# Understanding the U.S. Inflation During Covid-19 Pandemic

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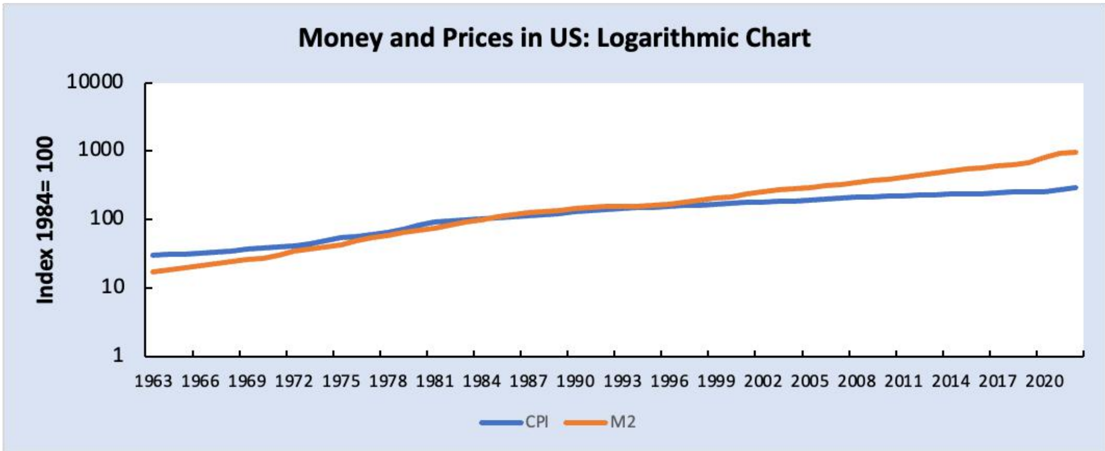
## Highlights

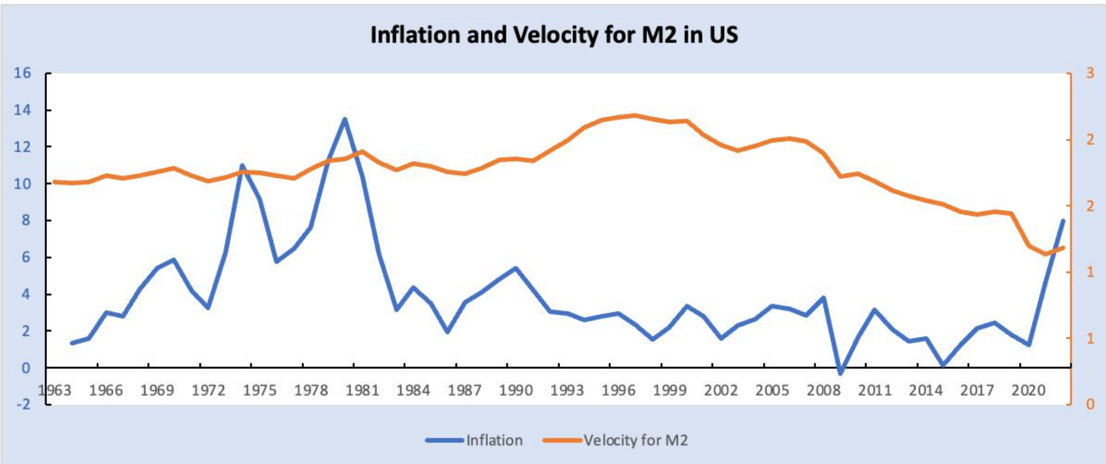
- From 1963 to 1980 money supply (M2) growth was slower than that of CPI but after 1996 the trend reversed and this gap between the growth has widened.
- Money growth is generally higher than inflation and is an important factor in determining it. Except for the years that suffered from huge economic shock, the US economic growth rate is generally faster than inflation.
- The dramatic growth in M2 supply and supply chain shortage resulted in out-of-control higher inflation during the Covid-19 epidemic.
- To control inflation, the most common way is to raise interest rates to influence GDP. Starting in January 2022, the Fed has raised its Fed Fund Rate continuously from 0.25% to 4.75%, leading to decreasing residential and inventory investment.
- Although this inflation control measure is useful and effective, this effect is delayed. The negative GDP growth rate in the first two quarters of 2022 saw a downward trend in inflation from the peak of 9.06 in July 2022 to 6.41 in February 2023.

