

Impact of COVID-19 Pandemic: A Global Inflation Crisis

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Abstract. Under the severe situation of COVID-19 pandemic, the global economy faces great challenges from multiple shocks. Since people's activities are restricted indoor due to lock-down policies, the unemployment seems to get negatively affected. This paper focuses on the impacts of COVID-19 on price indices and inflation rates within the economies of United States, Euro Area and China respectively. During the pandemic, there are tendencies of recession. The countries are trying to boost the economies. It explains the evidence of the changes of different indices utilizing figures and combines the evidence with the policies imposed by the governments and monetary authorities for each region. There might be other evidence between the expansionary policies and the economic performance. It also takes into consideration of effects from Ukraine conflict on the price indices. This research concludes that although the authorities are exerting to stimulate the economy, they might need to stabilize the price levels considering the long-term effects on inflation risks.

Keywords: Inflation crisis; COVID-19 pandemic; the U.S.; EU area; China.

1. Introduction

At a time of pandemic, Russia-Ukraine war, energy crisis and high inflation, countries are trying to mitigate and change the high inflation situation by introducing a series of policies based on their own circumstances due to supply chain disruptions, zeroing policies etc. For example, the Federal Reserve announced in November that it would continue to raise interest rates by 75 basis points and reduce its holdings of US Treasuries, agency debt and agency mortgage-backed securities [1]. In the face of high inflation, the European Central Bank announced that it would continue to raise interest rates by 200 basis points by raising the exchange rate. Increased investment in clean energy to ease the economic problems caused by the energy crisis [2]. China announced tax cuts and fee reductions for domestic SMEs, a moratorium on fees and charges, and an additional 300 billion yuan of policy-based development financial instruments to reduce the cost of corporate financing and personal credit [3]. Increased implementation of prudent monetary policies for foreign countries and support for specialized entities such as logistics companies, cross-border e-commerce platforms and large cross-border e-commerce sellers to build overseas warehouses, etc [4].

According to Adam, the COVID-19 outbreak will cause a decline in core PCE inflation. We attempt to synthesize various events, such as pandemics, energy crises, and the effectiveness of related policies by analyzing indices such as CPI, core CPI, and PPI by region [5]. As the impact of the new pandemic is long term and countries have different policies in dealing with this global disease, we try to compare policies across regions and find out which policies are better and which ones are vicious. We have selected three regions that have some influence on the global economy: the US, the EU and China. The data are used to analyse the effect of each policy on the economic problems caused by the epidemic, the energy crisis and so on.

2. The US Economy

Since the outbreak of the COVID-19 epidemic in late 2019, the economic environment in the United States has been of great concern to the world. As the current super economic entities, the US monetary and economic policies has leading and informative for other countries. As the most vital form of currency reserve for many countries, the changes in the real value of dollar is forward-looking in terms of the entire financial environment changing trends. In this section, a deeper argument of the changes in this economy during the epidemic is provided by researching the impact of the Federal Reserve's market operations in response to the COVID-19 epidemic on inflation and the consumer price index (CPI) at various points during the end of 2019 to present to help policy makers choose better economic policies and to help understand changes in other economic markets.



Fig. 1 CPI of the US [6]

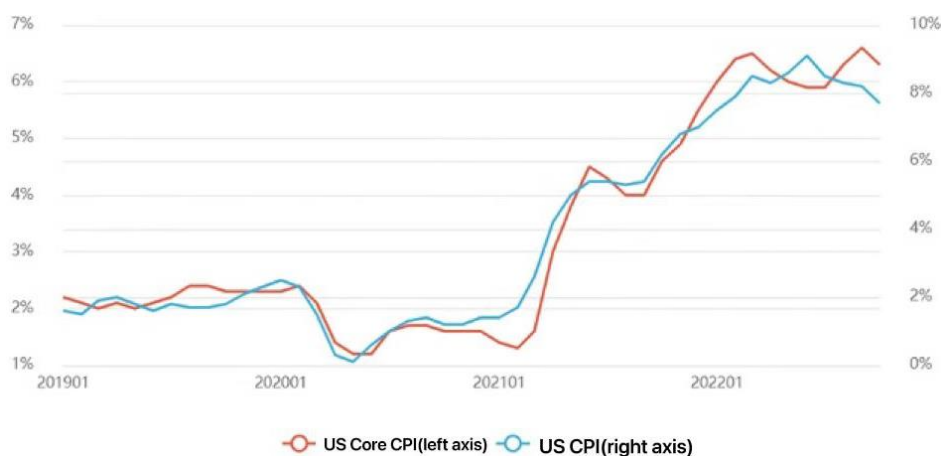


Fig. 2 CPI and Core-CPI growth rates of the US [7]

