Impact of COVID-19 on U.S. Inflation and Unemployment

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Abstract: This dissertation examines U.S. inflation and unemployment data from January 1, 1990, to June 1, 2022, and pandemic death data from January 27, 2020 to June 1, 2022, the impact of the pandemic on society is studied. Studying this case clarifies the relationship between inflation and unemployment, and the impact of pandemic deaths on inflation and unemployment. Data have been collected from Fred, County of Santa Clara Open Data Portal, U.S. Bureau of Labor Statistics. This dissertation explains why, during a pandemic, wage increases fail to attract workers, what happens when a labor glut doesn't drive down prices, and how to fix the economic problems caused by covid.

Keywords: Covid-19, inflation, unemployment

1. Introduction

Covid19 has had a huge impact on the U.S. economy. Unlike other epidemics, Covid19 has had a huge negative impact on both the labor market and the consumer market in the United States. On the financial market side, the spread of panic caused by the pandemic has led to turbulence in the stock market. A period when people had to wear masks to public places and a period when they were forced to work or study from home. The first cases were detected in the United States on January 20, 2020, after which the COVID-19 spread at an alarming rate and slowed the spread of the COVID-19, which led to the declaration of a national emergency in the United States on March 13 [1].

Due to the state of emergency, the United States imposed a lockdown to stop the continuation of the unending Covid-19 infection, with all non-essential shops, restaurants and bars closed, and even schools started teaching online. And this has also led to an unprecedented shock to the labor market, leading to a sharp decline in revenue in industries such as retail and dining, lodging and travel, and manufacturing. During the outbreak, most US states enacted their own home quarantine policies in March 2020, to the extent that many factories, companies closed across the US and stopped those who were looking for work. As a result, the U.S. unemployment rate rose by nearly 11.2% between January 2020 and April 2020, as seen in the data from the U.S. Bureau of Labor Statistics [1,2] (from 3.5% to 14.7%). There is a certain relationship between the contraction of US GDP and the rise in the prices of daily consumer goods. Due to the economic recession brought about by the pandemic, according to statistics from the World Bank, the inflation rate in the United States dropped from 2.5% to 0.3% during the pandemic period [3].

This study will focus on unemployment and inflation data, which seem to be the easiest way to visualize the impact of the decline in the number of workers and the impact of the economic downturn caused by the COVID-19 crisis. This study provides recorded data on the number of new and cumulative COVID-19 cases among Santa Clara County residents using the Santa Clara County Open Data Portal collected by the Fred Economic Data website from World Development Indicators provided by the World Bank. WDI), world consumer prices as inflation data, and current employment statistics from the U.S. Bureau of Labor Statistics, collected by the Fred Economic Data website as unemployment data. Regresses three data measures using the mathematics of regression analysis and provides tabular and graphical representations to understand and elucidate the relationship between inflation and unemployment during the pandemic, and why wage growth has failed to attract workers.

2.   Literature Review

In recent years several scholars have expressed their views on the overall impact of COVID-19 on the US economy.

Kurmann et al. employ the worker-firm matched daily data, to create the updated real-time projections of the COVID-19 crisis's effect on employment and hours worked in the United States. Their results show that if only focusing on the leisure and hospitality and retail sectors, which were the most affected by the outbreak, employment in these two sectors fell by an estimated 19.8 million people from mid-February to the end of April, a shocking 60% reduction. And a third of that decline was due to firms reducing employment to zero [4].

Bauer et al. identify ten points where the epidemic has affected the US economy, including affecting the revenue of small businesses; Statistically speaking, from January through August 2020. As of August 9, the leisure and hospitality sector's average daily revenue had decreased by 47.5 percent, the education and health services sectors by 16.4 percent, and the retail and transportation sector's by 14.1 percent. The total small business revenue across all industries had decreased by 19.1 percent [5].

Hamilton suggests that the COVID-19 pandemic has been an extremely threat to the US businesses, especially small businesses; more than 400,000 failed during the period. However, Hamilton also noted that given the severity and scope of the COVID-19 problem, it is challenging to draw conclusions from previous experience on how small businesses can deal with COVID-19 issues [6].

