

DOES INFLATION LEADS TO GDP CHANGE? : AN EMPIRICAL STUDY THROUGH PANEL DATA ANALYSIS USING GLOBAL ECONOMIC DATA

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Abstract: Globally, heartbeat of any country is depends up on its Gross Domestic Product (GDP). However, inflation is creating resistance to economic development as increase in inflation reduces nominal GDP in most of the asian countries. In fact, historically all possible combinations were observed inflation with and without growth, no inflation with and without growth. However, nominal GDP is not matter much for understanding economic development. Hence, relationship between Real GDP and Inflation become major concern for most of the developing economy in Asia. In reality, vicious cycle of inflation and real growth was observed many times (Fischer 1993, Barro 1996). Here, in current research paper authors done humble attempt to understand relationship between inflation and Real GDP. For the same, authors have collected panel data of 170 countries and geographical area for 40 years from 1980 to 2019 from International Monetary Fund (IMF). Using panel data regression analysis positive relationships (higher Real GDP reduces Inflation and vise-versa) between two variables are established and shown strong implications to help government in asian region for most of developing economy to framing growth focused policy making. It also helps international bodies to understand method for dealing with inflation and Real GDP in Global economic environment.

Keywords: Inflation, GDP, International Policy Framing, Global economy

Introduction

Economic growth can be defined as the capacity of any economy to increase its production of both goods and services.it can be measured by change in GDP of that nation. Real GDP is better reflector of economic growth as it adjusts for inflation. There is a negative relationship between inflation and growth (Barro, 1995).

This paper tries to test this relationship between GDP and inflation and tries to assess whether the past values of these key economic indicators have any effect on the variables present values. In addition to this, paper tried to understand ultimate impact on asian

developing countries for implementation of results. The paper is divided into the following sections. Section II describes the past work conducted on the topic. Section III explains the research methodology used to analyse the relationship. Section IV elaborates the analysis of the model outputs and section V discusses the policy recommendations of the relationship.

Literature Review

Policy decisions taken by the government is dynamic and based on assessments of current and past economic condition under a high degree of uncertainty. A good prediction is important for medium to long term forecast of growth in the economy. Empirical research undertaken for forecasting macro-economic key variables helps in this direction.

In the seminal paper Taylor considers the trade-offs between inflation and output that monetary policy faces in pursuing its ultimate goals. The issue of inflation and growth is addressed by Bruno and Easterly (1995) and find no evidence of any consistent relationship between inflation and growth up to a certain level of inflation. Growth falls amidst high inflation (greater than 40%) crises and recovers when inflation falls.

Pooling technique is applied to establish link between annual output growth and leading economic indicators like real money growth and real stock return (Garcia-Gerrer *et al.* 1987, Hoogstrate *et al.* 2000). There are many studies using static factor model proposed by Stock and Watson (2002) and its dynamic equivalent of Forni and Lippi (2001), Forni *et al.* (2004 and 2005) to forecasts the growth of GDP, Inflation up to a year ahead. The studies undertaken by Boivin and Ng (2006) and Jacobs *et al.* (2012) demonstrates that expanding the data set does not always lead to betterment of a forecast if the additional series are nonstationary and noisy.

In the empirical literature there is large consensus that the co-movements of real and nominal variables are relatively high in the Euro zone and that cyclical asymmetries are relatively small among the member states in European Union (Benala *et al.*, 2006, and Giannone and Reichlin, 2006).

In this research article it is attempt by researcher to understand cyclical relationship between GDP and Inflation through checking following two hypothesis using panel data analysis.

H_0A : There is no significant impact of Inflation on real GDP for next period.

H_0B : There is no significant impact of real GDP on Inflation for next period.

Research Method as the Main Heading

Data and Time lineselected

227 country/region real GDP and Inflation are available from International Monetary Fund (IMF). However, many countries/region data were not up to date. Based on number of pair available from 1980 to 2019 for both real GDP and Inflation are selected in sample

for analysis. Out of 227 only 132 countries and regions are found with proper data records since 1980. In this way, $132 * 40$ years = 5280 data point for both variables taken for the analysis.

