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The U.S Fiscal and Monetary Response to the COVID-19 Crisis

An Assessment of the Stabilization Policies' Impact on the Long Term Economic Recovery

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Abstract

In this thesis we assess the U.S fiscal and monetary response to the COVID-19 crisis, and how these interventions have impacted the long term economic recovery. The broad range of policies implemented to counter the crisis have been analyzed through the lens of an extended AD/AS model.

Following the record amount of fiscal stimuli we document an overweight of demand-targeted provisions, despite categorizing the pandemic as a real economy crisis triggered by a supply shock. We find evidence that the U.S economy has recovered faster than anticipated while the production is still operating below full capacity, a finding that raise concerns around the broad targeted fiscal packages. Furthermore, we describe risks in regards to the speed, scope and size of the monetary programs. We find evidence of the Federal Reserve being more established in financial markets and to a larger extent being engaged in the allocation of credit, resulting in an unprecedented growth in money supply. The Fed's interventions contributes to increased inflationary pressure, supporting the our extended AD/AS model. Moreover, we employ the HP-filter to examine asset inflation and overheating in the economy. We find clear indications of inflated asset prices and a marginal positive output gap. The indications of asset inflation suggests increased financial instability, further indicating that the government has provided elusive stability. Furthermore, we find evidence of inflation in consumer goods running far above the inflation target in the United States. This inflation is argued to be persistent, creating a ripple effect that will harm businesses and households, who were the primary targets of the stabilization policy.

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1 Introduction

1.1 Motivation and Purpose

The COVID-19 pandemic has caused severe disruptions to the global economy. Countries were forced to shut down large parts of their society and economy in order to prevent the virus from spreading. The crisis we are faced with today can be categorized as a real economic crisis triggered by a negative supply shock. Additionally, the pandemic created a demand and financial shock which is almost unprecedented compared to other historical crises (Grytten, 2020). As a result, the annualized U.S real GDP fell by 31.7 percent during the second quarter of 2020 (Bureau of Economic Analysis, 2020). Furthermore, the unemployment rate spiked to 14.8 percent in April 2020, while financial markets experienced a freefall in stock prices (U.S. Bureau of Labor Statistics, 2021). As of December 2021, there is still uncertainty in the global economy. The pandemic continues to put pressure on economic activities, as the coronavirus is still posing restrictions on the society.

In an attempt to mitigate the economic repercussions, the authorities have pursued an expansionary fiscal and monetary policy. The fiscal policy in the United States has been both aggressive and unprecedented, as some of the fiscal packages are the largest in the history of the U.S. In addition, the Federal Reserve acted quickly and decisively to make use of all instruments in the conventional monetary policy kit, in addition to re-employing unconventional tools to counter the economic effects of the pandemic. The Fed went even further and launched a new series of innovative measures to stimulate economic activity. The background for our research question is the significant inflationary pressure on the U.S economy in light of the fiscal and monetary response.

By using time series data of macroeconomic variables, the aim of this paper will be to explore the effect of the policy response on the American economy. To what extent has the fiscal policy response been well-targeted and necessary to ensure sustainable recovery of the economy, and do we find indications of excessive stimuli? How has the monetary policy affected the economy and do the speed, scope and size of the interventions impose possible implications for economic development? Do we see signs of increased inflationary

pressure as a result of the authorities' decision-making? Answers to these questions could help in assessing what aspects of the stabilization policy that worked as intended, and what could improve in the face of the next crisis.

1.2 Research Question

More specifically, this master thesis will address the following research question:

"Have the stabilization policies in the U.S been counterproductive towards its goal of boosting the American economy?"

1.3 Outline

This thesis is organized in the following ways:

In chapter 2 we will present relevant economic theory and literature which form the basis for analyzing our research question. The goal of this chapter is to introduce the reader to the concepts and theories that are used throughout the analysis.

The data utilized in the analysis will be presented in chapter 3. We will start with displaying the characteristics of the data, before assessing the validity and reliability of the dataset. In chapter 4, we will present the methodology applied in our analysis, emphasizing limitations, assumptions and the reasoning behind our choices.

In chapter 5 we will start by analyzing the current state of the American economy in an AD/AS model. From chapter 6 we start presenting our main findings. First, we analyze the fiscal policy response to the COVID-19 crisis. In chapter 7, we will present the monetary policy response, and its implications for the economic recovery. Furthermore, in chapter 8 we will conduct a deviation analysis by applying the HP-filter on stocks, housing and GDP, to test for overstimulation and asset inflation. In chapter 9, we will discuss how the stabilization policy has led to increased inflationary pressure, and potential concerns surrounding this development.

