

The Review and Analysis of Inflation and its Effects: Will Current High Inflation Lead to an Economic Crisis?

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Abstract

The US and world have experienced soaring inflation for many months. What caused such excessive inflation and how should it be managed? Will current high inflation destroy the US and world economies and lead to a great depression? This paper provides the comprehensive review and analysis of inflation and its effects to answer these questions. Economic and finance theories are applied to explain how the equilibrium prices of products and services are determined and then changed to lead to inflation or deflation and why the currency exchange rate must be adjusted when an economy's relevant inflation rate is changed. The paper theoretically and empirically discusses the relationship of inflation with economic growth, unemployment, international trade, interest rates, and exchange rates, and explores the effects of inflation on individuals and investments. In addition, it examines whether government inflation targeting has been effective. The paper uses the latest US and world data in the analysis to support the relevant conclusions; the correlations of some variables from the US are calculated and significance tests are conducted. The paper projects that there may be a minor economic recession if the current high inflation lasts extensively but the US and world can avoid an economic crisis if take strong and effective actions to control and reduce the present high inflation. More importantly, it is essential that the world learns and knows how to prevent and avoid the next high inflation cycle. Particularly, the world should aim at reforming the existing economic and financial systems to be more inclusive and sustainable, solving the rising income and wealth inequality problem and better developing and using the new technologies that can benefit all more equally, improve environment, further enhance efficiency and continuously raise productivity.

Keywords: Inflation, Deflation, Inflation Inequality, Economic Recession, Economic Crisis

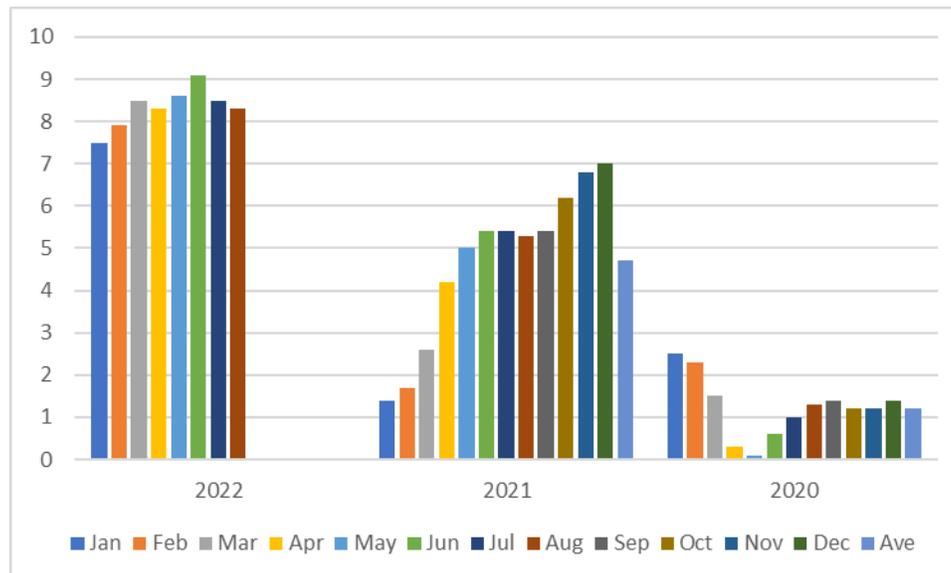
JEL Codes: D50, E40, F10, F31, O40

1. Introduction

Inflation is a dangerous disease that can destroy society as Nobel Economics Laureate Milton Friedman (1942, 1969) repeatedly warned. High inflation is more harmful to consumers and the whole economy because it will significantly raise the product and service prices and lowers the people's purchasing power so considerably below their current living standards. Sharp inflation also causes higher interest rates that may further lead to slower economic growth. Historically, excessive inflation and especially extremely abnormal inflation often triggered social unrest and even led to dramatic regime changes.

Currently, the world has experienced soaring inflation. In the US, its monthly Consumer Price Index (CPI) was 8.3% in August, following 8.5% in July, 9.1% in June 2022, highest since 1981, 8.6% in May, 8.3% in April and 8.5% in March. Figure 1 is the monthly US inflation rates from January, 2000 to August 2022. Many developed economies had inflation rates of above 8% while average inflation of emerging and developing economies was 8.7%, according to the International Monetary Fund (IMF). Such wide, persistent and excessive inflation is grave. More troubling is that the trend of dark inflation will not disappear soon.

Figure 1, US Monthly CPI (January 2000-August 2022)(%)
(Data Source: Bureau of Labor Statistics (BLS))



What are the effects of high inflation on individuals and the whole economy? What causes abnormal inflation? When should inflation be defined as high versus extremely high? For example, will 5% or 8% be considered too high? Are government inflation targeting and its relevant policies effective in controlling dramatic price rises? What are the possible solutions to reduce the current accelerating prices? These are important questions and issues. Particularly, people are worried whether the current high inflation will destroy the US and world economies and lead to a great depression. Although the US has had two consequent quarters with negative GDP growth, -1.6% in the first quarter and -0.9% in the second quarter in 2022, the National Bureau of Economic Research (NBER) has not officially declared recession since the process for declaring the U.S. economy does not fall simply on negative GDP reports. Instead, the NBER defines recession as "a significant decline in economic activity that is spread across the economy and that lasts more than a few months." Furthermore, an economic crisis is a more serious economic deterioration, a drastic fall in the economic performance with a decline in production and demand, rising unemployment and bankruptcy of businesses (Chen 2019).

This paper conducts comprehensive reviews of theoretical and empirical studies on inflation and its effects to answer these questions. Instead of giving a general review of literature in one section, all relevant previous studies are reviewed in different sections, based on the subject. Besides discussions of previously published studies, the paper also uses the US and world's latest data in the analysis to support relevant conclusions, the correlations of some variables from the US are calculated and significance tests are conducted.

This paper is different from other similar ones. Previous inflation review papers mostly focused on the relationship between inflation and economic growth. This review is more comprehensive and it in addition examines its relationship with unemployment, interest rates, international trade, and exchange rates, and explores its effects on individuals and investments. Moreover, it discusses whether government inflation targeting and its relevant policies have been effective, what caused recent high inflation, and how to better control it. The paper concludes that it is confident to say that the US and world will be able to control and reduce the present sharp inflation. However, it is essential that the world learns and knows how to prevent and avoid the next high inflation cycle.

The rest of the paper is organized as follows: Section II discusses Economics of inflation and explains causes of inflation; Section III studies the relationship between inflation and economic growth and reviews different theories and empirical evidence; Section IV describes the relationship between inflation and unemployment and surveys why the Phillips curve holds or does not hold. Section V links inflation with the interest rate; Section VI deliberates inflation and international trade; Section VII illustrates inflation and the currency exchange rate; Section VIII illuminates how inflation affects individuals differently; Section IX shows impacts of inflation on investments; Section X focuses on government inflation targeting and whether that is effective; Section XI explores the possible solutions of current high inflation and Section XII concludes the paper.

2. Economics of Inflation

Inflation is the overall average price increase in a given time period such as a month or quarter or year in an economy. Its common measurement is the price index's change such as the Consumer Price Index (CPI), Personal Consumption Expenditures Price Index (PCE), or Producer Price Index (PPI). According to Economics, the demand and supply for a specific product/service will decide its equilibrium price. Then shifts of the demand and supply curves will determine the new equilibrium price so the increase or decrease of the price of the product/service. Assume D is the demand function and S is the supply function in the following equations:

$$D = f(P, M, Pr, \mathfrak{I}, Pe, N) \quad (1)$$

where, P-price of the good/service; M-Consumer's Income; Pr-Price of related goods/services; \mathfrak{I} -taste pattern of consumers; Pe-Expected price of the good in some future period; N-Number of consumers in the market;

$$S = g(P, P_i, Pr, T, Pe, F) \quad (2)$$

Where, P_i - Price of Inputs, T - Technology Level, F - # of firms.