## Understand Inflation based on Quantity Theory of Money

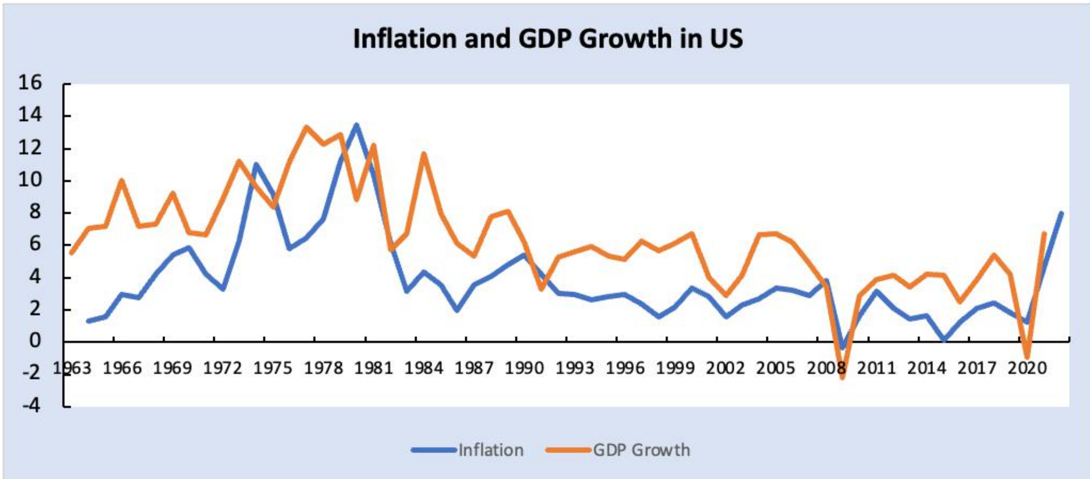
According to the Quantity Theory of Money, Inflation is equal to *Money Growth - Real GDP Growth + Velocity Growth*. The CPI line has a roughly constant slope from 1972 to 1980. The inflation slowed after 1983 and flattened until 2020. An upward trend can be noticed from the end of the line. Compared with the slow growth of inflation, M2 has grown a little faster but remained on a consistent rising path. It's interesting that from 1963 to 1980 M2 growth rate was slower than that of CPI but after 1996 the trend reversed and this gap between the growth has widened.




Data has shown US velocity for M2 had stabilized around 1990 and then increased during the 1990s even when inflation stayed low because the development of transaction technology has made people hold less money relative to spending. But after 2000, it has reduced gradually ending around the absolute value of 1.18 in 2022. This indicates that people in the US won't react intensively to increase and decrease their normal spending because they have a lot of money and alternative assets, like short-term government securities, to help defend against inflation eroding their purchasing power.