Finally; in chapter 10, we will present our conclusions, and discuss its implications.

2 Theory

2.1 Business Cycles and Economic Crisis

In order to understand how economies fluctuate, it is important to understand the concept of business cycles. According to a widely accepted definition by Burns and Mitchell (1946), business cycles can be defined as:

> *"a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; the sequence of changes is recurrent but not periodic [...]"* (Burns and Mitchell, 1946).

In essence, business cycles are distinguished by the alternation of expansion and contraction phases in aggregate economic activity, as well as the co-movement of economic variables in each phase of the cycle. Aggregate economic activity is mainly represented by real gross domestic product (GDP), but other important aggregate measures include inflation, unemployment, interest rates, export, import and housing prices (Grytten and Hunnes, 2016).

The percentage deviation between real GDP and the trend is commonly referred to as the output gap. The trend line represents potential GDP in which the economy operates at full capacity and maximum employment (Grytten and Hunnes, 2016). A business cycle starts with the expansion phase, in which consumers are confident in the economy. As a result, they desire to spend more, which leads to increased demand and firms hiring more employees to meet the demand. Eventually, the expansion phase hits a peak where the economy enters a contraction, as shown in figure 2.1. This could occur as a result of rising interest rates, increased inflation or crises such as a pandemic.

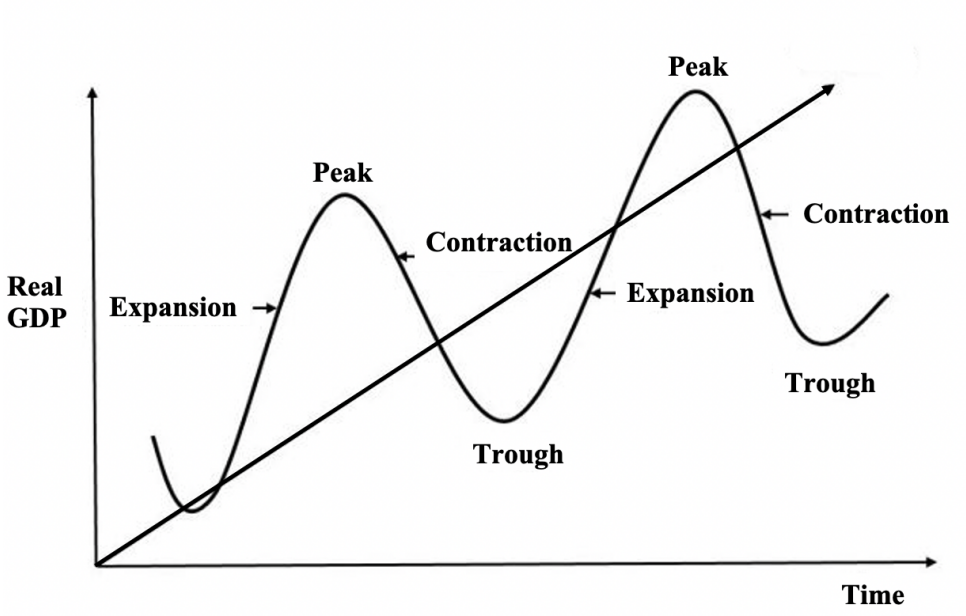


Figure 2.1: A Simple Illustration of Business Cycles

Among economists, there has been debate on why business cycles occur. According to Keynes (1936), fluctuations are based on variations in aggregate demand, thus the stabilization policies should target the demand side of the economy. These Keynesian theories dominated in the early post-war period. Later, Kydland and Prescott (1982) emphasized how business cycles are driven by real shocks, such as a pandemic, which affects the supply side of an economy.

In light of the COVID-19 pandemic, it is also essential to understand the concept of an economic crisis. Eichengreen and Portes (1987) provided the following definition of a financial crisis:

"a financial crisis is a disturbance to financial markets, associated typically with falling asset prices and insolvency among debtors and intermediaries, which spreads through the financial system, disrupting the market's capacity to allocate capital"

However, a crisis stemming from the supply side in the real economy manifests itself at the production level, leading to a reduction in output (Grytten and Hunnes, 2016). In the following section, we will present a framework that helps in determining the effects of different shocks and crises.