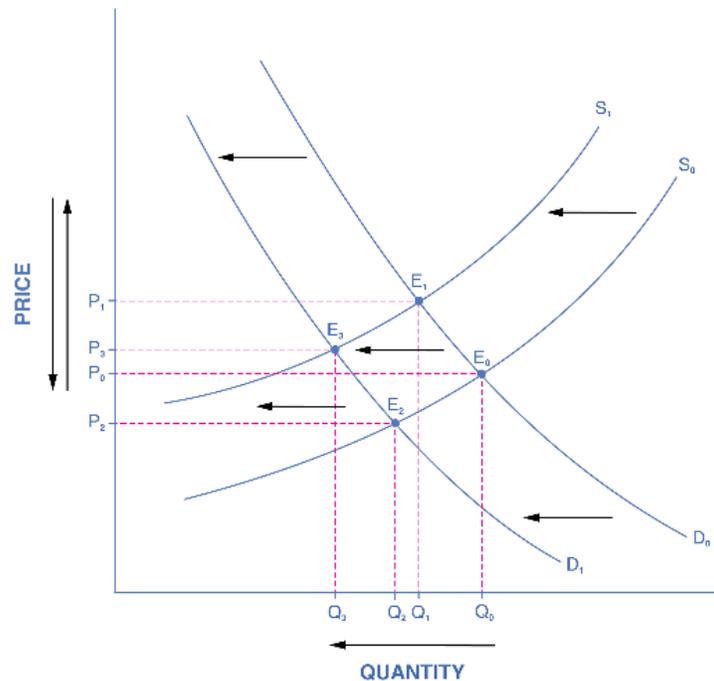
Then, the equilibrium price $P=P^*$ will be based on:

$$D=S \quad (3)$$

When any factor/variable, except its own price P, in the demand function such as M, \mathfrak{I} , Pr, Pe, or N is changed, the demand curve will have the parallel shift. Similarly, when any factor/variable, except its own price P, in the supply function such as P_i , Pr, T, Pe, or F is changed, the supply curve will have the parallel shift. Depending on which shift is more or less, the new equilibrium price could be higher or lower. In the following figure, D_0 and S_0 are the original demand and supply curves and so its equilibriums are price P_0 and quantity Q_0 , or $E_0=(P_0, Q_0)$. There are other three equilibria, $E_1=(P_1, Q_1)$, $E_2=(E_2, Q_2)$ and $E_3=(P_3, Q_3)$. For example, if both demand and supply are shifted to D_1 and S_1 , then the new equilibrium will be at $E_3=(P_3, Q_3)$. Obviously $P_3 > P_0$. So in this case, the price is increased.

The above discussions are for individual products/services. A price index composes weighted prices of the selected products/services. Its movements are more complicated since some prices are increased but the others may be decreased. But its principle is simple; i.e. the Index rises when the total increase of the prices of some products in the Index is more than the total price decrease of the others.

Based on the above economic theory, causes of inflation could be demand-pull and supply-push, which is also called cost-push. Demand-pull inflation occurs when the economy demands more goods and services than are available. Cost-push inflation is caused by an increase in the cost of goods such as labor cost from the supply side. Wage-push inflation is also called built-in inflation since the employees' salary is inflation-adjusted in the modern society.

Figure 2. Demand, Supply, Equilibrium and its Dynamics

Relevant and important questions here are: why the total demand is increased and why the costs of productions rise, therefore there is inflation. Monetary Economists view the money supply as the main source of inflation. They believe that over-supply of the money in the economy causes the inflation. In the long run, most inflation should be related with the money circulations in the economy. This is the main reason why almost all central banks in the world will raise their interest rates to fight against accelerating inflation because the high interest rate will lower the demand for the money/loan, increase savings and thus reduce the money circulations in the economy. These governments' measures have proved to be effective generally although that may not solve the inflation problem at all since there are other possible sources of inflation.

Inflation can also be caused by shortage, including labor shortage, natural resources or materials shortage. During 1970s, most western countries had huge inflation, mainly because of the oil shortage resulting from the oil embargo. In the opening economy, inflation can be domestically generated or foreign-imported.

The causes of current sharp inflation are more complicated. The over-supply of money in many economies, resulting from Quantitative Easing (QE) and governments' huge stimulus spending for the COVID-19 certainly is the original and essential cause. In addition, disruptions of supply chains and shortages of many products such as computer chips for cars have led to the jumping inflation and the war in Ukraine has made the situation worse. Furthermore, labor shortage and significant increases of demand for many products have additionally pushed prices up; In the US, many have furthermore blamed the tariffs imposed to imported products since the US relies on these imports heavily.

Moreover, scholars have examined how governments' huge deficits and exchange rates have contributed to the inflation. The government spending will generate more demand and also cause more money circulations so will lead to inflation. The exchange rate will affect import and export and also will impact the international capital flows; but such net effects on the inflation are quite complex. An economy's inflation rate will be sturdily influenced by exchange rate fluctuations if the large fraction of its trade is denominated in foreign currencies.

3. Inflation and Economic Growth

Many and most studies on inflation have focused on the relationship of inflation with economic growth. This is understandable because the economic development is foremost important to all people and whole economy. However, strictly speaking, inflation does not affect economic growth directly.

According to the economic theory of the production function, an economy's total output is determined by its inputs of Physical Capital (K), or tangible assets that are created for use in the production process, includes buildings, machines, computers, and other equipment, Labor (L), or input of skilled and unskilled activities of human workers, Land (P), including natural resources, raw materials, and energy sources, such as oil, gas, and coal, and Entrepreneurship (H), which is the quality of the business intelligence that is applied to the production function, including technology and innovations. So the total output Q can be expressed as following:

$$Q = f(K, L, P, H) \quad (4)$$

Based on the above formula, the change of the output or the economic growth depends on the changes of these inputs of K, L, P, and H. In other words, the inflation does not impact the economic growth explicitly since it is not in the production function. The expenditure approach of the Gross Domestic Product (GDP) shows that the economic growth comes from the changes of the investment, consumer consumption and net export. Again, the inflation does not directly influence the GDP growth. Chen, et al. (2017) developed an economic growth model and showed that an economy's growth fully and only relies on its changes of the economic structure, productivity and labor participation. Certainly the inflation affects economic growth indirectly since it affects trade, investment and others so implicitly impacts the economic development which will be reviewed in the later sections.

Inflation influences the economy and its growth implicitly. On the one hand, inflation induces forced savings (Goergescu-Roegen 1970, Taylor 1979) that will further push investment so affect the economy. Inflation may also raise business profits so attract more private investment. On the other hand, inflation may lead to economic inefficiencies (Baer 1967, Mundell 1971) so negatively impacts the economy. Such inefficiencies could be associated with the exchange rate and trade balance (Bhagwati 1978), shortage and government's price control, financing/loans, and rising risk of investment so reducing the investment and growth.

Inflation does directly impact an economy's nominal total GDP, Gross National Income (GNI) and its relevant value per capita. If its annual inflation rate is 5%, then an economy's nominal GDP or GNI growth rate will be 5% even if the real growth rate is zero. Similarly, the nominal GDP or GNI per capita will rise with the inflation. The World Bank (WB) classifies all economies into low, lower-middle, upper-middle, and high-income countries. The classifications are updated each year on July 1 and are based on GNI per capita in current USD. Although these classifications are adjusted based on the global inflation rate each year, a country will gain extra GNI if its inflation rate is more than the WB's adjusted inflation rate.

On the relationship between inflation and economic growth, there are four different views. One view posits that inflation will raise growth. As previously explained, inflation causes more savings and investments (Goergescu-Roegen 1970, Taylor 1979) so benefits the economy (Mallik and Chowdhury 2001, Rapach 2003, Benhabib and Spiegel 2009). The second view posits that inflation lowers economic growth because of inefficiencies as Friedman (1956), Stockman (1981), Fischer (1983), Barro (1995), Valdovinos (2003) argued. The third believes that inflation is neutral to the economy as Wai (1959), Dorrance (1966), Sidrauski (1967), and Cameron et al. (1996) concluded. As explained in the earlier section, inflation is not a factor or variable in the economic growth model so it does not impact the growth directly. Inflation influences other important economic variables but such effects may be offset so its net impact may be ignorable.

