Proceedings of the 7th International Conference on Economic Management and Green Development
DOI: 10.54254/2754-1169/43/20232170

The Relation of Economic Growth and Price Level: A Comparative Study of Mexico and the United States

Ronggeng Qian[1,a,*]

[1]*High School Affiliated to Shanghai Jiao Tong University, Shanghai, 100081, China*
a. ronggengqian@163.com
**corresponding author*

Abstract: This study aims to study the correlation between real GDP and GDP deflator. As regions with high economic development typically have higher price levels than less developed regions, this social phenomenon inspires this study to study the short-run relationship of these variables. An empirical study in this paper is done through detrending, and further calculations are done regarding descriptive statistics to figure out this relationship. As the major finding of this paper, in the short run, real GDP and price level have a rather weak correlation, and real GDP is much more volatile than the price level.

Keywords: economic growth, price level, developing countries, developed countries

1. Introduction

Real GDP is the total value of all final goods and services produced within a country over a particular period. As it reflects the productivity of a country, economists usually view this as an indicator of the health of an economy and the living standard of people in this country. The other important concept in this article, price level, means the cost for people to purchase goods and services in a country. This variable has several ways to measure, of which one of the most commonly used methods is the CPI (Consumer Price Index) calculated by the Bureau of Labour Statistics.

The classical AD-AS (Aggregate Demand-Aggregate Supply) model can be used to understand the relationship between real GDP and price level. With any changes in either the Aggregate Demand or the Aggregate Supply, the real GDP and the price level change accordingly, suggesting a strong relationship between these variables. However, within a single year, a great amount of change in Aggregate Demand and Aggregate Supply would happen, so the resultant change resulting from the new equilibrium point remains unclear.

A social phenomenon that is often seen might provide a key to this question that areas with high economic development tend to have higher price levels. Evidence from World Bank also shows this relationship by comparing the real GDP and the price level across different years in Thailand, China, and America. Although this phenomenon helps explain the long-run trend in the price level and real GDP variance, the short-run fluctuations that occur annually are still not fully understood.

2. Literature Review

The major thought about the relationship between price level and real GDP is that they are highly correlated. Some articles have contributed to the research and found that economic growth and price

DOI: 10.54254/2754-1169/43/20232170

level are positively related. Among them were the case studies that show this trend in some countries. For example, through a case study in Mauritania from 1990 to 2013, Mahmoud concluded that there is a strong relationship between GDP and CPI in his paper [1]. Urbanovský's study in the Czech Republic has found three pairs of Granger causality exist, reveals past real GDP change would finally result in changes in the price level [2]. Besides, several studies have focused on the relationship between real GDP and GDP deflator across different countries and worked out a general solution to this question. Ravallion's study, consistent with the Balassa-Samuelson model, shows that countries with fast economic development tend to experience higher increases in PPP, especially developing countries [3].

To test the claim that a rapid increase in real GDP is correlated with high inflation, a quantitative study is expected to be conducted, but the different degrees of economic development might impact the result. As Howell and Howell state in their article, the financial status of people is more closely linked to their subjective well-being in developing countries [4]. Oduh, Oduh, and Ekeocha's paper reveal the fact that the confidence of consumers is a key determinant of consumption spending [5]. Since it is stated in Aschauer's paper that consumption has a positive impact on aggregate demand [6], it is not appropriate to say that the relation between real GDP and the GDP deflator is the same for developing countries and developed countries. As a result, this paper will use a comparative method to study this relation in both cases so that a confounding variable would not occur.

3. Methodology

Following Tarvainen, Ranta-Aho and Karjalainen's detrending method applicating to HRV analysis [7], this article will use this method to work out the short-run relationship between the GDP deflator and real GDP, whose mathematical relationship remains to be unsure, and finally calculate the correlation index for these variables. Provided the correlation is validated, this article provides empirical evidence that in the short run, an increase in GDP is correlated with an increase in the price level.

To detrend the variables, line charts are made from the data of price level and real GDP, and a line of best fit is added to both diagrams to indicate the difference between the real value of GDP deflator and real GDP, and the trend of GDP deflator and real GDP. Because real GDP and price level cannot be directly compared, this article also calculates the cycle of each variable. After gaining the difference between real value and trend, this difference is then divided by the trend of each variable, the resultant value indicates the percentage difference from the trend.

After gaining the cyclical of price level and real GDP, some comparisons shall be made. The standard deviation of cyclical is counted as part of the descriptive statistics for indicating the magnitude of variance in both GDP and GDP deflator. In addition to the calculation of stand deviation, a more critical calculation in this article is the correlation index between the price level cyclical and real GDP cyclical, a value that is closer to positive or negative 1 means a stronger correlation. Comparison between data in Mexico and America should be made to know whether the correlation between the price level and real GDP is stronger for developed countries or developing countries. We assume an absolute correlation index value greater than 0.7 is evidence of the relationship between the GDP deflator and real GDP.

4. Data

To ensure the correlation between real GDP, in US dollars, and price level, with no unit, is not influenced by significant economic events such as the financial crisis, data through a long period, from 1981 to 2022, is selected for this research from the World Bank. While proceeding with the data,

DOI: 10.54254/2754-1169/43/20232170

only data updated once a year is used to calculate the correlation. This selection aimed to shorten the observation period and provides a more accurate calculation.

Nevertheless, a problem regarding the data is noticeable. Among the data of real GDP and price level in Mexico, both variables started from a relatively high point since their starting point and immediately saw a steep decrease. Since a single difference from the trend would result in a variation in the result, this significant divergence from the line of best fit might cause calculation errors, making the conclusion of this research inaccurate.

5. Result

The descriptive statistics of real GDP and GDP deflator of America and Mexico are shown in Table 1.

