Unemployment and GDP: Example of Alabama

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Abstract. This article focus on how the unemployment rate affects real Gross Domestic Product and uses data collected in Alabama state. By analysing recession periods recently, and conducting the Granger test, the outcome is that the unemployment rate is a granger-cause of real Gross Domestic Product, and the unemployment rate harms real GDP. A further implication of this result on the local governor of Alabama, the United States of America as well as similarly developed countries is that government should continue to regulate the unemployment rate by using methods such as subsidies to firms, attempts to eliminate information failures between employers and workers, and strategies to enhance labor quality should be considered.

Keywords: GDP; Unemployment Rate; Granger.

1. Introduction

The recent COVID-19 epidemic has posted a huge effect on the unemployment rate and the GDP of multiple economies. With few preparations to counter this black swan, most economies' had great fluctuations in the unemployment rate and GDP, which made the changes obvious. The unemployment rate gauges joblessness, reveals the growth of the economy and confirms other economic indicators(Amadeo, K., 2021), which is very vital.

As circumstances may change, past research is based on peace periods without exceptions such as the 2008 economic crisis and the COVID-19 epidemic, which both of them posted a huge influence on the two indicators, hence the conclusions might not still be able to apply. This article focuses on recent statistics and events and hopes to find correspondence between past and current situations of how the unemployment rate alters the GDP of an economy.

In section 2, past studies on the topic will be reviewed and a hypothesis of explanation will be provided. In section 3, data and graphs will be explained and analyzed, especially two recession periods recently. In section 4, those data will go through the Granger test and outcomes will be interpreted.

2. Literature Review and Hypothesis

Measuring the monetary output, GDP was well researched. One of the most well-known laws describing the relationship between Gross Domestic Product and employment rate might be Okun's Law. The basis of the law means that there is a positive relationship between the employment rate and GDP, and a negative relationship between the unemployment rate and GDP. Usually, for a percentage of the employment rate to rising, almost twice the rate of GDP growth is needed to satisfy the rise in that cycle (Amadeo, K., 2021). The exact coefficient for Okun's Law may vary from economy to economy (Gurvich, 2015). Other factors such as energy consumption, which has a bi-directional relationship with GDP(Soytas and Sari, 2002), and consumer spending also affects GDP(Terzo,2022).

We hypothesize that there is a correlation between GDP and employment rate, two factors should be accounted for fluctuations in both of the statistics. For instance, when GDP rises, which means there are expansions in the total demand, thus firms will hire more employees to maximize their output, and the unemployment rate will fall. For another example, when the employment rate rises, people occupy more dispensable income in total, as a result, people may spend more, resulting in higher GDP.

3. Data

The quarterly data of real Gross Domestic Product and the unemployment rate were analysed in this article. The reason for using real GDP in this article is that it can eliminate the effects of inflation, which will be a better scale than nominal GDP in this test. The data were all collected from https://fred.stlouisfed.org/, and data are of Alabama state in the United States of America, the periods are from 2005/1/1 to 2022/1/1. The overall trends of real GDP (fig. 1) and unemployment rate (fig. 2) during this period are shown. In the charts, the darker vertical lines represented periods of recession.

In the first dark column, it was during the economic crisis of 2008. The relation can be clearly identified where the unemployment rate rises and real GDP drops. This relationship becomes more obvious in the second dark column due to the COVID-19 epidemic, many labor forces are being resigned for firms to save their cost, and other factors such as bad health status and quarantine periods makes the unemployment rate almost skyrocketed. Correspondingly, the real GDP falls dramatically. During recessions, changes become more intense and can be more easily recognized.