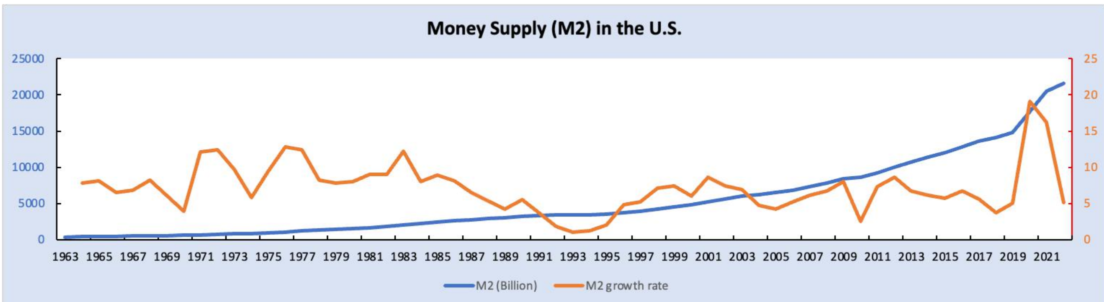


The US GDP growth rate is mostly above inflation, except in the years 1974, 1980, 2009, and 2020. We can see money growth rate is typically greater than inflation and except for the years that suffered from huge economic shocks, the US economic growth rate is generally faster than the growth of inflation.

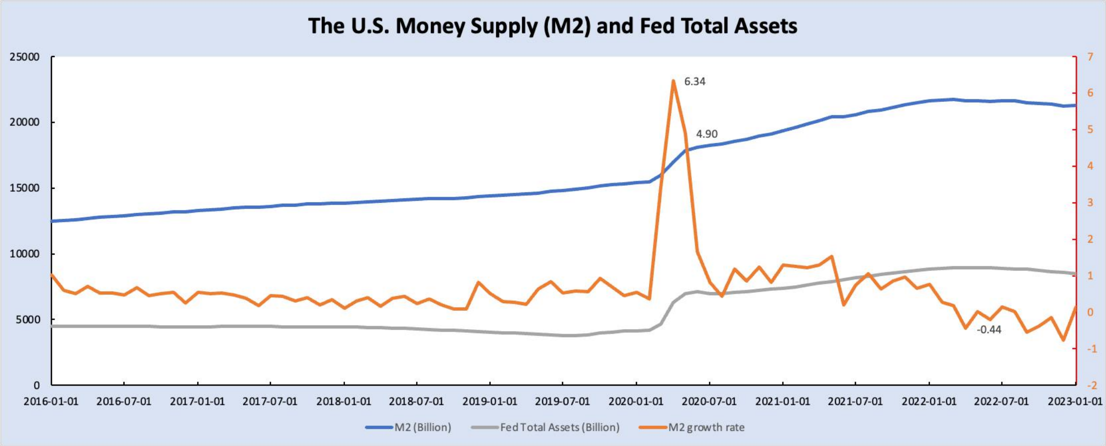



## Money Growth drives Inflation

Money growth is the most significant determinant of inflation. To understand how inflation has surged after the pandemic, we need to explore how the money supply has changed during the period. The chart has witnessed a steady growth of money supply from 1996 to 2019 with an average growth rate of 6.14% but a surge happened in 2020 and 2021 during the pandemic.

