists, then information obtained on one variable can be used to predict the other. A long-run relationship between two variables exists if they are stationary or if each time series is integrated of the same order (Malik and Chowdhury, 2001).

We then have to determine the stationarity properties of variables. There are two unit root tests that are used in the literature. The Augmented (Dickey and Fuller, 1981) test and the Phillip-Perron test. We will perform both tests on our two variables real GDP and CPI.

The ADF test consists of estimating the following regression:

$$\Delta X_t = a_0 + a_1 t + a_2 X_{t-1} + \sum_{i=1}^{\rho} c_i \Delta X_{t-i} + \varepsilon_{it} \quad (3)$$

Where ε_{it} is whit noise error term, ΔX_t is the first difference of ΔX_t, ρ is the number of lagged differences included to make error term serially uncorrelated. The lag length is based on Schwarz information criterion.

ADF adjusts the DF to take care of possible serial correlation in the error terms by adding lagged differences terms of the regressed. Phillips and Perron (1998) test use non parametric statistical method to take care of possible serial correlation in the error terms without adding lagged difference terms (Gujarati and Porter, 2009).

The pp unit root test is based on the following equation:

$$\Delta X_t = \emptyset + \emptyset_2 \left(t - \frac{T}{2}\right) + (\rho - 1) X_{t-1} + \emptyset_3 \Delta X_{t-1} + e_t \quad (4)$$

The appropriate critical values of the t-statistics for the null hypothesis of non-stationarity are given by MacKinnon (1991).

The second step is testing whether the variables are cointegrated or not. The Johansen (1988) cointegration test will be used. This procedure is based on likelihood ratio (LR) test to determine the number of cointegrating vectors in the regression. Johansen technique enables to test for the existence of non-unique cointegration relationships. Two statistics are suggested the trace test and the maximum eigenvalue test statistics. The trace test tests the null hypothesis that the number of distinct cointegrating vectors is less than or equal to r against a general alternative. The maximum eigenvalue statistics tests the null hypothesis that the number of cointegrating vectors is r against the alternative of r + 1 cointegrating vectors. The maximum eigenvalue test has the sharper alternative hypothesis. It is usually preferred for trying to get the number of cointegrating vectors Enders (2010).

It is critical part for applying the Johansen approach, the determination of the lag length for the VAR model. It is of importance to specify proper lag length in estimating cointegrated system. Enders (2010) points out that one could select lag length using multivariate generalization of the Akaike information criterion (AIC) or Schwarz criterion (SC).

If time-series included in the analysis are $I(1)$ and cointegrated, then according to Granger (1988) there must exist at least one way causation. This causation is represented by an error-correction model of the following form:

$$\Delta LRGDP_t = a_0 + \sum a_{1i} \Delta LRGDP_{t-j} + \sum a_{2i} \Delta LCPI_{t-j} - a_3 ECT_{t-1} + \Theta_t \quad (5)$$

$$\Delta LCPI_t = b_0 + \sum b_{1i} \Delta LRGDP_{t-j} + \sum b_{2i} \Delta LCPI_{t-j} - b_3 ECT_{t-1} + \tau_t \quad (6)$$

Where ECT_{t-1} is the error-correction term lagged one period. The ΔLRGD and ΔLCPI are differenced time-series of $LRGDP$ and $LCPI$ respectively. Θ_t and τ_t are white noise error terms. The independent variable is said to cause the dependent variable if the error term (ECT_{t-1}) is significant, or the coefficients of the lagged independent variable are jointly significant. Negative and statistically significant values of the coefficients of the error correction terms indicate the existence of long-run causality. Causality test should be based on equations (5) and (6) when series are found to be cointegrated.

4. Data and Model Results

We use two variables in our study to achieve intended results. Annual data for real Gross Domestic Product (GDP) and Consumer Price Index (CPI) for the period 1980 to 2016 are used. Data were obtained from Qatar Central Bank annual reports and from Ministry of Development Planning and Statistics.

In order to avoid spurious regression phenomenon in our time series, the univariate characteristics of the variables real GDP and CPI are tested. Both Augmented (Dickey and Fuller, 1981) (ADF) and Phillip-Perron (PP) unit root tests were applied, and results are reported in table (2).

Table-2. Unit Root Test

Augmented Dickey-Fuller Test			Phillip-Perron Test	
Variable	Constant	Constant & Trend	Constant	Constant & Trend
LCPI	1.806(5)	-2.779(1)	-1.299[1]	-1.736[0]
LRGDP	3.542(0)	-1.233(0)	1.707[1]	-0.935[11]
ΔLCPI	-3.27**(0)	-3.89**(2)	-3.66***[5]	-3.615**[5]
ΔLRGDP	-3.633**(0)	-5.432***(0)	-4.161***[3]	-6.155***[12]

*, ** and *** are 10%, 5% and 1% level of significance respectively. LCPI is log of Consumer Price Index (CPI),

LRGDP is log of real GDP, and Δ is first difference operator. Numbers between parenthesis are lag length using Schwarz Info criterion automatic maximum lag=12 and numbers between square parentheses are Band width (Newey-West Automatic) using Bartlett Karnel.

Both variables were found to be nonstationary in level. Once variables were differenced once, they became stationary. This imply that inflation and economic growth in Qatar are integrated at order one I(1).

To check for cointegration between inflation and economic growth, Johansen cointegration test is applied on data. Johansen procedure requires a selection of appropriate lag length of vector autoregressinn system (VAR). The lag length is selected by minimizing both Akaika information criterion (AIC) and Shwartz information criterion (SC). The lag length of two is chosen by criteria selected. Table (3) shows the results of lag length selection.