Objective of the Study

As discussed in introduction and literature section, real GDP and Inflation are interdependent variables. Not only that, continuous decline in real GDP leads to increase in Inflation for next period and that further resulted in to reduction in to real GDP in next time period. This vicious cycle hurt any economy in very bad way. Hence, it is very important to understand this relationship properly to prevent country economy from any possible meltdown. Based on this, Objective of the study is defined as follow:

- To understand relationship between real GDP and Inflation as preceding and anticipating economic measures

Variables Selected and Model Development

For understanding real GDP based on last period Inflation or Inflation based on last period real GDP, panel data analysis is possible way of solution. Models are developed as follow:

Model 1:



Model 2:



Panel Unit Roots Test and Panel Model Used

Models shown in last section are required to check for panel unit root test for both the economic measures to decide whether to panel data analysis is appropriate or not. If panel unit root test fail to reject null hypothesis than data is considered to be non-stationary. This possibility required further transformation in data to make it stationary.

After get appropriate form of stationary data, panel data regression should be perform for check the relationship between two measures. As default, Random Effect Model (REM) panel data analysis should be performed first. However, Hausman test can be helpful tool to understand REM is proper tool to understand relationship or not. If null hypothesis in Hausman test is rejected, it will indicate wrong selection of REM.

Hence, Fixed Effect Model (FEM) should be performed. In addition, Wald test should be performed to check FEM can be used for analysis or not. If null hypothesis is rejected, FEM is also not right selection. Hence, in last Pooled Regression Model (PRM) should be performed.

Based on appropriate model selection, further analysis of relationship between two economic measures can be done. And that result is used for implications on helping to stop possible economic meltdown that can be predicted through given model.

Data Analysis and Interpretation

Panel unit root test was performed to check following two hypotheses:

$H_0(1)$: Real GDP has unit root (Real GDP data are non-stationary)

$H_0(2)$: Inflation has unit root (Inflation data are non-stationary)

Table 1: Unit Root Test for Real GDP

Method	Statistic	Prob.	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t	-38.45	0.0000*	131	5073
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-39.92	0.0000*	131	5073
ADF - Fisher Chi-square	1942.11	0.0000*	131	5073
PP - Fisher Chi-square	2076.04	0.0000*	131	5109

Note: * Significant at 1%

Table 2: Unit Root Test for Inflation

Method	Statistic	Prob.	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t	-25.00	0.0000*	131	5045
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-27.42	0.0000*	131	5045
ADF - Fisher Chi-square	1339.84	0.0000*	131	5045
PP - Fisher Chi-square	1492.77	0.0000*	131	5109

Note: * Significant at 1%

As shown in Table 1 and Table 2, both the variables have stationary data. Hence, panel data can be used for further analysis.

The impact of Inflation on Real GDP through model 1 was run for REM in Eview10. Result was reported in table 3 as follow:

Table 3: REM for Real GDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.6855	0.1687	21.84	0.0000
Inflation (-1)	-0.0179	0.0095	-1.87	0.0060*

Note: * Significant at 1%

$$\text{Real GDP} = 3.6855 - 0.0179 * \text{Inflation} (-1)$$

Before doing further interpretation of result, Hausman test was performed to check whether REM is appropriate or not:

$$H_0(3): \text{REM is appropriate model for prediction of Real GDP}$$

Table 4: Hausman Test for Real GDP

Test Summary	Chi-Sq. Statistic	Chi-Sq. df.	Prob.
Cross-section random	1.9198	1	0.1659

As shown in table 4, null hypothesis fail to reject (Non-significant, $p > 0.05$). Hence, REM is appropriate model to run for understanding impact of Inflation on Real GDP. Apart from it, as per indicating in table 3 on an average one percent increase in to Inflation of any economy can be result in to on an average decrease in to Real GDP by 0.0179 percent in next year significantly. This is showing rejection of our intial hypothesis form in literaturereview H_0A . Hence, this will cause hurdles in economic development. On the other side, policy that leads to control in inflation may automatically result in to improvement in to Real GDP for the next year.