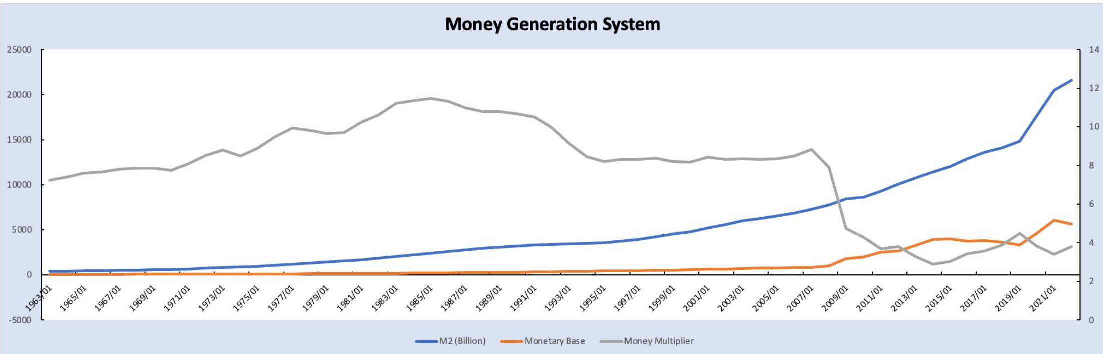



Zooming in on this pandemic period, we can find the U.S. money supply rose exponentially at 6.3% in April and 4.9% in May 2020, which is 30 and 8 times that of last year respectively, and 2 times that of the previous peak in 1983. The figure then grew at the same speed as the normal level before the epidemic but has intentionally decreased since April 2022 due to hyperinflation. Specifically, since the beginning of March 2020, the Feb bought nearly $4.33 trillion in assets, mostly bonds, and other long-term securities, the increase accounted for 48% of the Central Bank's total assets in April 2022. Meanwhile, this action drove an increase of $5.66 trillion in M2 supply, making up 26% of the total. There is no doubt that the dramatic growth in M2 supply far surpassed the need for supporting economic growth, resulting in out-of-control higher inflation later.

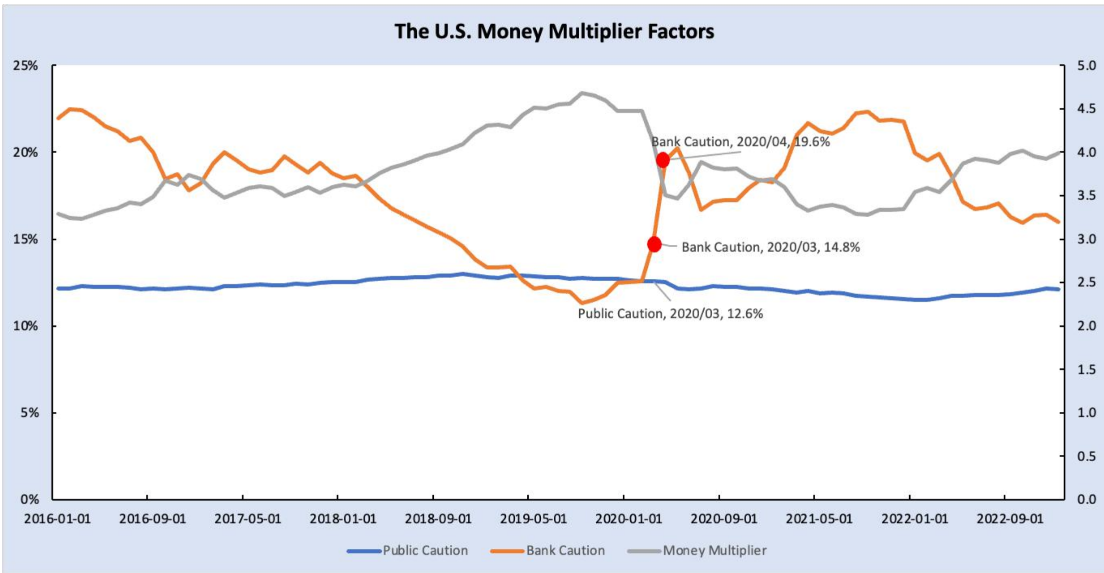



- **Decompose Money Supply to Understand Money Creation**

Next, let's disaggregate the money supply to better understand the money generation system and the market response. Money is equal to monetary base times money multiplier. It's clear that the money multiplier had increased gradually from 1963 to 1985 peaking at 11.47 and decreasing since then, especially a huge crash in 2008, ending at 3.81 in 2022. On the contrary, the monetary base had risen dramatically since the 2008 Financial Crisis, then slowly decreased from 2014 to 2020, and climbed up because of Cov-19. Briefly speaking, the money multiplier fell in 2020 and 2021, but poke up in 2022, while the monetary base did the opposite and was drained in 2022 due to the rising money multiplier. We can say that sky-high inflation is driven by the enormous money supply, which is attributed to the decreased money multiplier and the high-record monetary base.