Table-3. Determination of Lag Length at VAR Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	11.372	NA	0.0017	-0.646	-0.552	-0.616
1	97.600	154.61	6.20e-6	-6.317	-6.034*	-6.228
2	103.79	10.261*	5.35e-6*	-6.468*	-5.997	-6.32*
3	104.98	1.8002	6.58e-6	-6.274	-5.614	-6.068
4	106.30	106.30	8.10e-6	-6.089	-5.241	-5.823

* indicates lag order selected by the criterion

LR: sequential modified LR test statistics. PFE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

Johansen full information maximum likelihood is implemented on data, and results are shown in table (4). One cointegrating vector between inflation and economic growth is found. Since there is cointegration, the direction of causality is tested.

Table-4. Johansen Cointegration Test

Trace Test				Maximum Eigen Value Test			
Null	Alternative	Stat.	95%CV Null	Null	Alternative	Stat.	95%CV
r=0	r≥1	15.87**	15.49	r=0	r=1	15.83**	14.26
r≤1	r≥2	0.039	3.841	r≤1	r=2	0.039	3.841

**significant at 5% level

Causality test results are presented in table (5). Results show that the causality runs from inflation to economic growth. It is also found that economic growth does not Granger cause inflation in Qatar economy.

Table-5. Granger Causality Test

Null Hypothesis	Wald test/Chi-square	Conclusion
LCPI does not Granger cause LRGDP	6.533 (0.004) ***	Reject H_0
LRGDP does not Granger cause LCPI	1.092 (0.348)	Fail to reject H_0
		No causality

*** Significant at 1% level. Probabilities are in parenthesis

5. Conclusion

This paper attempts at studying the causal relationship between inflation and economic growth for Qatar economy for the period of 1980 to 2016. Annual data were used, and unit roots tests and Johansen cointegration method were implemented on data. Inflation and economic growth were found to be cointegrated, hence a long-run relationship between them exists. When Granger causality test was performed, it was found that causality runs from inflation to economic growth in Qatar for the period of time selected.

References

Ahmed, M. S. (2010). An empirical study on inflation and economic growth in Bangladesh. *International Journal of Sustainable Development*, 2(3): 41-48.

Ahmed, S. and Mortaza, M. (2005). Inflation and economic growth in Bangladesh: 1981-2005 policy analysis unit (PAU) working paper 0604.

Algaeed, A. (2016). The relationship between inflation and economic growth: A further evidence. *Journal of World Economic Research*, 5(5): 65-71.

Ayo, O., Ifeakachukwu, N. and Ditimi, A. (2012). A trivariate causality test among economic growth, government expenditure and inflation rate: Evidence from nigeria. *Research Journal of Finance and Accounting*, 3(1): 65-72.

Chimobi, O. P. (2010). Inflation and economic growth in Nigeria. *Journal of Sustainable Development*, 3(2): 159-66.

Datta, K. and Mukhopadhyay, C. K., 2011. "Relationship between inflation and economic growth in malaysia- an econometric review, international conference on economic and finance research." pp. 415-19.

Dickey, D. and Fuller, W. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49(4): 1057-72.

Enders, W. (2010). *Applied econometrics time series.* 3rd edn: Wiley: USA.

Erbaykal, E. and Okuyan, H. (2008). Does inflation depress economic growth? Evidence from Turkey. *International Research Journal of Finance and Economics*, 17: 40-48. Available: http://ssrn.com/abstract=1288783

Granger, C. W. J. (1988). Some recent development in the concept of causality. *Journal of Econometrics*, 39(1): 199-211.

Gujarati, D. and Porter, D. (2009). *Basic econometrics.* McGraw Hill: Singapore.

Hossin, M. D. (2015). The relationship between inflation and economic growth of Bangladesh: An empirical analysis from 1961 to 2013. *International Journal of Economics, Finance and Management Sciences*, 3(3): 426-34.

Hussain, S. and Malik, S. (2011). Inflation and economic growth: Evidence from Pakistan. *International Journal of Economics and Finance*, 3(5): 262-76.

Ibrahim, I. and Harrigan, F. (2012). Qatar's economy, Past, present and future, Qscience connect. Available: www.gsdp.gov.qa

Jayathileke, P. and Rathnayake, R. (2013). Testing the link between inflation and economic growth evidence from Asia. *Modern Economy*, 4: 87-92. Available: www.scirp.org/journal/me

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12(2/3): 231-54.

MacKinnon, J. (1991). *Critical values for cointegration Test, in R.F. Engle and C.W.J. Granger, eds. Long run relationships, readings in cointegration.* Oxford University Press: Oxford.

Malik, G. and Chowdhury, A. (2001). Inflation and economic growth: Evidence from four South Asian countries. *Asia-Psific Development Journal*, 8(1): 123-35.

Mubarik, Y. (2005). Inflation and growth, An estimate of threshold level of inflation in Pakistan. *State Bank of Pakistan – Reserve Bulletin*, 1(1): 35-44.

Phillips, P. and Perron, P. (1998). Testing for a unit root in time series regression. *Biometrica*, 75: 335-46.

Qatar Central Bank Annual reports, various issues. Available: www.qcb.gov.qa

Ruzima, M. and Veerachamy, P. (2016). Impact of inflation on economic growth: A survey of literature review. *Golden Research Thoughts*, 5(10): 1-9.

Saaed, A. (2007). Inflation and economic growth in kuwait: 1985-2005 evidence from cointegration and error correction model. *Applied Econometrics and International Development*, 7(1): 143-55.