The last view is that inflation induces the economy in terms of specific thresholds. In other words, when inflation is low enough, it will positively impact growth and then it will negatively affect the economy when the rate is above the threshold. Scholars have analyzed different economies and used the different time periods of the data; and their identified thresholds were quite variant from as low as 1.26% (Akgul and Ozdemir 2012) to as high as 10-20% (Gylfason and Herbertsson 2001) and even 40% (Bruno and Easterly 1998). The basic conclusions are that an inflation threshold exists and that this cutting-off rate depends on the specific economic characteristics (Khan and Waqas 2020). Such characteristics could include its development level, economic structure, labor forces and participation, and economic and financial systems. Also, the conclusion relies on the data set used and the methodology implied. Generally, this threshold rate is larger to the developing economies than to the developed countries. In other words, a high inflation such as 8% may still benefit a developing

country's economy such as China but it will negatively impact a developed economy like US. Sarel (1996) determined that the threshold was 8%, based on the used data and after this rate, inflation's negative effect is significant, robust and extremely powerful.

It is important to point out that there are short-run and long-run effects of inflation to the economy. Very low inflation may benefit the economy in short-run but may have no long term effects. Similarly, high inflation in a very limited time period lowers the growth temporarily but may not have any lasting impacts.

Another interesting phenomenon is deflation. Before recent high inflation, several countries like Japan experienced deflation. Is deflation good or bad to the economy? Like inflation, large deflation and especially persistent deflation will hurt economic growth. Historically, sharp deflation was associated with the economic meltdowns, such as the Panic of 1837, the Long Depression of 1873-1896, and the Great Depression of the 1930s in the US (Fleckenstein, et al. 2017). But some argued that deflation was neutral to economic growth (Boinaovsky 1998) and not all deflations were related with the economic depressions (Atkeson and Kehoe 2004, Bordo and Filard 2005).

One more relevant issue is the inflation uncertainty, expectations and its effect on the economy. Some studies found that it was not inflation itself but the inflation risk or uncertainty negatively impacted economic growth. As the uncertainty of government policies and other economic conditions in the future adversely affects financial markets, investments and business decisions, the future inflation uncertainty impacts businesses and consumers negatively. Sethi (2015) showed that the inflation did not impact economic growth significantly but the inflation uncertainty did have the adverse effect on the economy. He and Liu (2011) demonstrated that China's inflation since 2000s was caused by the inflation expectation, not its monetary policy. Golob (1994) showed that the inflation uncertainty rises with inflation. Živkov, et al.(2019) identified the bidirectional linkage between inflation and its uncertainty (inflation volatility) in the selected ten emerging Asian countries. In other words, more serious and potential negative effect of inflation to the economy is future inflation uncertainty. High inflation leads to higher expectation of future inflation and that may push inflation further. However, Miles and Schreyer(2009) evidenced that inflation lowered uncertainty at some horizons and predominantly in those countries with the higher rates of inflation. This seems reasonable because very high inflation will not be persistent so it will be expected that the inflation rate will go down eventually.

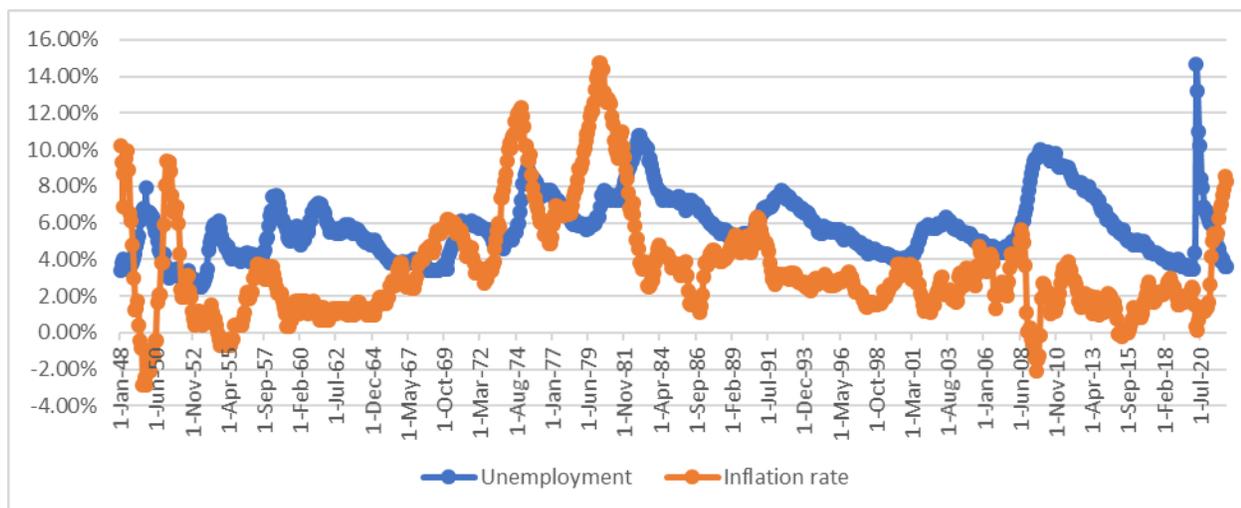
4. Inflation and Unemployment Rate

According to the Phillips curve (Phillips 1958, Phelps 1967), there is a stable and inverse relationship between inflation and unemployment. The theory states that economic growth causes inflation and lead to more jobs and less unemployment. Similarly, low unemployment rate induces high wage so inflation. Thus, inflation and unemployment move in opposite directions. Although there have been many empirical approvals of this theory, the occurrence of stagflation in the 1970s, in which both inflation and unemployment were high, questions its validity. Also, during 1990s, the US experienced the low inflation, low interest rate and low unemployment rate.

The trade-off between inflation and unemployment (Santomero and Seater 1978) generally still exists in most times and most economies. However, the connection between economic slack and inflation has become weaker and weaker now (Powell 2018, Dorn 2020). The possible main reason is that the central bank has set up the stable target inflation each year now. In the US, the target inflation rate is 2% since 2012. As a result, inflation expectations are well established so the prices have been more stable.

Figure 3 is the US inflation rates and unemployment rates from January 1948 to April 2022. These two variables are not closely correlated. Its correlation coefficient is 0.0708, which is statistically insignificant. Nonetheless, in the past two years, the world has observed the Phillips curve again. In the US, its inflation has been very high while the unemployment rate has been extremely low. The correlation coefficient of inflation rates and unemployment rates from 2021 to April 2022 is -0.9254 and it is significant statistically.

Figure 3. US Inflation Rate and Unemployment Rate (January 1948 –April 2022)
(Data Source: Bureau of Labor Statistics (BLS))



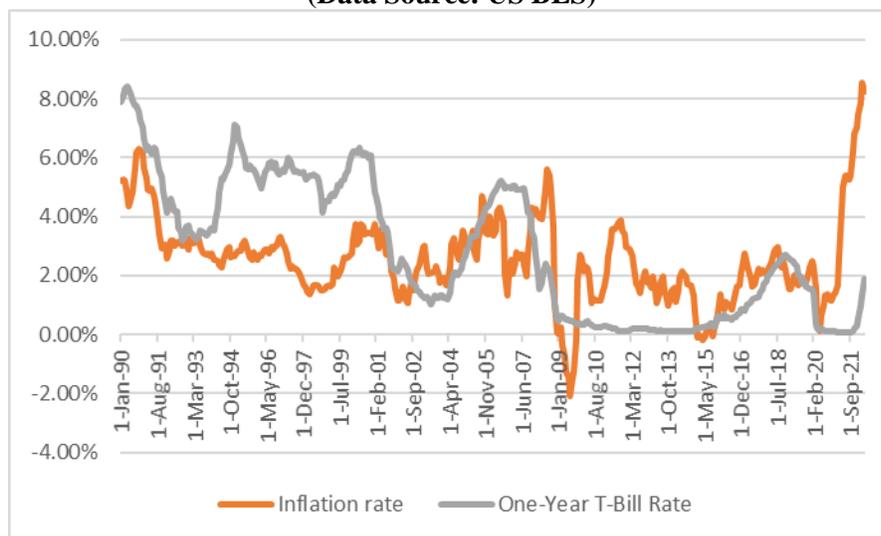
5. Inflation and Interest Rate

Inflation will lead to a higher interest rate since the central bank has the mandatory responsibility to control inflation and its primary tool is to raise the rate (Alvarez et al 2001). So interest rates tend to move in the same direction as inflation but with lags (Fama 1975). In the U.S, the Federal Reserve targets an average annual inflation rate of 2% since 2012. On the other hand, the central bank will do the opposite, lower interest rates to stimulate the economy, when inflation is falling and economic growth is slowing.