Figure 1. The unemployment rate in Alabama
Note: source from https://fred.stlouisfed.org/

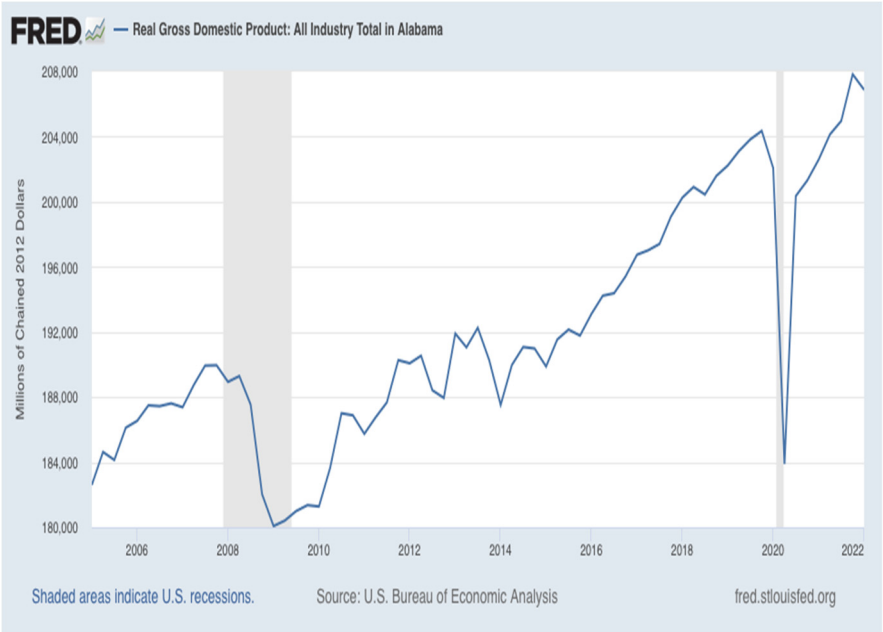

Figure 2. Real GDP in Alabama
Note: source from https://fred.stlouisfed.org/

3.1 Result

Those data will then be tested through the Granger Causality test to test if the unemployment rate is a Granger cause of the real GDP.

The results of the granger-causality test as shown below in table 1. The Ur stands for the unemployment rate, and RGDP stands for real Gross Domestic Product. P-values below 0.05 were accepted.

3.2 Interpretation

In Table 1., when the lags were chosen between 1 to 4, the p-value of the hypothesis "Ur is not granger-cause of RGDP" is all within 0.05, and is the smallest among all when the lag is 2, which the p-value being 0.006. Starting from 5, the p-value becomes out of range.

From the results, the hypothesis that the "unemployment rate is not a granger-cause of real GDP" is false, and the unemployment rate delays 2 periods of responding to changes in real GDP. The time taken for the labor market to change may be different in other regions, for instance, in Akkemik's research, it was 4 periods (Akkemik, 2008).

A possible explanation for this result might be: that the unemployment rate resembles the state of households' income and their ability and willingness to consume goods and services. Without reliable income, people are less likely to consume more goods and services, and as a whole people spend less. Furthermore, after signaling the lack of demand to the producers, employers may further cut employees to sustain their business. When the unemployment rate fluctuates, real GDP then fluctuates negatively.

Table 1. Results obtained from granger-causality test

Original Hypothesis	p-value	f-value	lags
Ur is not granger-cause of RGDP	0.026*	5.205	1
Ur is not granger-cause of RGDP	0.006**	5.481	2
Ur is not granger-cause of RGDP	0.027*	3.295	3
Ur is not granger-cause of RGDP	0.034*	2.802	4
Ur is not granger-cause of RGDP	0.081	2.090	5

Note: * is values within the range, ** is the smallest value within the range, Ur represents the unemployment rate, RGDP represents the real Gross Domestic Product

4. Conclusion

To sum up, we take an analysis of trend graphs and the Granger cause test, using statistics collected from the past 17 years in Alabama state. Results from the Granger test indicate that the unemployment rate is a granger-cause for real GDP, which also corresponds with the trend graph, and unemployment is most likely to delay in two time periods. Therefore, the hypothesis previously stated was inconsistent with the results carried out in this article.

This result could be vital for the governments of Alabama, the United States of America, as well as other developed countries that resemble the USA. Being able to influence the real GDP, the unemployment rate should be monitored and controlled long-term to prevent it from rising undesirably high through government regulation and should not make light of its vitalness. For instance, by offering subsidies for factories and firms for every extra unit of workers hired, they will have the incentive to employ more workers; by establishing and maintaining official information site to reduce the information failure between workers and entrepreneurs; by making education mandatory and offer those services, schools can supply more efficient labors to the labor market.

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