According to data provided by U.S. Bureau of Labor Statistics, the CPI has been always rising. Since the beginning of the COVID-19 in the US, it has shown a volatile climb with respect to before, which has reached 298.012 in November 2022, hovering on the verge of breaking 300. Through observing the tendencies of the CPI and core CPI, they show a synergistic growth trend, with the core CPI growth rate in the US always higher than the CPI growth rate prior to the epidemic. This suggests that food and energy market prices did not grow as rapidly as other product prices in the US. However, a period occurred between mid-2020 and mid-2021 where core CPI growth rates are distinct less than CPI growth rates, indicating a significant increase in food and energy prices. This is due to a surge in the population's stocking of food at that time, leading to an over-supply and an increase in transport and manufacturing costs in an epidemic environment. US as a major food and energy importer, is not surprising to have such an impact.

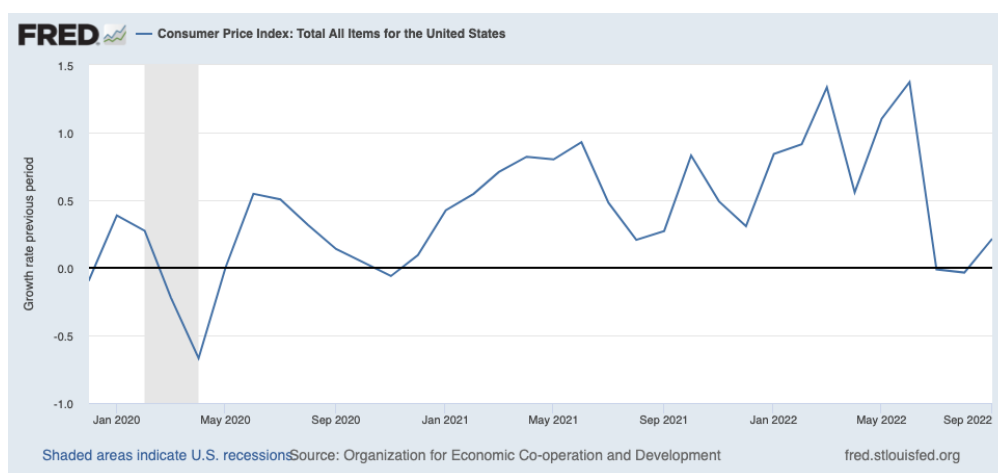


Fig. 3 CPI: total all items of the US [8]

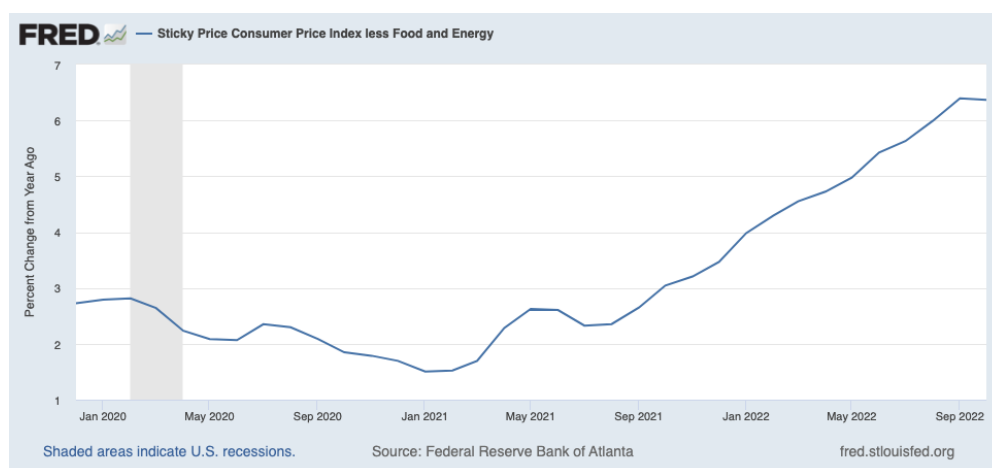


Fig. 4 Sticky price CPI less food and energy of the US [8]

During the period of 2020, the Federal Reserve carried out several actions to hedge against the impact of the epidemic. In March 2020, the Federal Reserve used traditional monetary policy successively, cutting interest rates to between 0% and 0.25% several times, lowering bank reserve ratios to 0% and conducting repo operations to inject \$4.7 trillion into the market. In terms of fiscal policy, the US announced tax cuts and the acquisition of some corporate debt. And then, on 27 March, it even signed a Bailout Scheme up to \$2.2 trillion and a \$2.4 trillion CAREs bill (the bill includes policies such as retirement funding, unemployment benefits, lump sum allowances and expanded tax credits). In terms of the US fiscal stimulus plans, the Federal Reserve prefers to directly subsidize the income of the residents in times of crisis.