Figure 4 shows the relationship between the inflation (CPI) and one-year T-bill rates (1990-2022). The trends of two curves have been generally consistent. The correlation coefficient between these two variables is 0.3964 and that is statistically significant. This relationship shows that the Federal Reserve in the US has been successful normally in managing and controlling the inflation. However, when the inflation is extremely high, such as about 19% in early 1980s, it will be very difficult to cool it down quickly even if the interest rate is raised to the enormously high level like 10%.

One more issue is that raising the interest rate is mostly effective in lowering the inflation but the opposite may not be true, i.e. when there is deflation, lowering or raising the interest rate may not be effective. Japan experienced so called “lost two decades”, in which its economic growth and interest rates both were near zero. Its central bank tried to use different tools to stimulate the economy and push its inflation up, but mainly failed. The foremost issue here is what causes the higher inflation so higher interest rate. As discussed in the previous sections, there can be variant sources for rising prices although most would consider the money supply as the essential cause.

Figure 4. Inflation and Interest Rate (One Year T-bill)(1990-2022)
(Data Source: US BLS)



6. Inflation and International Trade

Trade is crucial to an economy's development. The world's trade has been significantly increased since 1990s although in some years there were decreases during the economic recessions/crises such as in 2009 and 2020. The world's highest ratio of the trade to GDP was 60.78% in 2008 but in 2009, it dropped to only 52.32%, according to the World Trade Organization (WTO). In most western countries, its trade to GDP ratio has been about 30%; in China it was over 60% in 2007 and now is about 35% (Chen et al. 2015, 2019). Figure 5 is the ratios of trade/GDP of different economies and world; and Figure 6 is the ratios of US, China, Japan, Germany and India.

Trade promotes the economic development and also has been an important indicator of the global economy. During the COVID-19, the international trade has been more resilient to the economic downturn, compared that during the 2008-2009 economic crisis.

Inflation impacts economic growth so affects international trade. When the global economy's growth is slower, the demand for products and services will be lower, and then global imports will be decreased. Also, inflation raises the cost of the production so the prices of products; consequently these products will be less competitive in the global markets (Josling et al. 2010). As a result, high inflation leads to lower global export. Moreover, trade, in return, impacts inflation. Studies have indicated that inflation in opening economies has been increasingly determined abroad although wage and core inflation are still mainly domestic processes. In other words, the CPI inflation in the US is import-generated, except rising of wage and core consumption products' prices (Forbes 2019).

Figure 5. Trade to GDP Ratios of Different Economies and World (1990-2020)

(Data Source: World Trade Organization (WTO))

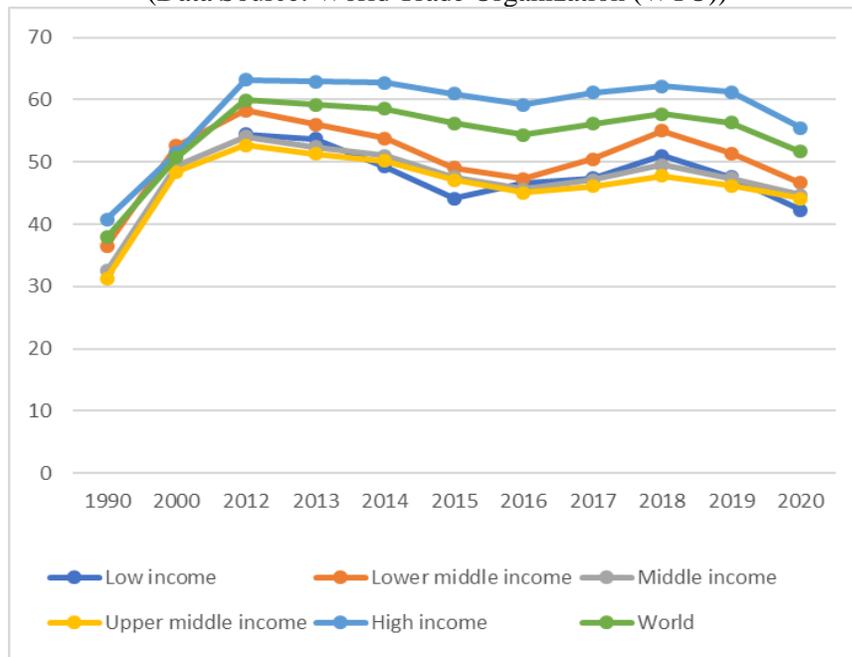
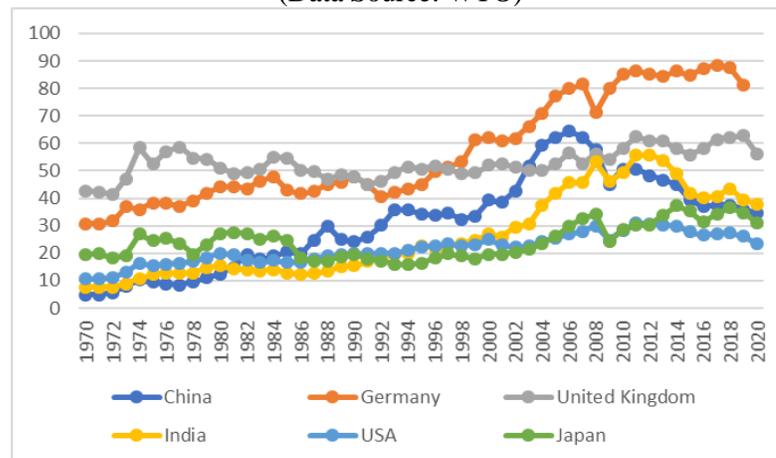


Figure 6. Trade to GDP Ratios of US, China, Japan, Germany and India (1970-2020)

(Data Source: WTO)



7. Inflation and Currency Exchange Rate

Inflation may impact a currency’s exchange rate. In a fixed change rate regime, inflation raises the cost of products and services; as a result, without the adjustment of the exchange rate, its products and services will be less competitive so less attractive and that will lead to the reduction of the exports.

At the same time, assuming the other factors are not changed, imported products and services will be more competitive and relatively cheaper since the prices of the foreign-made products are not changed but domestic ones are more expensive. Consequently the balance of trade and balance of payments of the country will be worsen. This will force the country to adjust its exchange rate policy and depreciate its currency value; otherwise its international currency reserves will be continuously decreased.

In a flexible exchange rate regime, inflation will push its currency to be depreciated in order to keep its competitiveness of the products and services in the world; otherwise the export firms will lose profits. Generally, inflation inclines to diminish a currency because inflation can be equated with a money’s purchasing power reduction. Therefore, high inflation economies tend to experience weaken currencies relative to other currencies.

This relationship can be explained using the Uncover Interest Rate Parity(UIP) as stated in the following equation:

$$F_0 = S_0 \frac{(1+i_d)}{(1+i_f)} \text{ or } F_0/S_0 = \frac{(1+i_d)}{(1+i_f)} \quad (5)$$

where: F_0 =Forward exchange rate between two currencies; S_0 =Spot rate; i_d =Domestic interest rate; and i_f =Foreign country interest rate.

