

# Relationship Between GDP and Inflation Rate

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**Abstract.** In history, inflation has appeared many times. For example, the Recession. Also, GDP inflation and deflation occur from time to time. However, there is little research about the relationship between inflation and GDP. Therefore, this paper wants to investigate how inflation is associated with GDP. However, there is no linear relationship between these two factors. Investment managers must discover a degree of awareness that aids their decision-making without overwhelming them with superfluous information. Discover the implications of inflation and GDP on the marketplace, the business, and the investment. Innovative banking variations across nations, or within a nation and over time, influence how inflation impacts economic growth. Smaller intermediaries costs mean that inflation has a negative production less than in higher-cost nations, and comparable effects apply within the same nation when intermediation prices shift over time. Inflation's impacts on growth have long been debated, both conceptually and experimentally. In contrast to several financial concerns, where the issue is frequently whether a particular impact or no impact exists, there are consistent theories that indicate inflation can have a favorable, unfavorable, or no influence on economic growth. As a result, it appears to be a perfect condition for testing different ideas against evidence.

**Keywords:** Relationship; GDP; Inflation rate.

## 1. Introduction

During the COVID-19 pandemic, gross domestic product (GDP) decreases drastically and inflation is very severe. Therefore, it is very significant to discover the relationship between inflation and GDP in order to promote GDP growth and lighten inflation, and in turn, help economics recover from the pandemic. From early 1990, a reappearance of effort in the problem of inflation and economic expansion emerged. The majority of the present research has employed cross-country information, either aggregated in development regression models or evaluated independently in time-series analysis, and one of the findings is that there are significant disparities between nations.

Aside from inflation, the researchers included employment levels as a variable in the equation since economic expansion and jobs are associated. It is the relationship between an increased country's economic production and lower national jobless. This is because, in order to improve a country's economic production, individuals must return to work, decreasing unemployment. Most nations around the globe are concerned about inflation and economic development. As a result, economic expansion and inflation have garnered praise since the classical era. All mainstream economists, politicians, and central financial institutions have to understand whether inflation is good or destructive to development.

It is widely agreed in macroeconomics that a moderate level of inflation will boost the growth of GDP. However, the problem of what level of inflation is 'good' for economics is remain open. Structuralists believe that a moderate level of inflation could benefit economic expansion, while from the monetarists' perspective, inflation imposed a detrimental effect on economic growth. Earlier empirical work generally supports the argument that inflation impairs economic development. Even so, it is quite hard to deny the possibility of a natural link between GDP and inflation.

Many powerful mathematics and statistics tools were utilized by economists to elucidate the causal relationship between two variables. The unit root test is one of the most widely used techniques in casual relationship analysis. For cases where time series data are stationary, the causal relationship could be unveiled by ordinary least squares (OLS). If there are unit roots and nonintegrated, the Error Correction Model may be needed to transform the model. This method has been used to check the integration order of the variables [1]. To study the long-term relationship between variables,

cointegration analysis could also be employed [2]. Other methods like nonlinear least squares (NNLS) estimation [3], Granger Causality Test [4], Series Autocorrelation [5], and GDP-CPINLDS [6] have also been used to find the causal relationship.

Recent research tends to believe that there is a ‘threshold’ inflation rate (i.e. a country is more likely to recess if its inflation rate is above the threshold inflation rate; on the contrary, it will grow if its inflation is lower than the threshold inflation rate.) In 2005, Yasir Ali Mubarik used four variables model to find the threshold inflation rate for Pakistan [7]. According to annual data from the Economic Survey of Pakistan, he claimed that the threshold value of inflation is 9% for Pakistan. On the contrary, in the research conducted by Sweidan in 2006, Sweidan reported a positive structural effect at a 2% inflation rate, while rates bigger than 2% would lead to destructive effects [8]. In addition to the research focusing on developing economies, there is also some research conducted in some developed economies. In 2005, Lee and Wong used the unit root test to determine the nonlinear relationship between inflation and GDP growth. After reviewing the data from 1965 to 2002 in Taiwan and Japan, they found the threshold inflation rate is 7.25%, while this rate is 2.52% for Japan [9]. In this article, research methodology is applied to ascertain the relationship between gross domestic product and inflation rate in the USA.