In addition to this, Federal has actively implemented relevant crisis tools. The primary market corporate credit facility (PMCCF), the secondary market corporate credit facility (SMCCF) and the term asset-backed securities lending facility (TALF) were used to support the credit markets, the reintroduction of money market mutual fund liquidity instruments directly conferred liquidity on the US financial markets, the term asset-backed securities lending facility, the dealer credit facility and the commercial paper lending facility further easing the cost of investment. In addition, compared with the 2008 financial crisis, this time the Fed's quantitative policy was more accommodative and use a larger amount of unconventional instruments than in. According to Michael D. Bordo's research, while unconventional instruments can provide a significant cushion to the market directly, this may lead to excessive reliance on Fed support by firms in any crisis, which in terrible cases will lead to moral hazard effects.

At the end of 2020, the Federal Reserve suspended the usage of uncommon instruments. Observing the U.S. CPI and core CPI are at low levels in 2020 (core CPI fluctuated between 1% and 2%, and CPI changed among 0% and 2%, showing a low level of inflation) and that yearly inflation is around 2.5%, indicates that the dollar does not depreciate rapidly as the expected impact that those monetary policy should lead to. The reasons for this may come from two views. Firstly, the dollar is an important currency for countries to hold with the development of international, and, as an intermediate currency, a depreciation of the dollar affects other central banks. So dollar will have a slight probability appear oversupplied situation. Secondly, a country's currency greatly represents the country's international credibility index. The US has been a leader in the financial markets long time and the fact that the dollar is seen as a safe-haven currency also makes it hard to see a significant devaluation of the dollar. However, this phenomenon will gradually disappear as several important countries (such as China, Germany, France and so on) are now working to decentralize the dollar hoping that dollar, which is strong enough to manipulate market conditions, will no longer have the ability to consume the wealth and welfare of other countries for their serve. Diversification of countries to hold more types of currencies would have a impact of a check, mutual constraints and balance on the financial markets within the whole world, as the label of specialization in dollar is lost and each currency has equal reserve value, reducing some moral hazard (if the US dollar remains the only reserve currency, then the US can always pay off its fiscal deficit and solve various problems under the epidemic by increasing the money supply).

From 2021 until today, with the Federal Reserve gradually relaxing its previous policy of controlling the COVID-19, however, the US CPI growth rate and core CPI growth rate continued to increase. In the first half of 2021, the Federal Reserve continued its previous policy of easing to bring liquidity into the market and the \$1.9 trillion American Rescue Plan of 2021 grants were proceeding as planned. This action relieved market pressure while also creating significant liabilities for the Federal Reserve. The government was forced by the continued rise in its balance sheet, so implement of shrink fiscal policy in the second half of the year. This move had a dampening effect on the currency devaluation situation, but only little effect that US liabilities peaked at \$8,965,487 million in April and US core CPI growth above 5% by May 2022.

The reason for this current hyper-inflationary situation in the United States is precisely that the monetary and fiscal strategy it has adopted only supports economic recovery in the short term, and for a long-term crisis, the United States needs to establish synergies with foreign markets to comfort the effects of the COVID-19 epidemic. Otherwise, the current labor shortage, self-supply and reduction in imports will all lead to a persistent hyperinflationary environment. Therefore, it is recommended that the US should focus on the coordination of domestic factors of production, rather than relying on monetary and interest rate regulation to deal with various problems.

3. The Economy of Euro Area

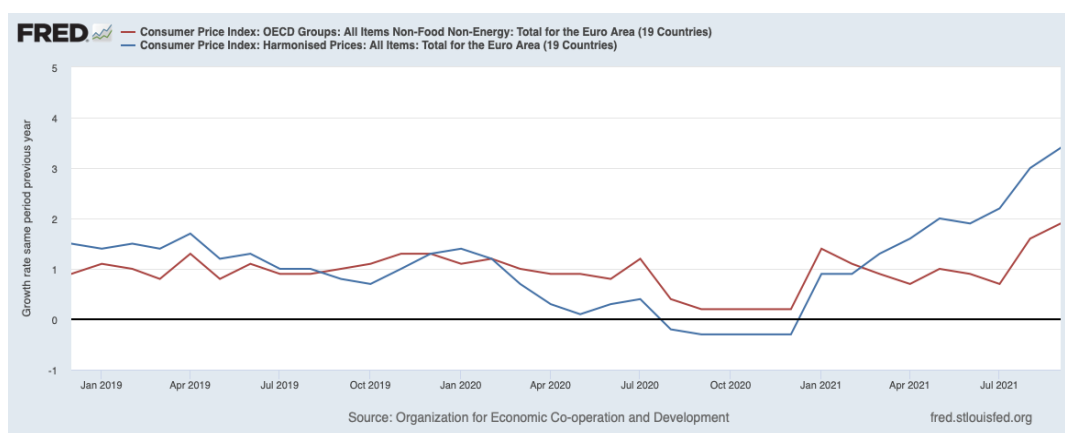


Fig. 5 CPI and Core-CPI of the EU [8]