If a country's inflation rises while the foreign country inflation is the same, its interest rate i_d needs to be higher as previously discussed while i_f is still the same. Then in order to keep Equation 5, the forward exchange rate F_0 must be higher while the spot exchange rate will remain the same. As a result, the foreign currency will be appreciated or the domestic currency is depreciated.

On the other hand, the exchange rate affects inflation as well. The exchange rate impacts import and export and influences international capital flows; but such net effects on the inflation are quite complex. An economy's inflation will be steadily impacted by exchange rate fluctuations if its large fraction of trade is denominated in foreign currencies. Anzuini et al. (2016) demonstrated that the exchange rates and inflation differentials between the Euro Yuan and US Dollar moved in the opposite directions consistently.

There are different types of economic policies but some of them are interdependent. A flexible exchange rate system requires a stable and well functioning inflation target (Mishkin and Savastano 2001). "The Impossible Trinity", or the "Trilemma" stipulates that a country cannot simultaneously select all of the following three policy goals – monetary independence, exchange rate stability and financial integration (Mundell 1963, Fleming 1962).

8. Effects of Inflation on Individuals

Inflation impacts individuals unequally. First, low income and fixed income people suffer most (Engel 1857, Jaravel 2021). Sharp price increases in food, energy and other necessities hurt all consumers but lower-income households dedicate a higher percentage of their income on necessities so they are harmed most by high inflation. Jaravel (2021) found that annual inflation for retail products was 0.661 percentage points higher for the bottom income quintile relative to the top quintile and applying Feenstra (1994)'s method to the expanding product variety, based on the Consumer Expenditure Survey (CES), this inflation inequality rises to 0.8846 percentage points a year.

Inflation also widens wealth gaps among different groups. The outcome is that rich people become richer and poor individuals are poorer. Wimer and Jaravel (2019) estimated that the inflation inequality led 3.2 million more people in poverty in the US from 2004 to 2018 and that real income for the bottom 20% household essentially reduced by nearly 7% since 2004, instead of a decline of about 1% using official CPI. These results imply that inflation inequality considerably heightens both the rate of poverty and real income inequality.

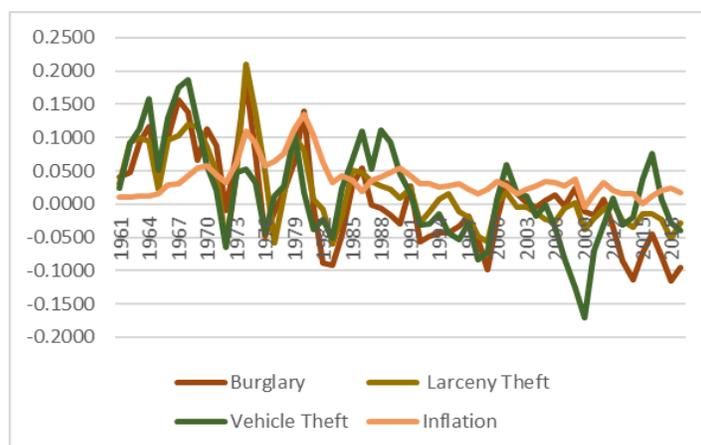
Inflation enriches wealthy people because they had businesses and other investments which benefit from inflation. For example, they own more real assets like properties that will be increasingly appreciated with inflation. The U.S. Bureau of Labor Statistics (BLS) data showed that the house prices are 850.54% higher in 2022 compared with 1967. From 1967 to 2022, US housing had an average rate of return of 4.18% per year, compared to the overall inflation rate of 3.98% during this same period. In other words, housing costing \$100,000 in the year 1967 would cost \$950,536.40 in 2022 for an equivalent purchase. The correlation coefficient between quarterly house price index and CPI from January 1975 to March 2022 in the US is 0.2273 that is significant. Therefore, inflation generally raises the house prices significantly.

Thirdly, Phillips curve may not hold as happened many times in the past, then the inflation may lead to more people unemployed. Even if the Phillips curve is true, the overall unemployment rate lowers, many people may still be unemployed due to the difficulty of small businesses with abnormal inflation as discussed early. As a result, many individuals and families suffer from both lost jobs and paying extra costs for necessities.

Moreover, high inflation and especially extremely excessive inflation often causes serious social problems, high crimes and instability of society. Consequently, all citizens suffer but poor and low income people are hurt most since they are living and working usually in the less safe districts. Figure 7 is the US inflation and crime rates from 1960 to 2019. Generally, inflation and crimes rates were moved consistently. The correlation

coefficient between the inflation and the overall crime rates of the burglary and thefts is 0.3691, which is significant statistically.

Figure 7. US Inflation and Crime Rates (1960-2019)
(Data Source: <https://www.disastercenter.com/crime/uscrime.htm>)



In the US, many people are also small business owners. According to the U.S. Census Bureau, there were 6.1 million employer firms in the United States in 2019; among them, 99.7% had employees fewer than 500 and 98.1% with less than 100 employees. Inflation deadly hurts small businesses more than large ones. The stock markets data showed that U.S. large company stocks performed well in modestly rising inflation environments (US Bank 2022). Inflation pushes costs of doing business, rising salary and materials costs and lowers consumers' purchasing power so reduces their demand for products and services. Most small businesses are in intensively competitive markets; as a result, small businesses have its difficult to increase products and services prices appropriately. This is also true since their products and services are more substitutable. Therefore, many small businesses more likely encounter profit reductions with inflation.

9. Effects of Inflation on Investments

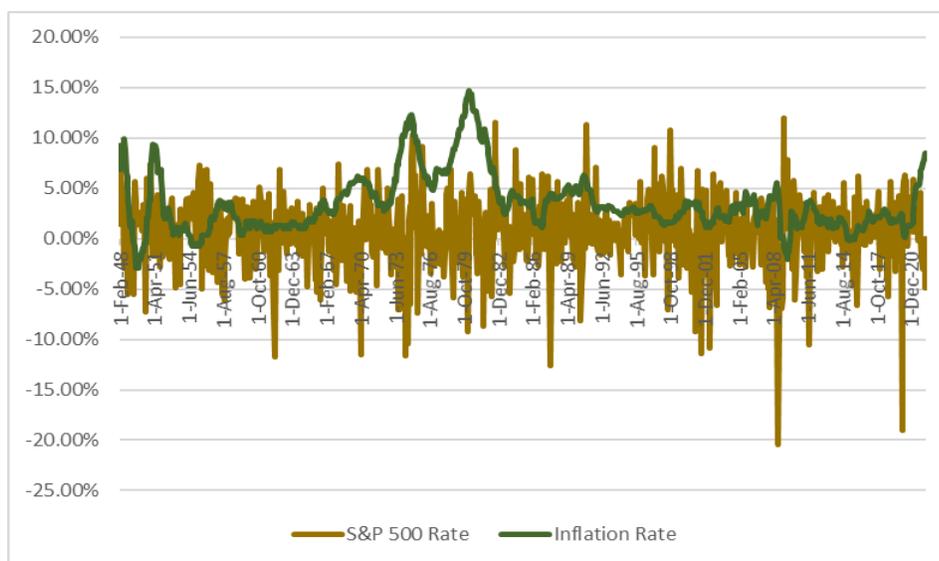
As earlier discussed, high inflation generally affects investments negatively, dis-attracts investment and lowers many businesses' profits. Some industries, however, usually benefit from inflation, including energy and metal sectors. Frenkel and Mehrez (2000) found that high inflation benefited service industry and hurt manufacturers and that employments were moved between these two sectors accordingly; as a result, it caused resources misallocations.

Based on the quarterly data of the Gross Private Domestic Investments (GPDI) and CPI from 1990 to 2022 (Data Source: BLS), its correlation coefficient is -0.1471 and the negative relation of these two variables is statistically significant. In other words, higher inflation in the past thirty years led to lower private investments.