In his paper "The effect of COVID-19 on the U.S. economy", miller argues that the lock-down policies imposed to combat the spread of the virus, froze the U.S. economy at an unprecedented rate. Even 3.28 million Americans applied for unemployment benefits, the highest number ever, and unemployment rose much faster than during the 2008 recession. And to protect the unemployed during the epidemic, the US Congress has passed a massive stimulus bill that provides for hundreds of billions in new spending, expanded unemployment insurance and cash assistance to low- and middle-income Americans [7].

Farmanesh et al, in their comparative analysis of COVID-19 and the global financial crisis, found that the strong contagious nature of COVID-19 led to its severe impact on the daily working lives of citizens. So much so that it has had an unprecedented impact on the labor and consumer markets. The labor market and Morgan Stanley predicted that the unemployment rate of the global crisis went to 10% in 2008, while the unemployment rate of the pandemic could reach 12.8%. So the article argues that the COVID-19 pandemic is worse than the global financial crisis of 2008. This is because the virus spread to various countries, hitting the US economy and the rest of the world, forcing the US government to limit and restrict every movement and program to stop the contagion. Ultimately, because individual countries imposed their own Lock-down policies, large countries like the US, China and Europe were able to survive economically with the help of reserves, while smaller countries would fall into recession or even depression [8].

Apergis et al. From the data, as well as the GARCHX model showing that all estimated coefficients in the conditional variance equation are statistically significant, it is concluded that inflation expectations and their volatility within the United States are positively affected by the Covid-19 pandemic. At the same time, these results apply equally to the volatility of the Covid-19 pandemic versus total deaths and the Covid-19 pandemic versus breakeven inflation [9].

Song et al. Compared to other similar companies, larger and more cash-rich companies are often more likely to endure periods of demand more efficiently by funding themselves, resulting in positive market valuations for investors. Their study, which looked at 795 company-year observations, found that restaurant companies with larger, more international characteristics were more resistant to a stock drop caused by COVID-19. This shows from the side that the pandemic has had a great impact on small and medium-sized catering enterprises [10].

In his paper, "Inflation with Covid Consumption Baskets," Cavallo argues that the pandemic has caused consumers to spend more on food and other groceries and less on transportation, travel, and more. This change in spending patterns has led to significant deviations in the cpi and has also made the inflation index during the pandemic more difficult to interpret. Cavallo constructed updated CPI weights using high-frequency spending estimates based on transaction data and concluded that during the pandemic, the cost of living for consumers is higher than the official CPI estimate, so welfare effects become especially important during the pandemic [11].

Ball et al. Their findings show that since the 1970s, the Fed's main core metric has been the inflation rate excluding food and energy, also known as XFE inflation. Headline inflation has fluctuated erratically due to pandemic-related industry shocks, and XFE inflation has performed quite poorly as measured by volatility and its relationship to slack [12].

Baker et al. Economic uncertainty during a pandemic is recorded and quantified using three indicators: stock market volatility, newspaper-based economic uncertainty, and subjective uncertainty in business expectations surveys. Their findings show that U.S. real GDP contracted by nearly 11% year-on-year through the fourth quarter of 2020, with the 90% confidence interval extending to a contraction of nearly 20% [13].

Coibion et al. Using repeated large-scale surveys of households in the Nielsen Homescan panel, the survey shows that employment fell by 20 million, and the number of jobs lost has far exceeded the number of jobs lost throughout the Great Recession. At the same times they found that the increase in unemployment was much less than proportional, suggesting that most of those who lost their jobs were not actively looking for new jobs [14].

3.   Data Description

In this work, the "Inflation, World Consumer Prices" data from Fred's website is used as a mathematical method for regression analysis of inflation statistics with statistics on unemployment and covid-19 deaths. The data source is the World Bank World Development Indicators (WDI). The World Development Indicators (WDI) are the World Bank's main collection of development indicators, compiled from officially recognized international sources. It provides the latest and most accurate global development data, including national, regional, and global estimates. This data provides the annual percentage change in the average consumer cost of purchasing a basket of goods and services using the median aggregation method. The data used in this report is from January 1, 1990, to June 1, 2022, and the data is public data and does not contain all confidential information about individuals and businesses.