## 2. Methodology

### 2.1 Source of data

A dataset from the US Bureau of Economic Analysis and US Bureau Labor of Statistics is used to predict the relationship between GDP growth and inflation rate. The data consists of 10 quarters’ data of GDP and inflation. The inflation is taken from CPI.

In this dataset, the independent variable is inflation (CPI). Inflation represents a price rise for commodities and services. If a country’s inflation is increasing, then the general price level in this country will also increase. Conversely, if a country’s inflation is decreasing, the general price level in this country will also decrease. The dependent variable in this dataset is GDP growth, which is used to measure how quickly an economy is growing or shrinking.

### 2.2 Machine learning models

Linear regression to examine the relationship is used in this work. Linear regression is a common technique to model the relationship between interpretation variables and scalar responses, i.e., independent and dependent variables. If there is only one explanatory variable, the regression is called simple linear regression. Regression of more than one explanatory variable is called multiple linear regression. An analogous concept is multivariate linear regression, which predicts multiple independent variables rather than single scalar variables [9]. Linear regression model relationships based on linear predictive functions and their unknown model specifications are calculated from collected data. In general, assumptions that the average value of the response condition yielding the value of interpretation variables is considered to be an affine function of these values. Not too common is to use the median and other digits of the condition. As with all forms of regression analysis, linear regression places much emphasis on the condition.

## 3. Results

### 3.1 Data Visualization

Consider using descriptive statistics tables for variables (showing means, etc. in tabular form), GDP growth, and Inflation rate are shown in Table 1.

**Table 1.** GDP growth and Inflation rate

Variables	Obs	Mean	Std. Dev.	Min	Max
GDP growth	40	3.51%	4.47	-1.8%	7.2%
Inflation rate	40	4.47%	9.84	0.7%	13.3%

So far, the government has initiated a monetary policy in order to promote GDP growth and decrease the inflation rate. For example, the government would borrow money and send it to citizens in order to increase government spending and promote costs.

The two major goals of this article are to identify and investigate the link between economic expansion and prices. A questionnaire survey is used to accomplish the goal of this work. The sample size is used because it makes use of both response variables and cross-sectional knowledge and provides a high quantity of observations, enhancing the amount of freedom and decreasing colinearity between explanatory factors. Data series enhances econometric evaluation in ways that cross-section or time series information alone cannot. It provides far greater modeling freedom for cross-sectional unit behavior than forced air time series analysis does. The data is organized into panels. The very first quadrant is composed of five factors: real GDP per capita percentage growth, deflation, capital, demographic, and beginning real GDP per capita. The second section is made up of two factors: real GDP growth rate and inflation. The first part is designed to examine the link between economic expansion and inflation. The second part is made up of economists who are attempting to determine the connection between economic expansion and inflation.

The USA is the largest economy in the world. This country's GDP was around \$15 trillion in 2011. When compared to other countries, the United States ranks eighth, after countries like Norway. This is based on her 76,450 per capita income. The United States has a huge economy with a continuous and stable GDP. There was a modest reduction in the rate of unemployment. This was accompanied by an increase in the parity of purchasing power. All of these factors combine to make the United States economy one of the largest on the planet.

The next regression coefficient is the expenditure rate. The majority of research found that investment had a favorable influence on economic growth. For example, the United States discovered that investment had a favorable influence on economic growth. The information was obtained from the Penn World Tables website. INVT denotes the rate of investment in this study.

Although higher inflation rates are detrimental to economic growth, the administration must also manage the inflationary pressures. These original study findings confirm the Monetary-Lead Theory and imply that the government ought to concentrate not just on the growth of the financial industry, but also on other macroeconomic policies that favor a stable currency exchange rate. A low high ratio of inflation implies that policymakers rethink the current Macroeconomic Policy [10].

The helps influence component is the demographic. It is the geometrically expanding pace of the midseason populace. The understanding of the link between population expansion and industrial progress is mixed. According to some, rapid population increase places a strain on limited natural resources, thereby restricting personal and government wealth production and economic success. Others contended that increasing population was helpful to productivity expansion. GPOP denotes the effect of population expansion. The World Bank information was used to create this collection.