Some commodities and assets generate adjustable cash flows, like property rental income; thus they incline to perform better with rising inflation. But fixed income securities such as bonds, treasuries and CDs suffer from inflation. Bond prices fall when inflation rises.

Early studies indicated that the aggregate stock market was negatively correlated with inflation (Fama and Schwert 1977, Fama 1981), i.e. the stock market in general performed poorly during inflationary periods. But Konchitchki (2013) showed that investment portfolios based on real-time inflation resulted in abnormal risk-adjusted returns. The U.S. Bank Asset Management Group (US Bank 2022)'s analysis showed that in the last 30 years, stocks have held up well against inflation. Particularly, larger companies performed better than mid-sized companies that in turn better than smaller companies. Figure 8 is the US S & P 500 Index vs. CPI from January 1948 to April 2022. It seems that historically, there were no clear patterns between the inflation and stock index. In fact, the correlation coefficient of these two variables is -0.092, although it is negative but insignificant statistically.

Figure 8. US S & P 500 and Inflation (January 1948-April 2022)
(Data Source: BLS)



10. Government Inflation Targeting

Inflation is serious social disease and high inflation causes many economic and social problems. Therefore, a responsible and powerful government must take firm actions to fight against rising prices and control the inflation. The government may use monetary and fiscal tools to cool down inflation. The central bank plays a major role in stabilizing prices and controlling the inflation rate. Studies showed that the US Federal Reserve has been successful in reducing inflation uncertainty or volatility since its establishment in 1913 (Bredin and Fountas 2018).

Many governments in the world set up annual inflation targeting rates as its policy goals. Major developed economies have adopted inflation targeting although their target rates are variant. The first country to adopt inflation targeting was New Zealand in 1990. Many developing countries are now also accepting inflation targeting in its annual economic and financial policy process. China first set up 3% annual inflation as its target in 2010 and now 5% as the target rate. After the 1997 crisis, some emerging market economies were forced to give up its pegged exchange rate system and started adopting inflation targeting as well (Jahan 2015). Table 1 gives the list of economies adopted inflation targeting.

Table 1. Economies Adopted Inflation Targeting

Country	Targeting Inflation Rate at the Time of Adoption	Adoption Year	Country	Targeting Inflation Rate at the Time of Adoption	Adoption Year
New Zealand	1-3%	1990	Guatemala	5%, 1%(+/-)	2005
Canada	2%, 1%(+/-)	1991	Indonesia	5%, 1%(+/-)	2005
United Kingdom	2%	1992	Romania	3%, 1%(+/-)	2005
Australia	2-3%	1993	Republic of Serbia	4-8%	2006
Sweden	2%	1993	Turkey	5.5%, 2% (+/-)	2006
Czech Republic	3%, 1%(+/-)	1997	Armenia	4.5%, 1.5%(+/-)	2006
Israel	2%, 1%(+/-)	1997	Ghana	8.5%, 2%(+/-)	2007
Poland	2.5%, 1% (+/-)	1998	Uruguay	3-7%	2007
Brazil	4.5%, 2%(+/-)	1999	Albania	3%, 1%(+/-)	2009
Chile	3%, 1%(+/-)	1999	Georgia	3%	2009
Colombia	2-4%	1999	China*	3%	2010

South Africa	3-6%	2000	Paraguay	4.5%	2011
Thailand	0.5-3%	2000	Uganda	5%	2011
Hungary	3%, 1%(+/-)	2001	Dominican Republic	3-5%	2012
Mexico	3%, 1%(+/-)	2001	USA*	3%	2012
Iceland	2.5%, 1.5%(+/-)	2001	Japan	2%	2013
Republic of Korea	3%, 1%(+/-)	2001	Moldova	3.5-6.5%	2013
Norway	2.5%, 1%(+/-)	2001	India	2-6%	2015
Peru	2%, 1%(+/-)	2002	Kazakhstan	4%	2015
Philippines	4%, 1%(+/-)	2002	Russia	4%	2015

(Data Source: Jahan 2015, but *both China and USA are added by the author)

A central bank projects and makes public a target inflation rate and then tries to guide actual inflation toward that target, using tools of interest rate changes and financial instruments (such as buying or selling securities). Interest and inflation rates incline to move in opposite directions, so the possible actions that a central bank will take to increase or decrease interest rates become more transparent under an inflation targeting policy. Therefore, this leads to more economic stability.

Has inflation targeting been effective and useful? Roger (2000) studied targeting and no-targeting countries for the periods 1991-2000 and 2001-2009 and concluded that both groups achieved significant declines in inflation rates and increases in average growth rate but improvements in inflation targeting countries were higher. However, Roger cautioned that these achievements cannot be totally credited to inflation targeting as broader structural and policy reforms are necessary conditions in inflation targeting. Some further questioned the validity of inflation targeting. Smaghi (2013) stated that inflation was not the problem but its economic growth during a global financial crisis. Thus, targeting inflation cannot solve economic and financial crisis. But many countered that inflation targeting is useful although it may not solve complicated problems at all. A better approach is to refine inflation targeting with the monetary policy and prudential instruments as having been used in fighting against 2008-09 financial crisis, not to abandon it (Banerjee et al. 2013).

11. Current US and World Inflation

Figure 9 is the global annual inflation from 1981 to 2021. Figure 10 is the inflation rates of Low Income, Emerging/Medium-income, Advanced, and World Economies from 1970-2021. These figures show that the global inflation has been increasing significantly in the past two years but compared with the ones before 2013, the current rate is still historically low. Figure 11 is the Global Annual Food Prices/Indexes from 1961 to 2022 and Figure 12 is the Global Monthly Food Indexes from July 2021 to May 2022. The US inflation rate has been higher than the average of emerging or advanced economies since late 2021 and the global food price has been flying in the past two years.

Figure 9. World Inflation (1981-2021) (Data Source: WB)

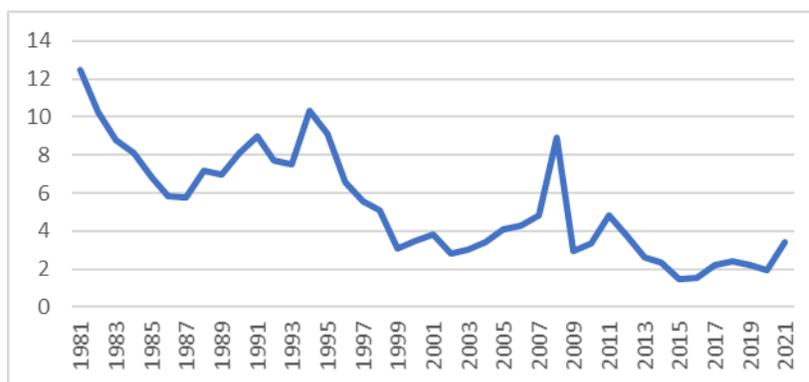
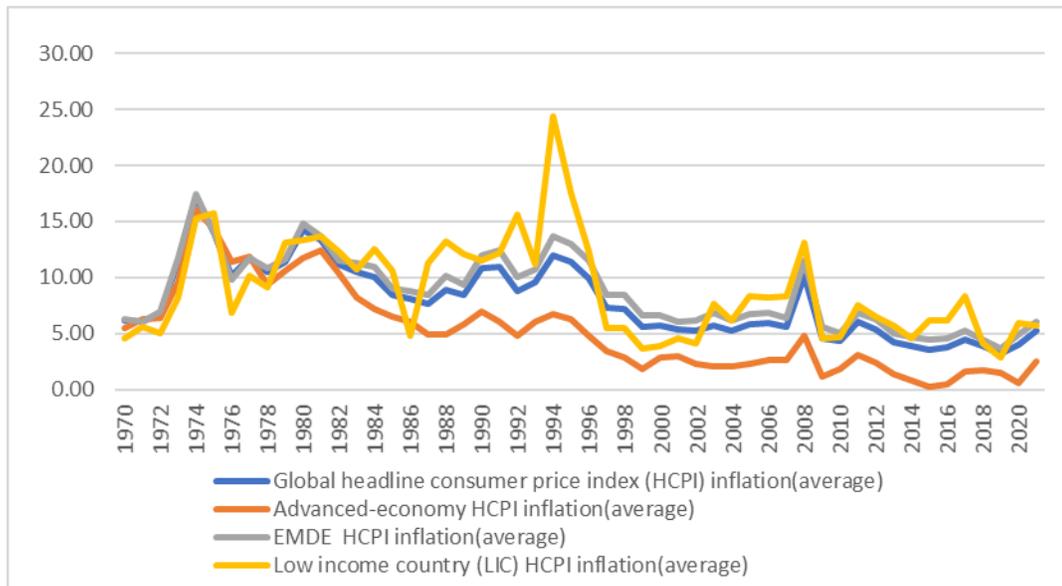