Now to check the impact of Real GDP on Inflation through model 2 is run for REM in Eview10. Result was reported in table 5 as follow:

Table 5: REM for Inflation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.9143	0.3972	17.40	0.0000*
REALGDP(-1)	-0.0932	0.0194	-4.79	0.0000*

Note: * Significant at 1%

$$\text{Inflation} = 6.9143 - 0.0932 * \text{Real GDP}(-1)$$

Before doing further interpretation of result, Hausman test is performed to check whether REM is appropriate or not:

$H_0(4)$: REM is appropriate model for prediction of Real GDP

Table 6: Hausman Test for Inflation

Test Summary	Chi-Sq. Statistic	Chi-Sq. df.	Prob.
Cross-section random	1.068361	1	0.3013

Note: * Significant at 1%

As shown in table 6, null hypothesis fail to reject (Non-significant, $p > 0.05$). Hence, REM is appropriate model to run for understanding impact of Real GDP on Inflation. At the same time, as per table 5 on an average one percent decrease in to Real GDP in any economy can be result in to on an average increase in to Inflation by 0.0932 percent in next year significantly. This is showing rejection of our intial hypothesis form in leterature review H_0B . So, Inflation for the next year and that hurts purchasing power of economy. Not only that, it also decline currency in long run.

Furthermore, increase in Inflation reduces real GDP for next to next period at the end as shown in table 3. In way, this will creates vicious circle for economy. However, any economic policy that helps to boost Real GDP automatically control inflation and change vicious circle to positive circle from the next period.

It means any economic policy that leads to improve in Real GDP also results in to higher Inflation for the next year and that hurts purchasing power of economy. Not only that, it also decline currency in long run. Furthermore, increase in Inflation reduces real GDP for next to next period at the end as shown in table 3.

In nut shell, improve Real GDP helps in improving Inflation and further more improved Inflation improves Real GDP. However, high Inflation in economy may starts vicious circle of decline in Real GDP and that further increase in Inflation. So, there isn't any question of trade-off between GDP and Inflation as mentioned in past literature.

Discussion and Implication

As shown in data analysis and interpretation section, when country phase issue in controlling one of economic measure from Real GDP and Inflation will be resulted in to vicious cycle. However, there is problem in implementing policy for improvement on one of the variable. As shown in literature improvement in one economic measure leads to ruining of second economic measure (Parikh and Patel, 2013).

However, in current study instead of single county time series data analysis data across world for 40 years are taken. This panel data helps in understanding relationship between Real GDP and Inflation in more depth with impact of one on the other as preceding and anticipating variables. Result of this study, clearly depicts that even influencing one variable

helps to start generous circle of improvement in both the economic measures. This is very important finding specifically for the Asian developing countries that required focusing on good growth with inflation control.

In addition, policy maker must focus on Real GDP improvement as it has more magnitude wise impact on Inflation. At the same time, improvement in Inflation may not help in Real GDP improvement magnitude wise. Thus, whenever vicious cycle observed in Real GDP and Inflation in any economy, this study can be help policy maker to decide about where to focus. This study is clearly indicating requirement of focus on Real GDP for economic improvement for all Asian developing countries.

Conclusion, Limitations and Further Scope

Using current study research did humble attempt to establish relationship between Real GDP and Inflation. It was found that increase in inflation result in decline of Real GDP in next period and vice-versa. Hence, once Inflation controlled automatically Real GDP is start improving and once Real GDP improve it helps in control Inflation for next period. But as per result any policy maker in Asian countries want to improve their economic growth, they should start with focusing on Real GDP.

However, these two variables are not the only economic measures. Hence, the major limitation of the study is it only talks about relationship between two economic measures. By including other variable controlled by policy maker may help in understanding relationship in more depth. Not only that, this further study may also help in development of strong implications for policy makers of economy.

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