The last regression coefficient in this analysis is the initial per capita GDP. Various studies produce conflicting results about the impact of beginning per capita GDP on growth in the economy. Barro (1997) discovered an inverse link between beginning GDP and wealth creation. Blomstrom (1996), on the other hand, discovered a positive link between beginning GDP and wealth creation. For this analysis, the real GDP per capita of 1969 is used as the starting point. GDP0 represents it.

### 3.2 Test-Hypotheses:

A threshold inflation rate for the US is presumed. When the inflation rate is higher than this level, economic growth will shrink. Otherwise, it will increase.

### 3.3 Test result and analysis:

The total of all factors in the study is shown in Table 2. Stata is used to compute it. It includes the average, standard deviation, and highest and lowest values of the data that may be seen. It is used to see the data's general perspective.

**Table 2.** The test result of all factors

Variable	Number of observations	Mean	Std. Deviation	Minimum	Maximum
GGDP	476	2.9299	5.7923	16.0492	19.48
INVT	478	19.1833	9.2088	0.9	21.37
GPOP	476	0.0158	0.7639	0.3871	4.8644
InINF	476	2.7673	1.4789	6.7196	7.0168
InGDPO	476	3.4908	1.0147	2.202	4.9267

Markets are geographically fragmented, with the cost of intermediaries proportionate to demand and rising with distance from the main market. Using cash, on the other hand, is expensive but proportionate to the real rates of interest, which is the same in all marketplaces. As can be shown, there is a cutoff point at which credit is employed in that site and all of those nearer to the domestic market, while cash is utilized in all markets farther away. This cutoff will be determined by the actual interest rate as well as inflation as calculated by the Fisher equation. Since credit is expensive, there will be an implicit financial sector, the size of which will be determined by the real rate of interest and inflation.

This section will discuss how to investigate the connection between economic development and inflation. To reach the objective of this study, I developed a model that incorporates inflation and beginning GDP into the Solow growth model. I replace labor and capital in the Solow growth model with population and investment. As a result, the model includes five variables: real GDP per capita, inflation, population, starting per capita GDP, and cash flow. Control factors include population, beginning per capita GDP, and investments. Every parameter and the method for measuring each variable is outlined below:

## 4. Discussion

The primary objective was to clarify the relation between foreign direct investment and economic progress, and the relation between business and pricing. The connection between foreign direct investment and the economy was also inspected, and a developmental model was constructed that contained three additional components in addition to inflation. Because the model requires a temporal impact, the explanation is based on the model. The study showed that inflation is statistically meaningful, but with a minus number, suggesting that inflation seems to imply a detrimental influence on economic growth. The estimate was done using three distinct models, but the results are all the same. This finding is similar to the findings of Fisher and Gregorio. They conducted extensive research on the subject and determined that inflation is adversely and strongly connected to growth in the economy [10].

In contrast to inflation, the findings suggest that beginning GDP has a detrimental impact on the economy's growth. This conclusion suggests converging, which indicates that the nations with greater per capita GDP originally have negative growth. The figure's coefficients of expenditure parameter have a good thing and are statistically meaningful. This outcome is consistent with Keynes' General Theory and the Sala-Martin investigation (1997). They demonstrated that investing was critical in supporting productivity expansion. Finally, the estimated results show a slightly negative correlation between population and economic growth. The multivariate cointegration test revealed that inflation stimulates economic expansion and that income growth creates inflation. For the 13 nations in the sample, the previous causation mechanism may be described as homogeneous. The latter process is diverse, occurring in Congo, the Democratic Republic of the Congo, and the United States but not in

other nations. As a result, it may be claimed that previous inflation rates help anticipate present-day economic growth (GDP) and vice versa.

## 5. Conclusion

Macroeconomic policy is associated with the realization of significant so-called economic objectives. Such goals involve raising real GDP levels, reaching high levels of production and domestic and international competitiveness, in addition to product creation, obtaining economic growth (and levels of unemployment), and, last but not less, attaining and preserving monetary and economic stabilization. By investigating trends in inflationary expectations for industrial development in the United States, we confirmed the concept that stagnant productivity is essential but is not sufficient for sustainable productivity expansion. A paradigm with multiple output responses was devised. A regression analysis was used for estimation. The connection between economic progress and pricing is proposed and the correlation test was applied. The projected result demonstrated that monetary policy was significantly and negatively related to economic growth. This demonstrates how inflation is a drag on productivity expansion. Inflation and per capita real GDP are moving in opposite ways.

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