Table 1: Descriptive statistics in the United States and Mexico from 1981 to 2021 of real GDP and GDP deflator.

Country	Correlation Index	STDEV of GDP	STDEV of GDP Deflator
United States	-0.05	19.24	1.33
Mexico	-0.31	71.16	43.11

Note: The source of raw data is the World Bank, collected from countries over the world on the real GDP and GDP deflator. Calculations are made to indicate the true relationship between these two variables.

For developed countries like the United States, the study reveals that the correlation index is not according to common sense and that the value is negative. More importantly, the low absolute value of the correlation index also indicates that there is nearly no relationship between real GDP and GDP deflator. While the standard deviation of real GDP cyclical remains to be high, indicating high variability of GDP, the GDP deflator is relatively stable during economic development.

On the other hand, Mexico, considered in this study as the representative of developing countries, shows a quite different result from the one of the United States. Based on the calculation of the correlation index of real GDP cyclical and GDP deflator cyclical from 1981 to 2021, a value of -0.31 is gained, indicating a stronger, yet still very weak, negative correlation between the variables. Besides, the standard deviation of real GDP cyclical and GDP deflator cyclical in Mexico is much higher than in the United States, with values of 71.16 and 43.11.

6. Discussion of The Result

As the major finding of this study, the result of the calculation on the correlation index between real GDP and GDP deflator reveals a fact that betrays the common knowledge that in the short run, these two variables have relatively weak or even do not correlate with each other at all. Furthermore, despite the correlation index being extremely low, the standard deviation of these two variables still suggests information on the difference of changes during economic development in developing countries and developed countries. While these two kinds of countries developed over time, developing countries experience far more volatile real GDP and price levels.

As a possible explanation for this phenomenon, the mixed effect of aggregate demand and aggregate supply might be partially accountable for it. Since countries in the modern world have robust agriculture and manufacturing industries [8], these kinds of countries usually have an aggregate supply that is unlikely to be decreased and, more importantly, is steadily increasing over time. As a result, economic development in countries in the modern world is largely driven by increasing productivity. On the other hand, the more rapid change in aggregate demand also plays a role in this phenomenon. Unlike aggregate supply, aggregate demand can be easily changed by using

DOI: 10.54254/2754-1169/43/20232170

monetary or fiscal policies. While an increase in aggregate supply makes the price level lower, rapid changes in aggregate demand make the resultant impact on the price level to be uncertain. Due to the fact that each year these two variables change differently, provided there is a steady increase in real GDP, there would still unlikely to be a steady increase in the price level.

However, although the correlation index of real GDP and GDP deflator is rather low, this still indicates some differences between these countries. According to the catch-up theory, since developing countries have more spare capacities for developing than developed countries, developing countries economic development is typically faster [9]. As shown in Table 1, the standard deviation of GDP cyclical is much greater for Mexico than for the United States. The empirical evidence strongly supports this claim. In the classic economics view, a shift in short-run aggregate supply cannot change the long-run trend of economic growth. Instead, it is driven by long-run aggregate supply. During a single year, the high growing capacity of a developing country enables it to have a rapidly developing long-run aggregate supply, so the resultant impact on price level is negative. Empirical evidence in Table 1 shows that the correlation index was more damaging for Mexico than the United States, which is convincing support for this finding.

7. Conclusion

The aim of this study is to figure out the relationship between real GDP and the GDP deflator and compare the correlation index between Mexico and the United States, to construct a comparative study on developing countries and developed countries. Through the use of detrending and the provision of data by the World Bank, this paper gained several descriptive statistics of real GDP and GDP deflator from 1981 to 2021 in Mexico and the United States.

As the conclusion of this paper, the correlation between the two variables is weak and negative in Mexico and the United States. For explaining this finding that diverges from the common knowledge that high economic growth is accompanied by high price levels, this paper suggests that the mixed changes in aggregate demand and supply cause this phenomenon. Besides, the paper also refers to the catch-up theory to explain the more negative correlation index in Mexico than the United States, that the huge growing capacity enables Mexico to have high growth in long-run aggregate supply, resulting in the negative correlation between real GDP and price level.

References

[1] *Mahmoud, L. O. M. (2015). Consumer price index and economic growth: a case study of Mauritania 1990–2013. Asian Journal of Empirical Research, 5(2), 16-23.*

[2] *Urbanovský, T. (2016). Interconnection of interest rate, price level, money supply and real GDP: The case of the Czech Republic. Procedia-Social and Behavioral Sciences, 220, 531-540.*

[3] *Ravallion, M. (2013). Price levels and economic growth: making sense of revisions to data on real incomes. Review of Income and Wealth, 59(4), 593-613.*

[4] *Howell, R. T., & Howell, C. J. (2008). The relation of economic status to subjective well-being in developing countries: a meta-analysis. Psychological bulletin, 134(4), 536.*

[5] *Oduh, M. O., Oduh, M. O., & Ekeocha, P. C. (2012). The impact of consumer confidence and expectation on consumption in Nigeria: Evidence from panel data. European Journal of Business and Management, 4(9), 86-100.*

[6] *Aschauer, D. A. (1985). Fiscal policy and aggregate demand. The American Economic Review, 75(1), 117-127.*

[7] *Tarvainen, M. P., Ranta-Aho, P. O., & Karjalainen, P. A. (2002). An advanced detrending method with application to HRV analysis. IEEE transactions on biomedical engineering, 49(2), 172-175.*

[8] *Martin, W., & Mitra, D. (2001). Productivity growth and convergence in agriculture versus manufacturing. Economic Development and Cultural Change, 49(2), 403-422.*

[9] *Nübler, I. (2014). A theory of capabilities for productive transformation: Learning to catch up. Transforming Economies, 113.*