Figure 5 depicts the trend of the Consumer Price Index and the Core Consumer Price Index (without food and energy) in the euro area over the last five years. the CPI index was higher than the Core CPI index until 2019. From the beginning of 2019, however, the values of the two curves start to move closer and entwine, with the Core CPI index even exceeding the CPI index at times, until the beginning of 2021 when the previous trend resumes. This may be related to the persistence of the new coronavirus outbreak, where most people were confined to their homes and did not work due to the recurrence of the new coronavirus epidemic, resulting in loss of income, which is shown in Figure 6.

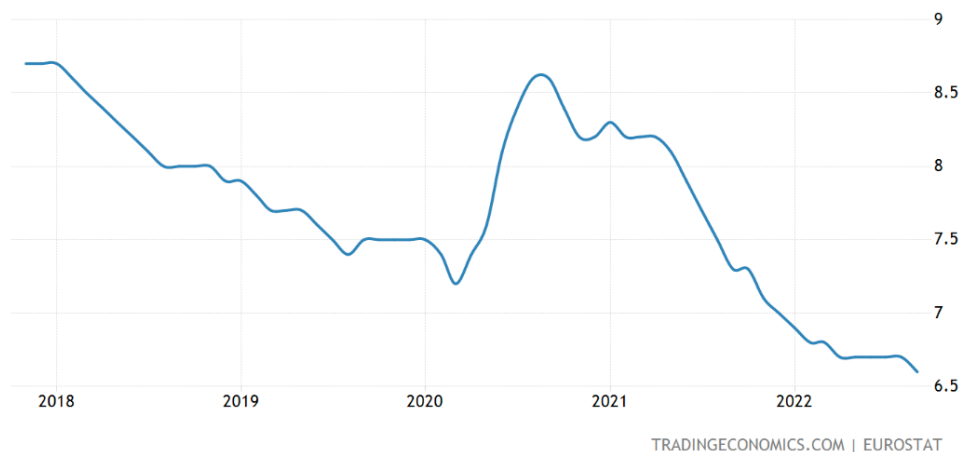


Fig. 6 Unemployment rate of the EU [6]

In addition, people stayed at home during the pandemic, increasing the consumption of electricity [9]. At the same time many governments banned the mobility of individuals and restricted international economic activity to the severely adverse consequences of the new crown pneumonia, with these restrictions mainly affecting imports and exports [10].

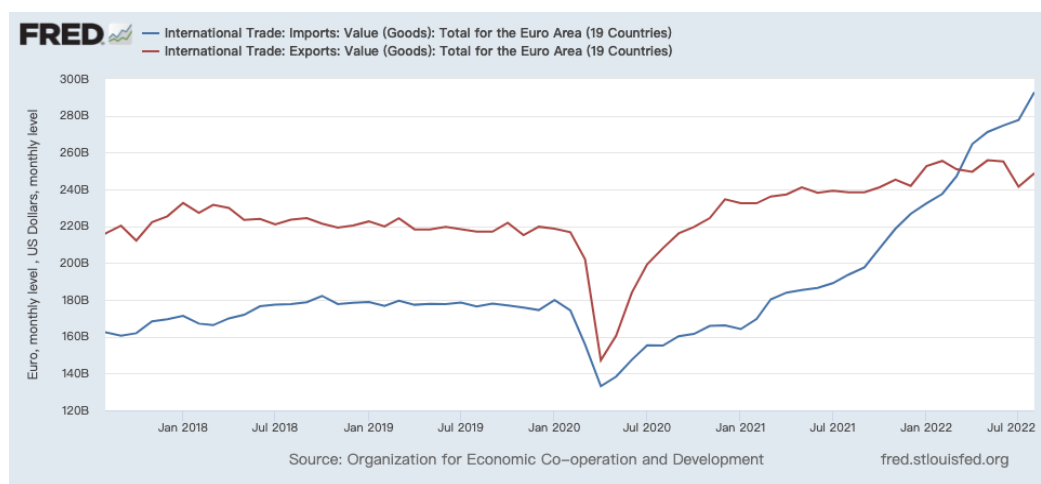


Fig. 7 Imported and exported goods values of the EU [8]

As can be seen in Figure 7, exports and imports plummeted in the first half of 2020, which also had a significant negative impact on foreign trade and thus on the overall economic recovery that followed. To remedy the consequences of the pandemic, the European Central Bank announced the Pandemic Emergency Purchase Program (PEPP) on March 18, 2020, with a budget of €750 billion [2]. After the PEPP monetary policy was proposed, the overall growth rate of both indices decreased and the CPI index was even in negative growth from August to December 2020, as can be seen in Figure 5, which shows that PEPP policy has an effect on combating negative economic flows. In the figure, it can be seen that both indices remain between 1% above and below in early 2019 to early 2021, indicating that the European economy was more stable and less affected during COVID-19.