2.2 AD/AS Framework

2.2.1 Aggregate Demand

Aggregate demand, as shown in equation 2.1 is the total amount of desired spending expressed in current (nominal) dollars (Gordon, 2012). A shock to aggregate demand (AD) is defined as a significant change in desired spending by consumers, businesses, the government, or foreigners (Gordon, 2012).

$$AD = C + I + G + (X - M) \tag{2.1}$$

AD is the sum of the following four components: consumption (C), investment (I), government spending on goods and services (G) and net exports ($X - M$). Later, we will show how increased government stimulus has affected the AD curve as a response to the pandemic.

2.2.2 Aggregate Supply

In the short and long run, aggregate supply (AS) is expressed differently. The short-run aggregate supply (SAS) curve shows the amount of output that business firms are willing to produce at different price levels, holding constant the nominal wage rate (Gordon, 2012). As opposed to the AD curve, the SAS curve is accelerating because it assumes that in the short run prices adjust while labor costs do not. The long-run aggregate supply (LAS) curve becomes vertical once the nominal wage rate is free to adjust in proportion to the price level. However, in this thesis, we will focus on short-run aggregate supply, as shown in equation 2.2.

$$\pi_t = \pi_{t-1} + \bar{v}\tilde{Y}_t + \bar{o} \tag{2.2}$$

The equation shows the relationship between inflation in period t and the following three variables: inflation in the previous period (π_{t-1}), short-run output ($\bar{v}\tilde{Y}_t$) and inflation shocks ($\bar{o}$). A shock to AS can take several forms. As a result of the COVID-19 pandemic, production has been restricted by lockdowns, which has led to a negative shift in the

aggregate supply curve. Consequently, total output is being reduced, which implies increased unemployment. When defining the crisis as a real economic crisis initiated from the supply side, one would expect the government to provide financial assistance to businesses which have lost sales because of supply-side factors. Later, we will discuss whether the authorities have implemented efficient economic policies to ensure a sustainable and quick economic recovery.

2.2.3 AD/AS Model

The AD/AS model combines the aggregate demand and aggregate supply to illustrate output and the price level in an economy. In figure 2.2, Y represents output, P is the price level in the economy, the AD-curve represents the aggregate demand and the AS-curve represents the aggregate supply. The model shows an economy in equilibrium, represented by point A. Later, we will illustrate the COVID-19 crisis using the AD/AS model in section 5.2.

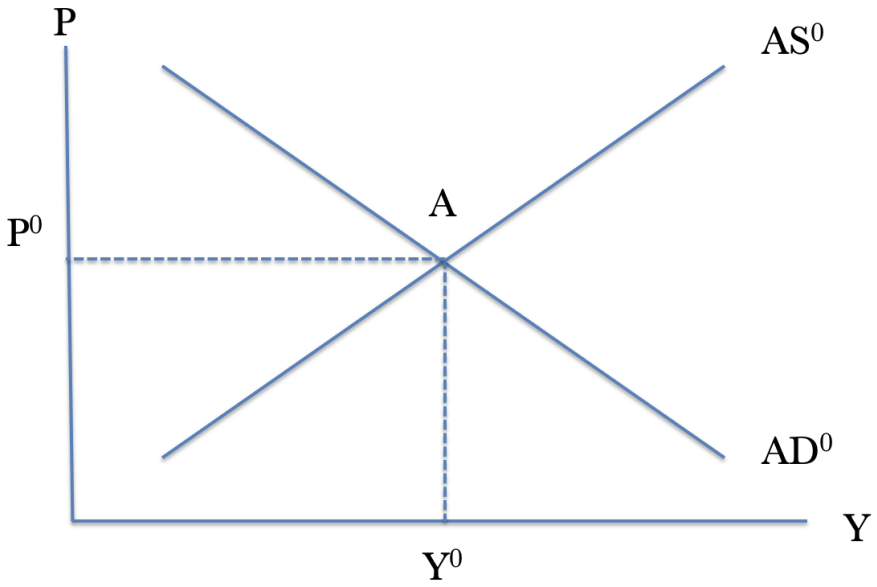


Figure 2.2: AD/AS Model in Equilibrium, (Grytten, 2020)

2.3 Fiscal Policy

Authorities have two main fiscal policy instruments to influence economic outcomes which are: Taxes and spending. Government spending refers to the overall government

consumption in addition to investments and transfers. When governments are running budget deficits, fiscal policy is said to be expansionary. By contrast; when revenues exceed government spending, fiscal policy is said to be contractionary (Weinstock, 2021). The goal is to balance the use of the instruments to stimulate economic activity and thus reach the desired effect on output. Related research argues that it is unclear which of the two instruments has the strongest effect on economic activity (Blanchard and Perotti, 2002).