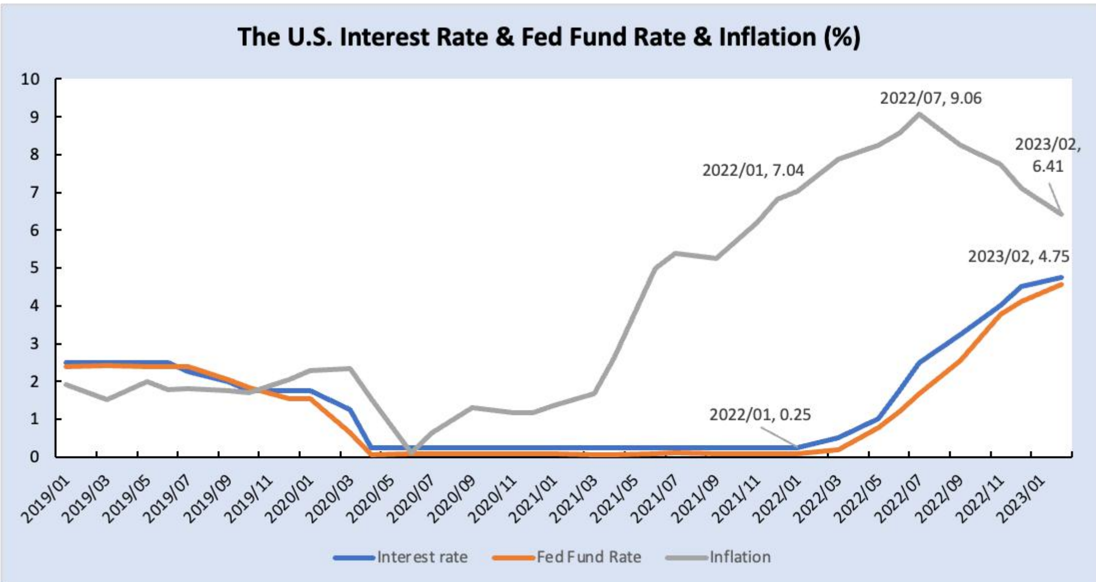

In terms of public response, generally, the decreased money multiplier has been driven by increased bank caution and public caution. The situation was similar during the pandemic. In the beginning, the money multiplier declined sharply with surging bank caution. Then in 2022, bank caution started to drop and continued the downward trend and the money multiplier increased during the same period.




## Inflation Control by Adjusting Interest Rate

Based on the research, inflation targeting is an effective way to manage the inflation. However, the central bank cannot control the price directly so it needs to use instruments to influence price indirectly. The most common tool is to set a short-time interest rate or intervention rate, which can be controlled directly by the central bank.

The Fed uses the Federal Fund Rate as the intervention rate and it manages it quite well! The chart shows as inflation had gone up, the Fed Reserve had raised its benchmark interest rate several times from 0.25% to 4.75%, the highest level since the 2008 Financial Crisis. With a series of actions, the Fed did control inflation, dragging it down from the peak of 9.06 in July 2022 to 6.41 in February 2023.




So how does inflation targeting work? Basically, the central bank influences interest rates to manage GDP. By doing so, the inflation is under control by adjusting the GDP with variable lags.

- **Covid-19 Impacts on GDP**

The U.S. GDP growth rate plunged from 4.23% in 2019 to -0.97% in 2020 but rallied greatly to 6.73% in 2021. As GDP is comprised of consumer expenditure (C), Investment expenditure (I), government expenditure on goods & services (G), and net exports (EX-IM), we can learn from the 2022 Q4 data that Consumption accounts for the highest proportion of GDP (67.9%), followed by government expenditure (17.5%), investment (17.2%: Residential Investment 4%, Non-residential 13.2%), and net export (-3.3%: Export 11.5%, Import 14.8%). Here is a question: when the GDP growth rate slowed down during the pandemic, how did each component contribute to this change? That is, what sector drives the business cycle?