Figure 10. Inflation Rates of Low Income, Emerging/Medium, Advanced, and World Economies (1970-2021)(Data Source: WB)



As earlier explained, high inflation causes many social and economic problems. Sharp price rises in many developing countries and especially poor ones not only adversely affect their economic growth and reduce people’s living standards, but also lead more people to poverty and even starvation. As Wimer and Jaravel (2019)’s study demonstrated that the unequal effect of inflation led many million more people to poverty. Especially prices of food and energy products have been risen more dramatically (Figures 11, 12 and 13) than the other products and services so low income countries and particularly poor people there are suffering most from current excessive inflation.

Figure 11. Global Annual Food Prices/Indexes (1961-2022)
(Data Source: Food & Agriculture Organization of UN)

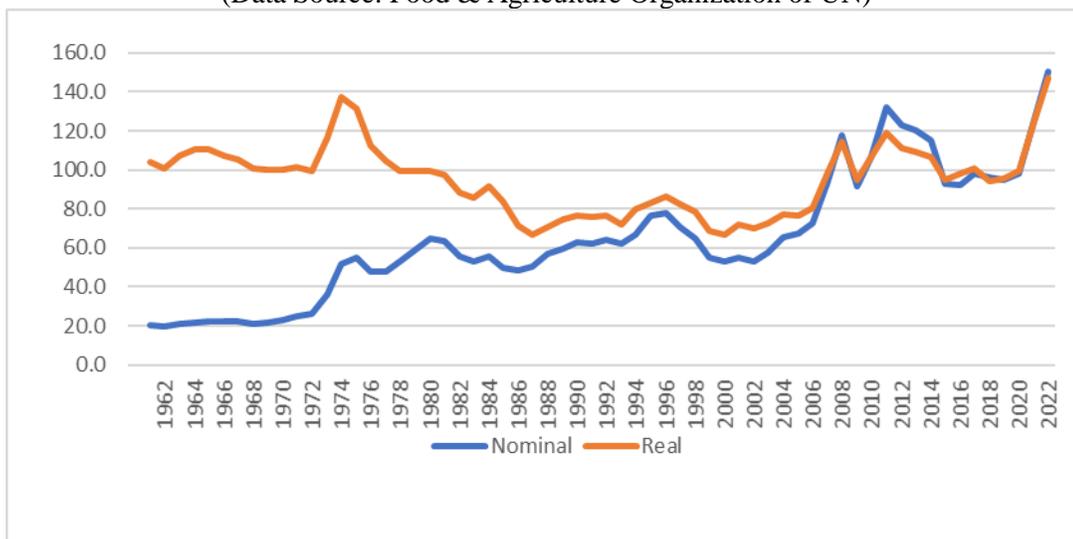


Figure 12. Global Monthly Food Indexes (July 2021 to August 2022) (Data Source: WB)

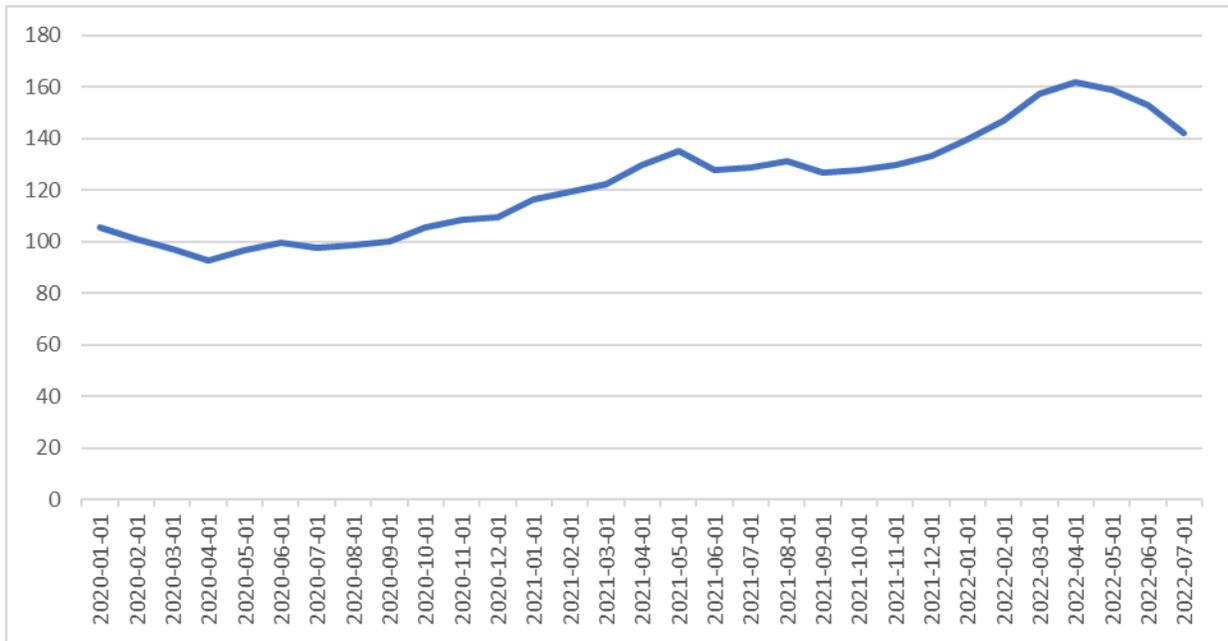
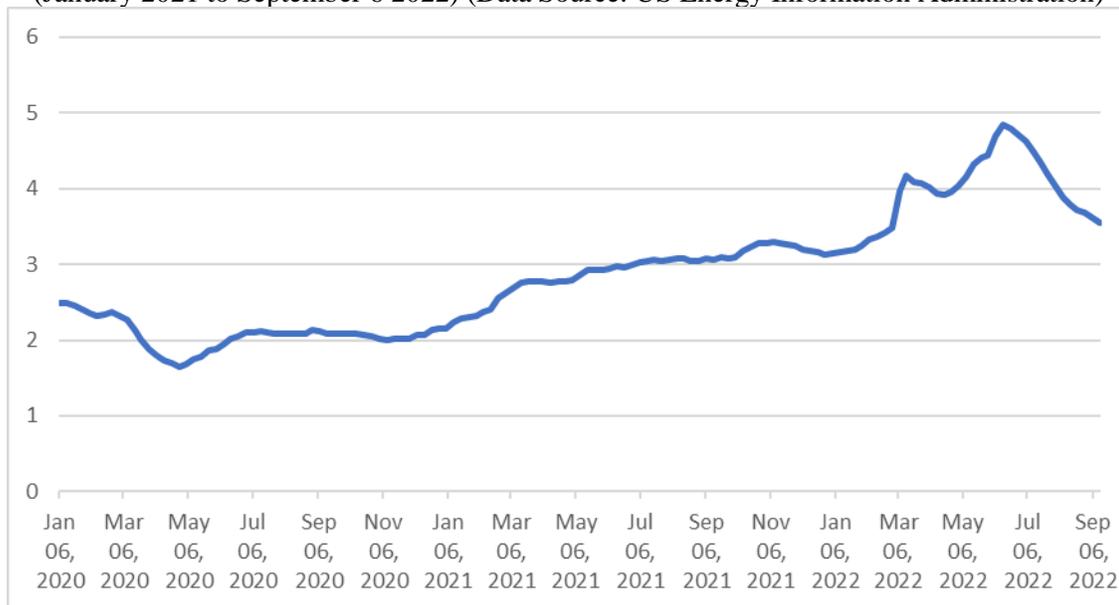
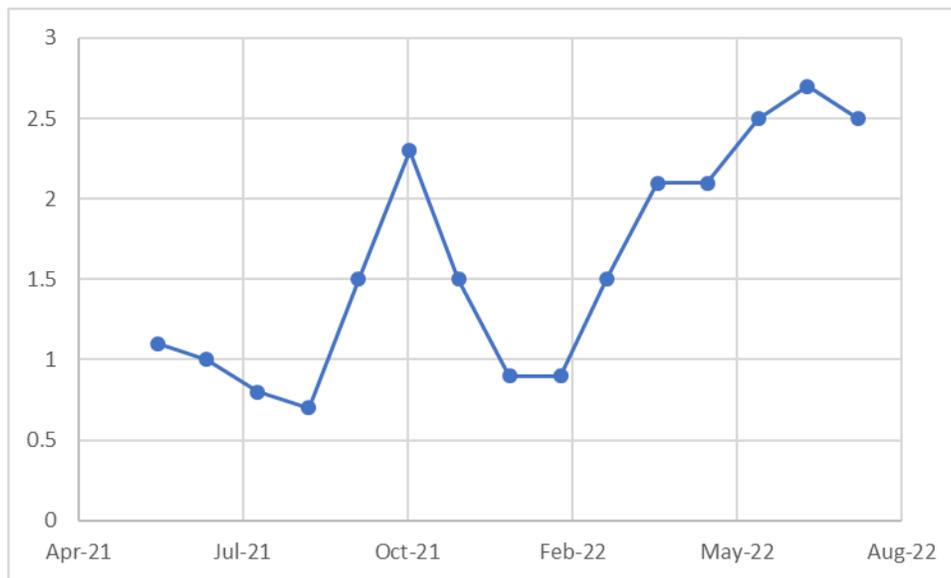