With the situation arising from the COVID-19 pandemic, we aim to analyze the effects of expansionary fiscal policy to counter the economic crisis. Most theoretical literature discusses the direction, effects, and magnitude of fiscal policy through fiscal multipliers. Fiscal multipliers were formally introduced by Keynes in "The General Theory of Employment, Interest, and Money" (1936). A fiscal multiplier is defined as the stimulating effects on macroeconomic variables, in most cases GDP, as a result of a specific change in a fiscal policy measure.

In the section below, we will present the theoretical background upon which the fiscal multipliers are based, before providing empirical research on the subject. Furthermore, we will assess the potential offsetting effects of expansionary fiscal policy. Finally, we will present literature on the responsible use of fiscal policy.

2.3.1 Fiscal Multipliers

Theoretical Background

Fiscal multipliers aim to measure short-term effects of discretionary fiscal policy on GDP. The fiscal multiplier is defined as the ratio of a change in output to an exogenous change in fiscal deficit, with respect to the fiscal baseline (Batini et al., 2014). In order to compare fiscal multipliers, peak multipliers are widely used following Blanchard and Perotti (2002). Peak multipliers represent the maximum value of fiscal multipliers across a given time horizon as a response to a fiscal shock, and can be calculated as:

$$\textit{Fiscal multiplier} = \frac{\Delta Y_{\max}}{\Delta \theta_0} \tag{2.3}$$

In equation 2.3, the maximum change in output is noted as $\Delta Y_{\max}$. The change in $\Delta Y_{\max}$, is a result of exogenous changes in fiscal policy, noted as $\Delta \theta_0 \in (G_0, T_0)$, where G_0 refers

to government spending and T_0 to net taxes. Models and estimations on the effects of spending and taxation vary substantially, as assumptions in both underlying theoretical framework and methods of identifying fiscal shocks diverge substantially (Riera-Crichton et al., 2016). Economic output is also influenced differently depending on the fiscal change in question. For instance, increased spending on infrastructure projects and decreased taxes on income can have an equal effect on the national budget. However, the two actions will likely produce different fiscal multipliers. Equation 2.3 shows that a fiscal multiplier greater than one would suggests that one unit spent on fiscal expansion, causes output to increase by more than one unit. If the fiscal stimulus results in higher spending by private actors, and hence increasing aggregate demand, the multiplier is higher than one. Fiscal multipliers are highly sensitive to the theoretical assumptions of the model through which they are assessed. The theoretical assumptions concerning fiscal policy mainly diverge in whether agents are forward-looking or not.

Keynesian theory, as described by John Maynard Keynes' (1936), argues that prices are sticky (resistant to change) and consumption is a constant part of net income in the current period (Hebous, 2011). The theory predicts that an increase in government spending affects economic activity through an accelerator effect and increases production. Furthermore, this growth raises the disposable income of private agents and increases private consumption. Consequently, Keynesian economists imply that spending in one area leads to spending throughout the whole economy (Guerrieri et al., 2020). Following the Keynesian theory, expansionary fiscal spending, targeting aggregate demand, results in an increase in output, total investment, and consumption (Gaber et al., 2013).

Standard Keynesian theory does not include forward-looking behavior of rational agents, and does not consider intertemporal budget constraints facing private consumers, businesses, and governments. Thus, in Keynesian theory, expected changes in future income and output does not affect the agent's behavior at the time of the fiscal change (Hebous, 2011). Nevertheless, the underlying theoretical framework of Dynamic Stochastic General Equilibrium (DSGE) models is increasingly being assessed. DSGE models include forward-looking agents with rational expectations, and as a result, these models yield different fiscal multipliers. Thus, the models assume that consumers maximize expected utility over their lifetime, as found in the permanent income hypothesis of Friedman (1957), while

businesses maximize profit constrained by technology available at the time. Furthermore, government budgets stay within a budget constraint decided by an intertemporal fiscal rule. Two main DSGE models, Neoclassical models, and New-Keynesian models, have two distinctions in their assumptions. Neo-classical theory includes perfect competition and flexible prices, while New-Keynesian theory combine Keynesian assumptions of sticky prices and imperfect competition with forward-looking agents (Hebous, 2011).

Empirical Literature

Reduced-form empirical studies have shown estimates that are dispersed over a broad range, where the findings account for both spending and tax multipliers (Spilimbergo et al, 2009). Table 2.1 provides an overview of studies that pay close attention to U.S fiscal multipliers. The table includes the methodology of the research, the fiscal shock, and the multipliers at the different horizons, to get a time perspective of how the multipliers affect the economy over time.