In February to March 2021, the CPI index resumes its previous trend of exceeding the core CPI index and soars all the way up. This may be linked to the energy crisis, which has increased global demand for energy (especially natural gas) as the economic recovery process intensifies [9]. In order to influence final prices for energy consumers, many European countries took measures such as tariff adjustments and retail or wholesale price regulations, which led to a slow increase or even a decrease in some segments of the CPI index in Figure 8 for the period 2021-2022, but the general trend remained upward [11].

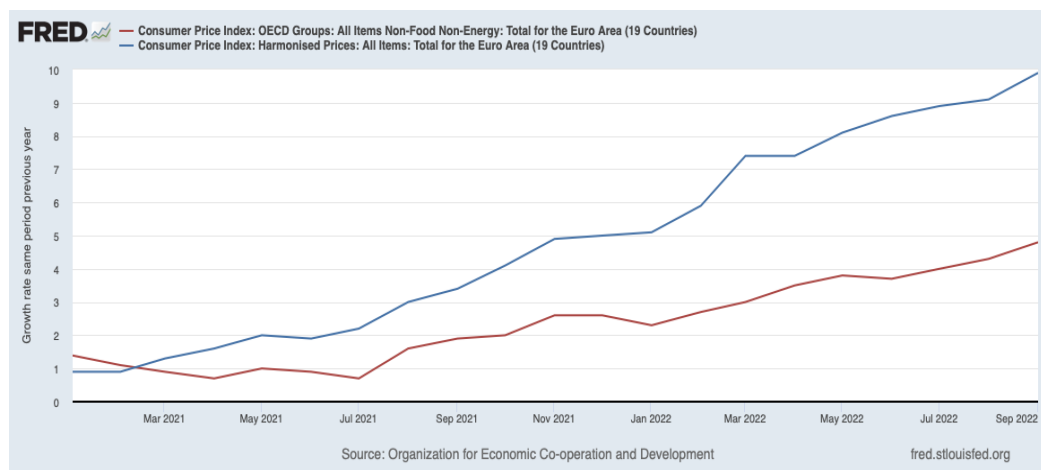


Fig. 8 CPI and Core-CPI of the EU in the recent two years [8]

This trend became even more pronounced after the outbreak of the Russo-Ukrainian war. European union is dependent on imported energy, especially natural gas, the largest part of which has come from Russia for many years. According to Siksnelyte-Butkiene, a total of 90% of the EU's natural gas consumption is imported, of which about 45% comes from Russia. Additionally, 25% of oil and 45% of coal comes from Russia [11]. The energy crisis in Europe has been exacerbated by the outbreak of the Russo-Ukrainian war in early 2022 and the European response to the illegal invasion [11]. Between the first and third quarters of 2022, Russia's proportion of EU energy imports decreased by more than 10 percentage points, from 25.5% to 15.1% [12]. The CPI index for February 2022 (7.4%) increased by 1.5% compared to January (5.9%) and is currently the fastest growing CPI month. The European Commission issued a communication on 8 March 2022 on how to achieve European energy independence from Russian fossil fuels by 2030, and the trend of growth has slowed since then, suggesting that this policy is having some effect. However, the CPI is still on an upward trend.

Although the CPI and core CPI indices for the Eurozone are less volatile from 2019 to 2021, because of the multiple effects of the energy crisis, the Russian-Ukrainian war and the full resumption of work, the level of inflation is already at a severe level and the European Union needs to think of countermeasures to alleviate the current severe inflation as soon as possible.

4. The China Economy

Under the background of worldwide COVID-19 epidemic, the Chinese government has established a number of policies aiming to contain the spread of virus within the populations. According to the transcript publicised by the Press Conference of the Joint Prevention and Control Mechanism of the State Council, the whole Chinese society should unswervingly adhere to the benchmark of policies that defend the society from virus inputs outside the border and limit the virus spread within the border [13]. In brief, this anti-covid policy is called “Dynamic COVID-Zero policy”. It started coming into force since August 2021 [14].