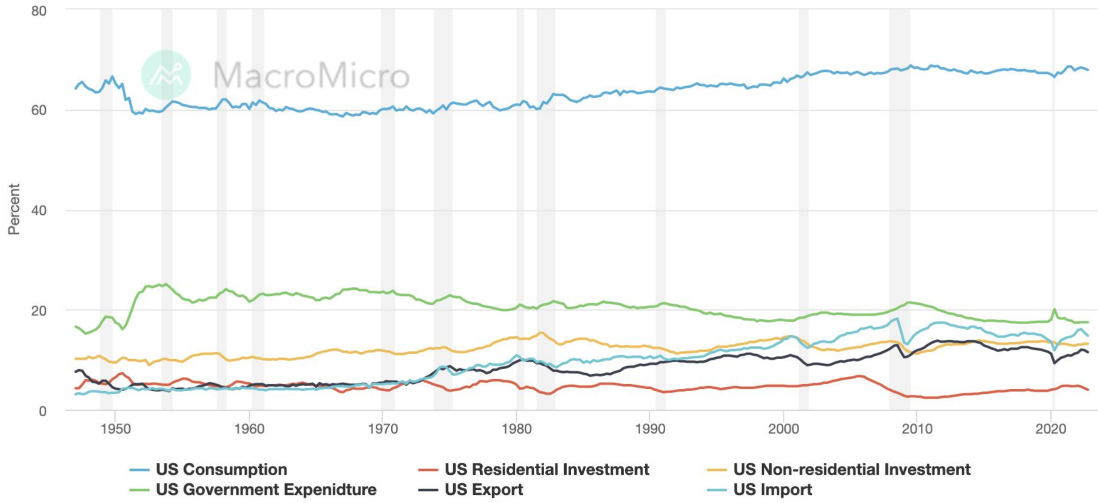
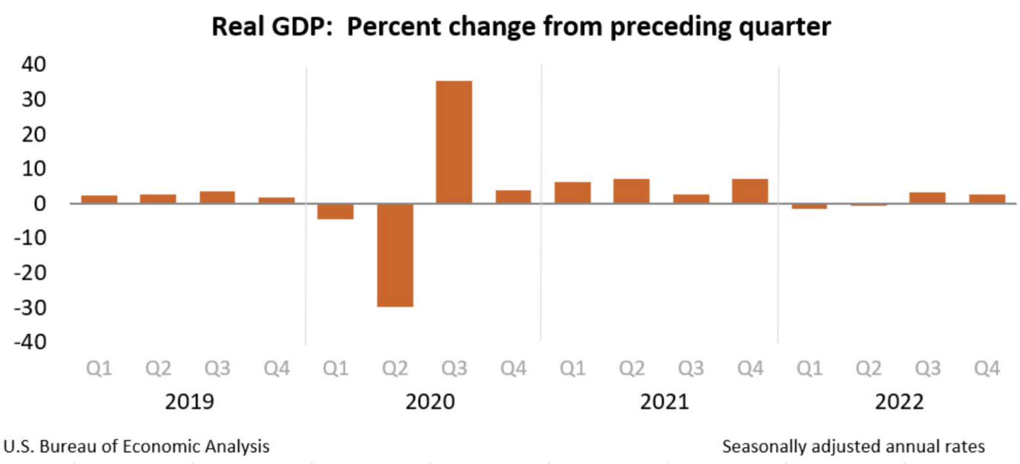



*Figure: US Shares of GDP*
*Source: en.macromicro.me*

To answer this question, we need to shift the focus to each component's contribution to GDP growth. It's clear that consumption is the biggest contributor, supporting before the crisis and recovery but being worse in turmoil. It is the consumption that pulled us down into recession but pulled us back to recovery. Non-residential investment and inventory investment had a similar but smaller impact and inventory investment contributed far more to the recovery. Government spending is reverse the business cycle, increasing in the trough and decreasing in the crest. It's now understood why the Fed didn't adjust interest rates initially to boost the economy, because consumption is the key to starting and ending the pandemic recession, instead of investment.