Table 2.1: Empirical Studies on Fiscal Multipliers

			Multipliers at different horizons			
Empirical Study	**Methodology**	**Fiscal Shock**	**One Year**	**Two Years**	**Three Years**	**Cumulative over Two Years**
Blanchard and Perotti (2002)	Quarterly structural VAR. No control for interest rates or money supply. Sample: 1960:Q1–1997:Q4	G, DT	0.5	0.5	1.1	1.1
		G, ST	0.6	0.7	0.7	1.3
		T, DT	0.7	0.7	0.4	1.4
		T, ST	1.1	1.3	1.3	2.3
Bryant and Others (1988	Comparison of various frameworks (econometric, VAR, and modelsimulations). Varying assumptions about the interest rate response	G	0.6 - 2.0	0.5 - 2.1	0.5 - 1.7	1.1 - 4.1
Cogan and Others (2009)	New Keynesian simulation exercise. Varying assumptions about the interest rate response	T, G	0.7 - 0.9	0.5 - 0.6	0.4 - 0.4	1.2 - 1.5
Perotti (2006	Quarterly VAR. Ten-year nominal interest rate included in the VAR. Multipliers reported are cumulative	G	1.4	1.9	2.2	-
		Z	1.2	0.5	0.2	-
Romer and Romer 2008	Narrative, singe equations and VAR. Sample: 1945 - 2007	T	1.2	2.8	2.7	4.0

G = Government Spending, T = Taxes, Z = Government Investment, VAR = Vector Auto Regression

The effect of expansionary fiscal stimulus varies over time. As an example, Blanchard and Perotti (2002) finds that a 1 percent increase in government spending have a positive effect on GDP by 0.5 percent the first year, 0.5 percent the second year, and 1.1 percent the third year. Mountford and Uhlig (2009) find fiscal multipliers in the United States

that are comparable with those of Blanchard and Perotti (2002). However, the study emphasizes that private consumption is less sensitive to investments in government spending. Consequently, multipliers associated with tax cuts are higher than multipliers associated with changes in government spending. This is further backed by Romer and Romer (2008), who finds that a tax decrease of 1 percent is found to increase GDP as much as 2.8 percent when the effect peaks two years after the initial fiscal shock. However, the empirical results found in studies such as Blanchard and Perotti (2002), Cogan et al. (2009), as well as Galí et al. (2007), show that private consumption has a significant rise after a positive fiscal spending shock, which in turn yields higher spending multipliers. The evidence from the empirical results provides support for the view that well-executed fiscal stimulus could provide a boost to economic activity in the U.S economy, despite having disagreement about the appropriate mix of government spending and tax cuts.

Based on the difference in methodology above, a 2012 academic research article provided by Coenen et al. (2012), estimated fiscal multipliers for various forms of stimulus using seven structural DSGE models. These models were used by policy making institutions and international organizations, such as IMF and OECD. Their main finding is that there is considerable agreement across models on both the absolute and relative sizes of different types of fiscal multipliers. They also found that some fiscal multipliers are large, particularly for spending and targeted transfers. Secondly, fiscal policy is more efficient if monetary policy accommodates it. Thirdly, permanent budget deficits yield significantly lower initial multipliers, and have a long-term negative effect on output (Coenen et al., 2012). Furthermore, the study found varying results for different forms of fiscal stimulus ranging from 1.59 for cash transfers to low-income individuals, to 0.23 for reduced labor income taxes, as presented in table 2.2

Table 2.2: Average First-Year Fiscal Multipliers for Stimulus in Selected Models

Fiscal Stimulus	Multiplier
Government Investment	1.59
Government Consumption	1.55
Targeted Transfers	1.30
Consumption Taxes	0.61
General Transfers	0.42
Corporate Income Taxes	0.24
Labor Income Taxes	0.23

Source: (Coenen et al., 2012)

One key limitation for the empirical results is the assumption that monetary policy will be non-accommodative. As a result, the size of the multiplier will most likely be influenced by the economic situation in which the economy finds itself at the time of the fiscal change (Coenen et al., 2012). It can also be difficult to distinguish between changes in government expenditure that occur because of changes in output, so-called endogenous changes, and changes that are made discretionary to affect output, so-called exogenous changes. Thus, there are possibilities of omitted variable bias and reverse causation, which reduce confidence in empirical results (Alesina et al., 1998). Thus, the multipliers found in the mentioned research should be assessed with caution.