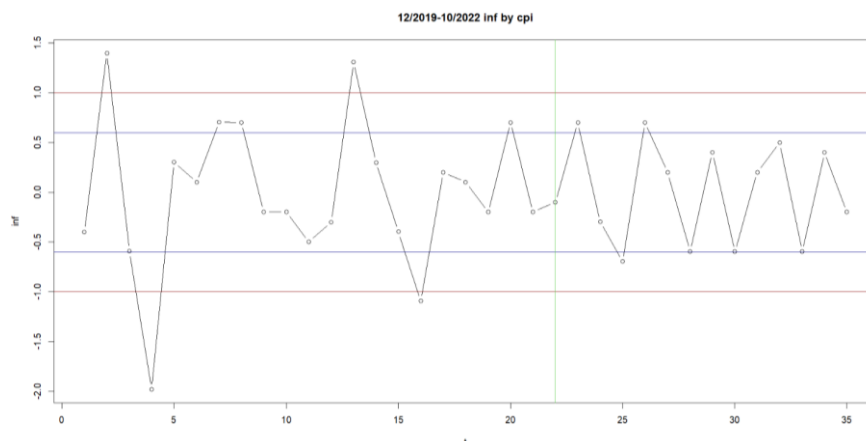


Fig. 9 Monthly CPI of China from Dec 2019 to Oct 2022 (Photo credit: Original)

Consumer Price Index in China is officially defined as the generally changing trends and degree of prices for the daily essential commodities and services purchased by both urban and rural residents in China within a certain period [15]. It can be applied to evaluate impact on the cost of living from the change of prices. Calculating the monthly inflation rates by monthly Consumer Price Index (CPI) provided on the Chinese National Statistics Bureau, the CPI inflation is shown in Figure 9. (Note that the inflation indices are in percentage unit). The time series starts from Dec. 2019 to Oct. 2022 in month periods. It could be found that the upper and lower bounds of inflation tend to be lower as time passes. Separating the time series into 2 parts, i.e., the first period is 12/2019 – 7/2021 (see Figure 10) and the second one is 8/2021 – 10/2022 (see Figure 11), it is more intuitive that the bounds of CPI inflation shrink.

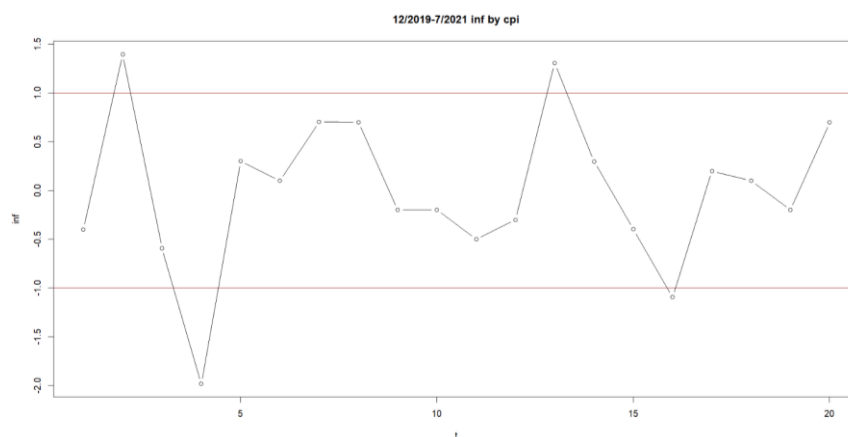


Fig. 10 Monthly CPI of China from Dec 2019 to Jul 2021 (Photo credit: Original)

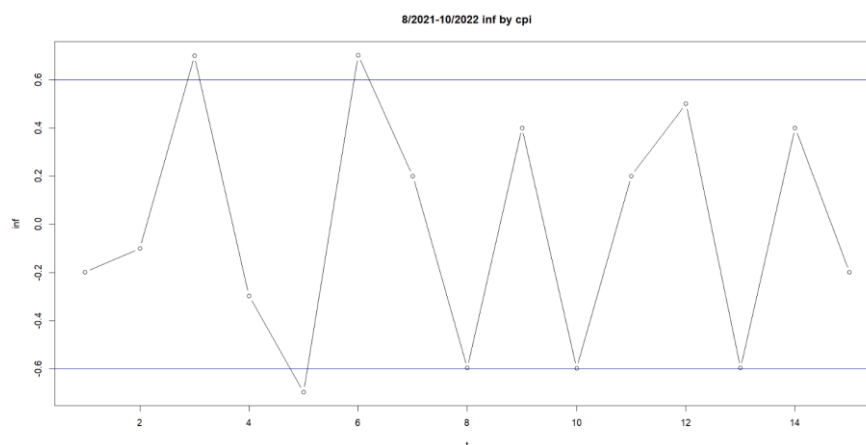


Fig. 11 Monthly CPI of China from Aug 2021 to Oct 2022 (Photo credit: Original)