The unemployment data, using Fred's unemployment data. The source of this data is the U.S. Bureau of Labor Statistics Current Employment Statistics - CES. Current Employment Statistics (CES) is a survey of U.S. businesses and government agencies based on payroll records. It mainly provides detailed industry estimates of the number of non-farm employed workers, wages and hours of non-

farm workers. The CES survey estimates that there are approximately 670,000 individual workplaces per month at approximately 131,000 businesses and government agencies in all 50 U.S. states, the District of Columbia, Puerto Rico, the Virgin Islands, and approximately 450 metropolitan areas and subdivisions. The proportion of the labor force provided in the data is limited to the unemployed 16 and older, and the labor force in the data does not include people living in institutions such as prisons and mental hospitals, nursing homes, and active-duty military personnel. This data is used as a mathematical method for unemployment statistics and is regressed on inflation and covid-19 death toll statistics. This report uses data from January 1, 1990 to June 1, 2022, which is public and does not contain all confidential information about individuals and businesses.

For data on deaths from the pandemic, the data comes from the official Santa Clara County government website. The data provides a daily record of the number of new and cumulative COVID-19 cases among Santa Clara County residents. A case is when someone tests positive for COVID-19 in a laboratory using a viral test, so some people have no symptoms and are not tested, so it is widely believed that the number of confirmed cases and deaths is an underestimation of the true number of people who test for COVID-19 - 19 Those who test positive will inevitably suffer from an undercount of cases. This data is used as a mathematical method for epidemic deaths and is regressed on inflation and unemployment statistics. The data used in this report is from January 27, 2020 to June 1, 2022, is public data, and does not contain all confidential information about individuals and businesses.

For the data before the first stage of the new crown epidemic, the work selected the monthly unemployment rate and monthly inflation rate in the United States from 1990 to January 2021 and performed regression data analysis. After the second stage of the epidemic, this work selected the monthly unemployment rate and monthly inflation rate in the United States and the number of deaths from the new crown epidemic in the United States from January 2021 to June 2022 and performed regression analysis.

Through regression analysis on the U.S. monthly unemployment rate from 1990 to the beginning of 2021 and the U.S. monthly inflation rate during the same period, it is concluded that the impact of the U.S. monthly inflation rate on the monthly unemployment rate is not significant, but after the outbreak of the new crown epidemic, the U.S. The number of deaths from the new crown epidemic is closely related to the unemployment rate and the inflation rate. Through regression analysis of the monthly inflation rate and monthly unemployment rate and the number of new crown deaths in the United States from 2020 to May 2022, it is found that the three are highly correlated and are determined by This can indicate that the new crown epidemic has a significant impact on the unemployment rate and inflation rate in the United States, which in turn affects the economic development of the United States.

4.   Empirical Methodology

The project's data are supported by the U.S. employment rate, unemployment rate and COVID-19 death toll since 2020 from the economic website FRED, and are validated by the inflation rate released by the World Bank's World Development indicators (WDI) and the current employment statistics (employment rate) released by the U.S. Bureau of Labor Statistics (CES), as well as the official COVID-19 death toll released by the US government.

One of the main goals of the work is to calculate and analyze the monthly inflation rate and unemployment rate statistics published by the Fred Economic Resources data website from 1990 to January 2021 in order to analyze the relationship between the two.

Note: this regression analysis only analyzes the statistical data of monthly inflation rate and monthly unemployment rate in the United States before COVID-19 epidemic, and does not consider the influence of other external factors for the time being.

First of all, the data that unify the starting point and end point at the same time are imported into the Excel software, then the mathematical method of regression analysis is selected to regression the integrated and imported data, and finally a complete regression equation is obtained. the regression results of the mathematical model include residual, residual, standard residual, linear fitting and normal distribution:

$$Ut = -0,30724 * It + 6.66877 \tag{1}$$

Ut is the U.S. unemployment rate at time t and It is the U.S. inflation rate

The regression equation shows that the correlation between monthly inflation rate and monthly unemployment rate in the United States is not high at t moment.