2.3.2 Potential Offsetting Effects of Expansionary Fiscal Policy

It is often assumed that expansionary fiscal stimulus will have a small effect on output over time due to a *crowding-out* effect on private consumption and investment (Cogan et al., 2009). With an increase in fiscal stimulus, the government increase the size of its budget deficit by issuing new debt. These borrowings lead to an increase in demand for loans. The increased demand will result in increased interest rates, as interest rates can be seen as the price of borrowed money. According to Taylor (1993), an increase in government expenditures leads to price pressure and higher interest rates. Rising interest rates generally depress economic activity, as it becomes more costly for firms to borrow and invest. Private consumers also tend to decrease interest-sensitive spending (Ball and Mankiw, 1995). Therefore, the rise in interest rates decrease investment and consumer spending which counteracts some of the increase in economic activity induced by fiscal

stimulus.

During recessions, the crowding-out effect tends to make less impact than during a healthy economic expansion. Firstly, there is already lower demand for investment and interest-sensitive spending. Furthermore, central banks often conduct a loose monetary policy. Consequently, the additional demand from fiscal expansions does not increase interest rates as much as it would in a normal economic environment (Auerbach and Gorodnichenko, 2012). However, Taylor (2009) argues that discretionary changes in fiscal policy will have no desired effect on economic activity, even in a situation where the central bank keeps interest rates close to zero. He refers to "Japan's lost decades", where Japan experienced ten years of nominal interest rates close to zero and negative economic growth. It was only after implementing quantitative easing (QE) that the Japanese economy showed signs of improvement. Discretionary fiscal policy changes seemed to have had little or no effect.

If an expansionary fiscal policy leads to high government debt and a large budget deficit, the change could increase the uncertainty in the economy and lead to economic actors becoming more cautious. Thus, the desired effect on consumption and investment is weaker because of increased savings. In such a case, the multiplier effect of the fiscal change will be smaller (Caballero and Pindyck, 1996). The same counts if consumers choose to use increased disposable income to repay their debt. In such a scenario, there would be less effect of an expansionary fiscal policy (Reinhart and Rogoff, 2010).

As known, the overall goal of expansionary fiscal policy is to boost output and employment, often by increasing aggregate demand in the economy. However, stimulus can be implemented too aggressively, or applied when the business cycle is in a position where production is near full capacity. If this is the case, the stimulus can result in a spike of demand for goods and services that the economy cannot supply. As demand surpasses available supply, prices tend to rise, a scenario known as inflation.

2.4 Responsible Use of Fiscal Policy

Before the global financial crisis of 2007-2009, there was a considerable agreement due to political barriers of deciding on how fair and responsible use of fiscal policy should be implemented. Consequently, short-run stabilization policies have historically been left to monetary policy. With record low nominal interest rates for the majority of central banks

in developed economies, fiscal tools have become a more important part of short-run stabilization. As an example, almost every OECD country employed discretionary fiscal stimulus in 2008 and 2009 (Romer, 2012). Most governments, especially in advanced economies, have also taken unprecedented fiscal measures in response to the COVID-19 pandemic (International Monetary Fund, 2021).

As we discuss US fiscal policy, we need to know what the government can and cannot do when deciding on their fiscal policy. The present value of the government's future consumption on goods and services must be less than or equal to the current debt as well as the present value of future income from taxes and fees (Romer, 2012). To express the following, Romer (2012) presents the government budget constraint, where $G(t)$ and $T(t)$ represent the government's purchases and tax collection at time t. $D(0)$ is the amount of debt outstanding at t = 0. $R(t)$ denotes $\int_{t=0}^{t} r(t)dt$, where $r(t)$ is the real interest rate at time t. The value of a unit output discounted back at time=0 will thus be: $e^{-R(t)}$. With this information we can derive the government budget restriction and denote it as:

$$\int_{t=0}^{\infty} e^{-R(t)}G(t)dt \leq -D(0) + \int_{t=0}^{\infty} e^{-R(t)}T(t)dt \tag{2.4}$$

As $D(0)$ represents initial debt, it enters the equation with a negative sign. The government budget constraint does not prevent it from being in permanent debt. In fact, the budget constraint allows a country to increase its amount of debt in eternity. This is shown mathematically, as the restriction the constraint sets on a government is that the limit of the present value of its debt cannot be positive. Which can be expressed in equation 2.5:

$$\lim_{s\to\infty} e^{-R(s)}D(s) \leq 0 \tag{2.5}$$

Consequently, if the real interest rate stays above zero, a positive but constant value of D, meaning that the government do not pay down debt, will satisfy the government budget constraint. The same counts for a policy where debt always increases. The growth of D satisfies the budget constraint if the growth rate of the debt is lower than the real interest rate (Romer, 2012).