As shown in Figure 10, the monthly inflation rates from 12/2019 to 7/2021 fluctuate between -1(%) to +1(%). While the inflation rates for the period 8/2021-10/2022 are within ± 0.6 (%) in Figure 11. Indeed, the inflation seems to be more converged after August 2021. In 12/2019-7/2021, the variance of CPI inflation rate (0.6132538) is larger than that in 8/2021-10/2022 (0.2403236), as shown in Figure 9. Additionally, the time spot of August 2021 is exactly the starting time of “Dynamic Covid-Zero Strategy” being established and into force. Hence, the prices of daily essential commodities have been more stable after the establishment Dynamic Covid-Zero Policy. This policy emphasizes the people health is the most important work controlling the spread of virus, which could make contributions on the stability of consumer prices in terms of daily consumption.

By analysing the inflation rates derived by Producer Price Index (PPI) monthly, however, the volatility of inflation rates tends to be higher since the end of 2021 (see Figure 12). Due to the effects of Ukraine War starting from Feb.2022, the worldwide oil price has been rocketing to a higher level than ever [16]. According to the research by Chen and Zhu, it indicates that Chinese industrial PPI will be more likely to be positively affected by the supply shock of oil in the condition that the industry has comparably high intensity of energy consumption [17]. Hence, due to the uncertainty of oil price, the monthly PPI inflation rates in China has a higher volatility since the tension military situation between Ukraine and Russia in Jan. 2022. By comparison with the oil price index of Crude Oil WTI from Trading Economics, the fluctuation of oil price has become more obvious since Mar. 2020, which could also explain the reason that Chinese inflation PPI had larger volatility during the same period (see Figure 13) [6]. To stabilize the energy price during the pandemic, Chinese government has imposed discount policies to set lower prices of electricity and natural gas uniformly for production use. This could be beneficial in long-run but also implies larger amount of government expenses and increasing inflation risks. The government has announced to offer extra fiscal supports on sanitary facilities, tourism industries and public transportation. Although the higher and higher fiscal expansion has risks of future inflation, the real production economy has been improved benefited by energy-structure transformation, supply-side structural reform, and recent stimulation on exports. Hence, with PBOC’s conventional liquidity expansion, the capital will be likely to flow into production led by the political guidances so that the economy can be stabilized further.

Under the severe situation of COVID-19, the Chinese government has been always having the well-being of people on top of any working aims. Even though Chinese government has been sticking to the dynamic elimination strategy, unlike the situation of western countries, the Chinese economic growth was recovered to some degree under the CDC’s wealth and diligence after a temporary economic downward move in Q1 of 2020.

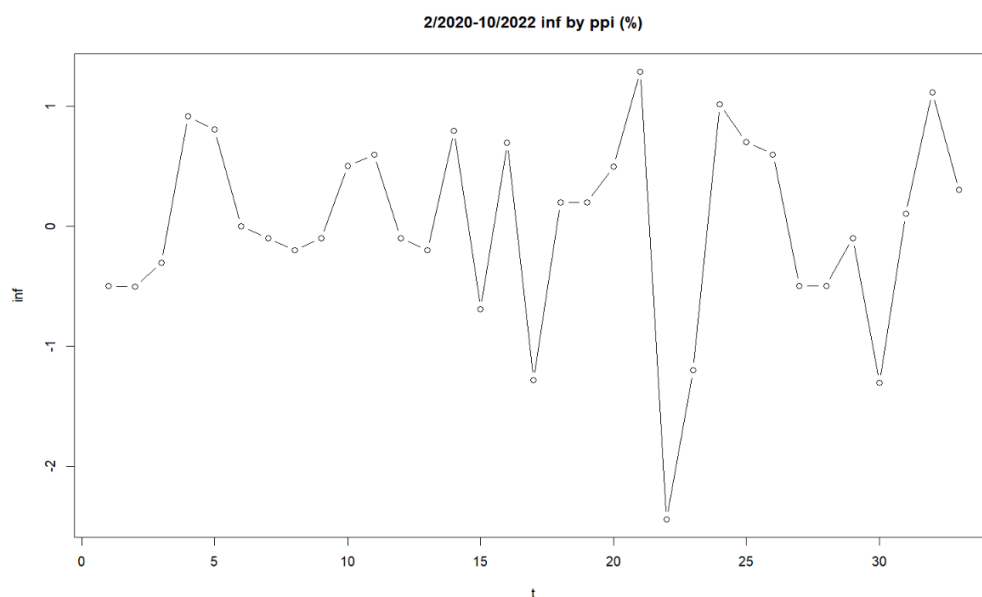


Fig. 12 Monthly PPI of China from Feb 2020 to Oct 2022 (Photo credit: Original)