Note: (drawing normal distribution map and residual map. Mathematical formulas are more likely to be analyzed than predicted).

Another goal of this work is to download and collate data on monthly U.S. unemployment and inflation rates, as well as COVID-19 deaths, from the Fred Economic Resources data site and also build mathematical models and run mathematical regressions on them. In addition, in the process of data integration and analysis, it is assumed that there are only three variables under the same time nodes of the US monthly unemployment rate, the US monthly inflation rate and the number of COVID-19 deaths in the US.

Firstly, the unified data of time starting point and time ending point were imported into Excel software, and then the mathematical method of regression analysis was selected to import and regression the integrated data, and finally a complete regression equation was obtained:

$$Ct = -48814.54 * Ut + 1469832.487 * It - 2766674.613 \tag{2}$$

Ct means Death toll from COVID-19 in the US at time T.

Ut is the U.S. unemployment rate at time t and it is the U.S. inflation rate.

The linear regression results show that the monthly inflation rate of the US is highly correlated with the monthly unemployment rate and the number of COVID-19 deaths in the US. The findings suggest that the number of U.S. deaths caused by COVID-19 directly affects the monthly U.S. inflation rate and the monthly U.S. unemployment rate. Inflation and unemployment rose in the United States after the pandemic. Figure 1 shows sample percentile of the linear regression (before COVID-19). Figure 2 shows sample percentile of the linear regression (after COVID-19).
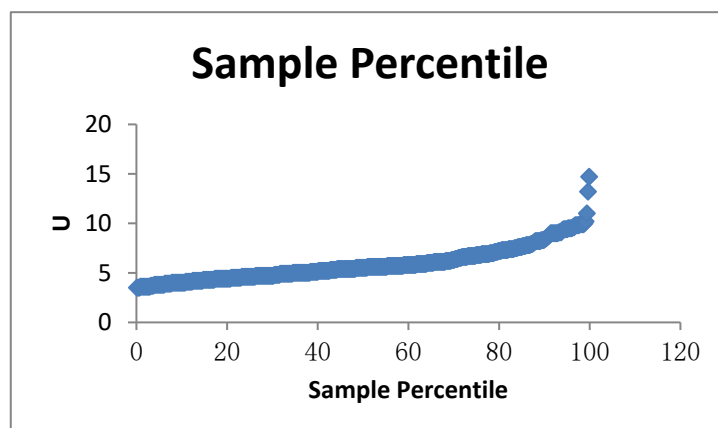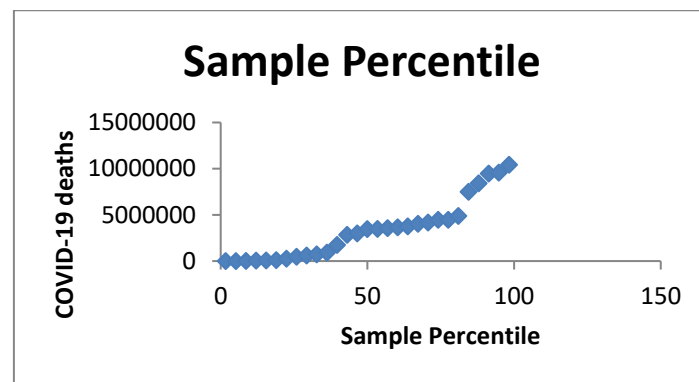

Figure 1: Sample percentile.

Figure 2: The Sample Percentile of COVID-19 deaths.

5. Conclusion

The analysis in this paper shows that population deaths due to the pandemic have a negative impact on inflation and unemployment. Due to time and personal ability issues, this work did not collect data on inflation rates and unemployment rates in other countries in this report, which makes this report a bit monolithic, and readers can only have a one-sided understanding of the pandemic after reading this report. The impact on a country's inflation rate and unemployment rate. In future, the work will be continually updated the part of estimates and assess the extent of recreation and hospitality based on the most recent data from Fred, County of Santa Clara Open Data Portal, U.S. Bureau of Labor Statistics. The results will also try to extend analysis to other countries to make this report more complete and persuasive.

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