2.5 Monetary Policy

2.5.1 The Role of Monetary Policy

Since 1977, the Federal Reserve has worked under a mandate from Congress to promote a strong U.S economy. More specifically, the Fed's responsibility in the words of Congress is: "to conduct the monetary policy to support the goals of maximum employment, stable prices, and moderate long-term interest rates.". The responsibility of maximum employment and stable prices is what is commonly referred to as the Fed's dual mandate (Board of Governors of the Federal Reserve System, 2020b).

Generally, monetary policy can have a set of objectives. Mainly, it is a set of tools that a nation's central bank has available to promote employment, stabilize exchange rates, provide financial stability, and control the money supply. In most developed economies, the primary objective is to maintain control over the money supply available to the nation's banks, consumers, and its businesses to stabilize inflation. This is in accordance with Friedman (1968), who emphasized the importance of price stability in a modern economic system.

The effect of the policymakers' actions on the real economy is temporary. This is dictated by the principle of money neutrality. In the long run, an increase in money supply affects both prices and wages. However, this will not have a general effect on economic productivity, as output is determined by other factors than money supply, namely preferences, the level of technology and countries' access to resources. Consequently, the long run GDP is not affected by monetary policy (Jones, 2020). This situation is often referred to as "the classical dichotomy" first introduced by Patinkin (1965), and further gives rise to the famous quote of Friedman (1970): "inflation is always and everywhere a monetary phenomenon".

However, in the short run, the classical dichotomy is rejected by both Keynesian and monetarist economists. As known from Keynesian theory, short run prices are sticky and resistant to changes. Hence, if prices fail to adjust in the short run, a change in the money supply would influence aggregate demand and have a direct impact on real economic variables. This would imply that a change in nominal interest rates leads to changes in real interest rates. As a result, nominal rates will affect output, since real interest rates

can be seen as the cost of capital, and therefore have a direct impact on the investment level in the economy. Fisher (1930) showed the relationship between these factors in the following simplified form:

$$r = i - \pi \tag{2.6}$$

In equation 2.6, r denotes the real interest rate, i the nominal rate and π denotes the inflation rate. As monetary policy relies on the assumption of short- run price rigidity, a change in the nominal rate will most likely affect the real interest rate in the short run. This assumption yields short-run monetary non-neutrality (Taylor, 1999).

In Friedman's "Role of Monetary Policy"" (1968), it is its stated that monetary policy can contribute to offset major disturbances in the economy. Furthermore, international research provides evidence of a positive correlation between short term economic stability and output in the long run (Sørensen and Whitta-Jacobsen, 2010). This gives the motivation for stabilization policies. Thus, one of the main roles of conventional monetary policy is to stabilize, often through trough a change in policy rates, aggregate demand in such a way that it corresponds to a normal level of resource utilization. By doing so, one can guide the production in the economy to a level consistent with potential output, the level of GDP that is sustained in the long term. In the U.S,. the Federal Reserve uses the Federal Funds Rate as a conventional stabilization tool. The Fed can influence economic activity by adjusting interest rates, as demand for interest-sensitive spending is affected by such changes. Examples of interest-sensitive spending can be business physical capital investment, consumer goods, and housing (Labonte, 2021).

2.5.2 Rules and Discretion

An important and highly discussed question considering monetary policy is whether policy changes should be determined discretionary by the central bank or follow explicit rules. Rules; in the case of monetary policy, refer to a predetermined guide for implementing policy changes (Faust and Svensson, 1998). In a discretionary framework, policymakers have the possibility of designing the best policy response for the given circumstances.

The time-inconsistency problem, first presented by Kydland and Prescott (1977), is a central motivation behind the discussions surrounding rules versus discretion. In the short run, inflation expectations are somewhat constant. Thus, policymakers could be tempted to pursue short run expansionary policies to create temporary increase in output. This temptation would lead to a time-inconsistent policy as the public experiences short run gains while the policymakers will ultimately fail to produce the long-run goal. Consequently, Kydland and Prescott demonstrated that discretionary policy changes may result in time-inconsistent solutions, which can lead to higher inflation. However, this is not to say that discretionary changes are never desirable, even in Kydland-Prescott's framework. Discretion opens the possibility of innovative changes to unforeseen problems. As known, there is uncertainty in the behavior and mechanism in the economy, especially in cases of exogenous shock. In these circumstances, there are several arguments in favor of discretion (Blinder et al., 2008).