**Fig. 13** Crude Oil WTI

5. Conclusion

To recover the economy from downward trend caused by COVID-19 pandemic, the authorities have imposed a number of policies to stimulate and stabilize the economy. As for the United States, it has injected a large amount of liquidity into the domestic economy through expansionary fiscal and monetary policies. Credit easing was also a solution. But the higher and higher pressure of expected inflation is noteworthy within USA. There is also expected depreciation in USD. In the following periods, the United States should promote the unemployment adjusting the domestic production factors. For the Eurozone, the ECB has imposed a large-scale asset purchasing programme called “PEPP”, which stabilized the economy through lowering price indices to some extent. But the indices increased in 2021 due to the uncertainty in fossil fuel prices. The Eurozone and even the whole Europe should consider transition of wide-spread renewable energy to diversify the energy price risks. Considering the economy in China, the consumer price index seems to be less volatile after the application of dynamic covid-zero controlling the spread of virus quite effectively. While the domestic PPI in China had high volatility since the Russian-Ukraine war, which is similar to the case in Eurozone. Under the macroeconomic background of spreading covid virus and energy crisis, countries in the world should put the people’s lives on top of the targets, seeking for maintaining low inflation with continuous economic growth. For the government, controlling the spread of coronavirus and promoting the renewable energy consumption could encourage a much stabler environment by reducing the effects from pandemic and energy crisis. To further stimulate the economy, the monetary authorities can also consider macroprudential tactics fuelling the credit market. Another necessary point is that the government should emphasize the unemployment issue which matters in the real economic development.

References

- [1] Federal Reserve issues FOMC statement. (n.d.). Board of Governors of the Federal Reserve System. <https://www.federalreserve.gov/newsevents/pressreleases/monetary20221102a.htm>. Last accessed 2022/11/26.
- [2] ECB Homepage. <https://www.ecb.europa.eu/home/html/index.en.html>. Last accessed 2022/11/26.
- [3] China's Monetary Policy Implementation Report Q3 2022. http://www.gov.cn/shuju/2022-11/17/content_5727435.htm. Last accessed 2022/11/26.

- [4] Govt unveils measures to bolster economic recovery. http://www.gov.cn/fuwu/2022-09/05/content_5708389.htm. Last accessed 2022/11/26.
- [5] Shapiro A. Monitoring the Inflationary Effects of COVID-19. Federal Reserve Bank of San Francisco, 2020.
- [6] Trading Economics database. <https://tradingeconomics.com/>. Last accessed 2022/11/26.
- [7] Macroview database. <https://www.macroview.club/aboutus>. Last accessed 2022/11/26.
- [8] FRED Economic Research. <https://fred.stlouisfed.org/>. Last accessed 2022/11/26.
- [9] Armeanu, D. T., Joldeş, C. C., & Gherghina, T. C. How Energy Sector Reacted to COVID-19 Pandemic? Empirical Evidence from an Emerging Market Economy. *Discrete Dynamics in Nature and Society*, 2022: 1–26.
- [10] Cengiz, O., & Manga, M. Impact of COVID-19 pandemic on exports: new evidence from selected European Union countries and Turkey. *Asia-Pacific Journal of Regional Science*, 2022, 6(3): 1195–1219.
- [11] Siksnyte-Butkiene, I. Combating Energy Poverty in the Face of the COVID-19 Pandemic and the Global Economic Uncertainty. *Energies*, 2022, 15(10): 3649.
- [12] Eurostat. Database. <https://ec.europa.eu/eurostat/data/database>. Last accessed 2022/11/26.
- [13] NHC (National Health Commission). Transcript of the Press Conference of the Joint Prevention and Control Mechanism of the State Council on September 8. <http://www.nhc.gov.cn/xcs/s3574/202209/6633cf47a8e640c1863c4c2858532957.shtml>. Last accessed 2022/11/26.
- [14] Jue Liu, Min Liu, Wannian Liang. The Dynamic COVID-Zero Strategy in China. *China CDC Weekly*, 2022, 4(4): 74-75.
- [15] National Bureau of Statistics. Database. <https://data.stats.gov.cn/>. Last accessed 2022/11/10.
- [16] World Economic Forum. How does the war in Ukraine affect oil prices? Last accessed 2022/11/10.
- [17] Chen J, Zhu X. The Effects of Different Types of Oil Price Shocks on Industrial PPI: Evidence from 36 Sub-industries in China. *Emerging Markets Finance & Trade*, 2021, 57(12): 3411-3434.