Figure 13. Weekly U.S. Regular Conventional Retail Gasoline Prices (per gallon)
 (January 2021 to September 6 2022) (Data Source: US Energy Information Administration)



High inflation is a global problem generally and in a few countries, their inflation rate is extremely high. For example, it was above 70% in Turkey and more than 50% in Argentina in May, 2022. But for some countries, their major issue is not rising prices. Figure 14 is China’s monthly inflation from June 2021 to August 2022 and it was 2.5% in August 2022, not a big issue in China right now.

Figure 14. China Monthly Inflation (June 2021 to August 2022)
(Data Source: WB)



As stated in the Introduction, the current sharp rises of many product prices in the US and many other countries are mainly from the oversupplies of money associated with the central banks' QE and governments' stimules, disruptions of supply chains that are related with pandemic caused shutdowns of businesses, rising wage and high demand for these products. The current war in Ukraine has made the situation severer. In the US, tariffs imposed to import products also contributed substantially to inflation. Therefore, the solutions to control heated inflation should aim at these causes.

Increasing globalization has promoted fast growth of the world economy and decreased costs and so lowered the prices of many products and services. International trade and integrations of international markets have benefited all economies and most people. Definitely, some industries and some groups of people in every economy in the world may have been harmed by globalization and especially international trade. However, anti-globalization and further disrupting and disintegrating current established supply chains will not be the solution and that will not relief adversely impacted industries and groups either. A better way is to make globalization more inclusive and sustainable (Chen 2010, 2015). The US has called for coming back of manufacturers from overseas for more than a decade, but the actual results have been marginal. The US in the past years has enforced extremely high tariffs to imports, especially the ones from China but the US continuously has had huge trade deficits each year and has been buying more products from China over years.

Global problems and issues need global cooperation. Further reforming existing global economic and financial systems is vital and urgent. All countries should work together to find out common grounds and mutually beneficial answers. The world is facing many challenges, including problems in environment, global warming, shortages of energy, foods and the others like chips, pandemic, healthcare system, terrorism, and conflicts among countries. It calls for global wisdom, courage and united actions in order to resolve them.

Inequality has been a serious global problem. Gaps in developments among countries and income and wealth gaps among different groups in each country in the world have been increasing over decades. The rich becomes richer and the poor is poorer. This phenomenon and its persistent trend are not only unfair and unjustifiable but also causing severe social and economic problems. It is urgent and crucial that all countries and the whole world work out effective and efficient strategies and plans to solve this inequality gradually and share wealth and benefits from economic and globalization developments more equally. Inclusive and sustainable economic growth will still be the key to this success.

Technology and its advancement are imperative to tackle many global problems, especially to reduce production costs. Fast developments of technologies and specifically many disruptive technologies and its applications such as internet and wireless communications have substantially shortened distances among people in

the world so lower the expenses of communications; artificial intelligence, robots and internet on things (IOT) are releasing people's work; gene therapies and innovative vaccines have saved many lives and helped overcome pandemic like COVID 19 and that in return generate more workforces. New technologies also have continuously improved productivities of agricultural, industrial and service sectors and particularly are making our productions and operations more efficient and energy saving. New technology and its applications in addition create many jobs and drive the economic growth. Besides dealing with the side effects of technology development, the world also needs to pay attention to the unequal adoptions and sharing of the technologies in different regions and countries. The new technology should be used to narrow the gaps among countries and people.

12. Conclusion

This paper provides comprehensive reviews of both theoretical and empirical studies on inflation and its effects. Using economic theories, it explains how the equilibrium price of a product or service is determined based on its demand and supply, how its price may be changed associated with shifts of demand and supply curves and thus there a price rising or falling. Then it describes the demand-pull and supply-push inflation and explains what caused the current sharp inflation in the US and world. The paper theoretically and empirically discusses the relationship of inflation with economic growth, unemployment, international trade, the interest rate, and the exchange rate, and explores the effects of inflation on individuals and investments. The government inflation targeting and its effectiveness are also reviewed. Finally, it examines the recent accelerating inflation and possible solutions. Latest data from the US and world are added in the analysis to support relevant conclusions and the correlations of some variables from the US are calculated and significance tests are conducted.

Inflation has been constantly associated with the world. In early 1980s, the world had annual overall inflation above 12% and the US's inflation rate was 14.6% in 1980. Compared with that, present inflation is not too high, but it is wider and more persistent than most past inflation. Specifically, the dramatic rising of foods, energy and other necessities are hurting ordinary people severely. As stated in the reviews of inflation and economic growth, there is a threshold of inflation in each economy. Above this point, inflation will damage the economy seriously. The US's monthly inflation rate of above 8% is unacceptable and unbearable. The annual target rate for the US is only 2%. Therefore, the US must take firm and effective actions to control inflation as discussed in the previous section, based on actual causes, not politics; otherwise, its economy will experience long-run suffering.

Will current high inflation destroy the US and world economies? Normally that will not be. The average inflation rate of about 5% to the developed economies and 7% to the developing economies is not too high, contrasted with the extremely high rates in 1980s, 1970s and 1920s. In addition, it seems that the peak of rising overall prices is already over or to be over soon in most economies although that will not go down quickly. More importantly, the US and many other countries have learned from past experiences on how to control soaring inflation using all types of tools, including monetary and fiscal policies and even administrative or executive powers. Financial systems and financial resources are also stronger now than before. The paper concludes that there may be a minor economic recession if the current high inflation lasts extensively but the US and world can avoid an economic crisis if take strong and effective actions to control and reduce the present high inflation. More importantly, it is essential that the world learns and knows how to prevent and avoid the next high inflation cycle. Inflation cannot be avoided but high inflation, especially extremely high inflation can be prevented. Particularly, the world should aim at reforming the existing economic and financial systems to be more inclusive and sustainable, solving the rising income and wealth inequality problem and better developing and using the new technologies that can benefit all more equally, improve environment, further enhance efficiency and continuously raise the productivity.

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