*Source: bea.gov*

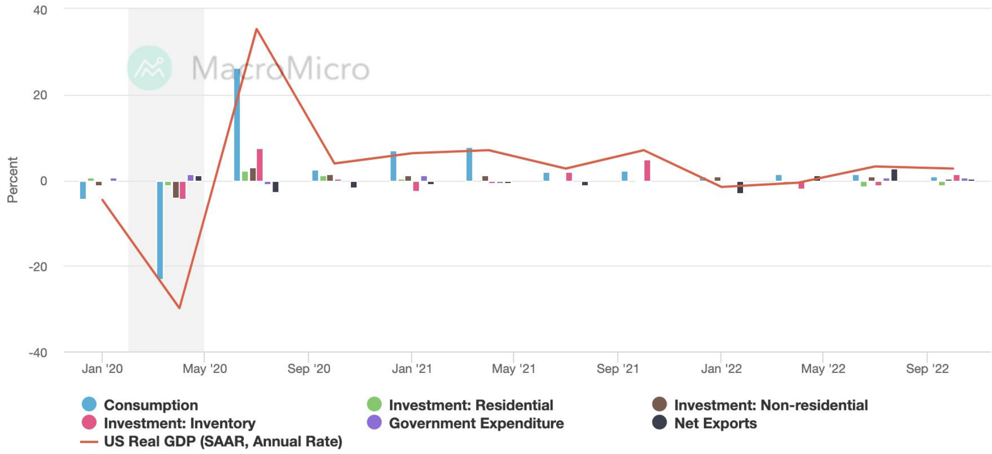


*Figure: US Contribution of Real GDP Component*
*Source: en.macromicro.me*

- **Influence on GDP by Changing Interest Rate**

When Covid-19 hit, the U.S. economy stumbled and inflation fluctuated during the same period but it actually started a significant rise after March 2021. As we mentioned before, controlling inflation is meant to manage interest rates, which will influence GDP to meet the inflation target. Therefore, the Fed took action in January 2022 by rising interest rates continuously.

As a result, the Real GDP growth rate did become negative in the first two quarters with decreasing residential and inventory investment. Although this inflation control measure is useful and effective, this effect is delayed, that is to say after you perform this operation, it will take some time to see the results. This makes sense that inflation started decreasing after July 2022 when the interest rate had increased 7 months before.

## Overall

By now the pandemic inflation story can be explained as when Covid-19 hit, people were required to stay at home or quarantine in the local city, reducing the demand for consumption. National and international transactions were restricted based on different governments' policies, greatly impairing the supply of goods and services due to the broken supply chain. Overall, the reduction in supply has surpassed the influence on the market's demand, resulting in higher prices of the items within the consumer bundle. Due to the reduced expenditure demand, especially the decrease in consumption, GDP suffered in Q2 2020.

Besides, because of the rising death rate and the lack of medical care for patients, many industries shut down, exacerbating the shortage of supply. For employers, the expenses to pay wages and maintain the business were fixed. By consuming all the reserves saved before, the company could not sustain itself anymore and declared default or bankruptcy. Substantial similar cases happened during the same period, stressing banks to be more conservative and cautious by lending less credit.

The rising bank caution drove down the money multiplier and the money supply might drop if the Fed took no action. To avoid the collapse in money supply, the Central Bank decided to raise the monetary base in March 2020 by buying open market assets. The surging monetary base has led to a colossal money supply, triggering higher inflation later. Apart from the Central Bank's action, the government had also built many rescue funds and plans to help families and companies go through this crisis, adding more cash flow in the market and enlarging the government deficits. The piles of money generated from the Central Bank and government have fueled the inflation.

To control inflation, the common way is to raise interest rates to influence GDP. Starting in January 2022, the Fed has raised its Fed Fund Rate continuously from 0.25% to 4.75%, leading to decreasing residential and inventory investment. The negative GDP growth rate in the first two quarters of 2022 saw a downward trend in inflation from the peak of 9.06 in July 2022 to 6.41 in February 2023.