According to Taylor (1993), rules have major advantages over discretion in improving economic performance. If policymakers follow random policies or deviate from rules, they introduce uncertainty and forecasting becomes challenging. Thus, the economy suffers. Inflation targeting has been the predominant rule in monetary policy and has proven to be advantageous in several ways. Empirical evidence suggests that inflation targeting is making the outcomes of monetary policy more transparent (Bernanke et al., 2018). However, the inflexibility of inflation targeting can limit the use of monetary policy, especially in responding to unforeseen incidents (Mishkin and Serletis, 2016). Thus, if inflation targeting is the overall priority in both the short and long run, higher fluctuations in GDP might occur (Faust and Svensson, 1998). This problem can be dealt with by introducing a low and stable inflation target in the long run, allowing for inflation to deviate from the target in the short run. Thus, the policymakers can attempt to moderate the fluctuations in output for short periods. This has later been referred to as "constrained discretion" (Bernanke and Boivin, 2003).

As discussed above, monetary policy can be implemented by rules or discretion. Research on rules and discretion has helped lighten the tradeoffs in a range of policy questions. In today's economic environment, these tradeoffs are highly relevant as conventional monetary policy tools may not be sufficient to stabilize the economy. Exogenous shocks have led to

the so-called zero-lower-bound problem in several countries and many policymakers have turned to unconventional monetary policy (Labonte, 2021).

2.5.3 Unconventional Use of Monetary Policy

In response to the unusually serious economic disruptions, the conventional policy tools may not be adequate as stabilization tools. Twice in its history, during the financial crisis in 2007-2009 and the current COVID-19 pandemic, the federal reserve has lowered the federal fund rate target to the range of 0 to 0.25 percent, which is referred to as the zero-lower bound. In these cases, the zero-lower bound prevents policymakers from providing conventional stimulus as desired to counteract the crisis. Thus, policymakers must turn to unconventional monetary policy.

Forward Guidance

One form of unconventional monetary policy is more open communication from policymakers of how the economy and outlook are assessed, often referred to as forward guidance. This allows both private actors and firms to make spending and investment decisions for the long run, introducing an element of stability and confidence to the markets. Thus, forward guidance can facilitate commitments from the policymakers to lower rates in the long run, which can add stimulus even when the interest rates are at the zero-lower bound. As a result, forward guidance impacts the current economic conditions, hence it helps central banks steer expectations, and extend the effects of monetary policy (Bernanke, 2020).

Quantitative Easing

Quantitative easing (QE) involves commitments from the central bank to conduct asset purchases of a pre-defined volume in a pre-defined time frame. Under QE, a central bank typically purchases longer-term securities exposed to risk, including treasury, municipal, corporate and sovereign bonds. The central bank purchases assets with newly created bank reserves to provide banks with liquidity, in order to increase lending and introduce new money to the economy. Furthermore, QE decreases long-term interest rates by increasing demand for fixed-income securities (Joyce et al., 2012). QE is an unconventional monetary policy tool used in a situation of low inflation or deflation, as well as situations where standard monetary policy tools have become ineffective.

The reason why the Federal Reserve can initiate QE programs is due to a change in how they conducted the monetary policy. In October 2008, the Fed started paying interest on reserves held at the Fed (IOR). By the introduction of the IOR, the Fed could expand its balance sheet to provide the necessary liquidity in order to support financial stability, while implementing a monetary policy in accordance with the Fed's dual mandate (Goodfriend, 2011). The decision of introducing the IOR to conduct QE was inspired by the arguments of Tolley (1957) and Friedman (1960). They stated that in a fiat money regime, bank reserves can be created at no marginal cost. Consequently, the opportunity costs to banks of holding reserves should be zero as well, dictated by economic efficiency. The authors further suggested that one way to satisfy the efficiency condition is for the central bank to pay an interest on the reserves, corresponding to the rate of other equal assets.

Studies published in the aftermath of the Great Recession have found that the Federal Reserve's purchasing of long-term bonds has contributed to lowering yields on a variety of fixed income securities, in addition to lowering credit risk. Consequently, the QE-program helped bring the U.S out of recession (Joyce et al., 2012). Effectiveness and risks of QE has been subject of dispute among researchers. Firstly, it is difficult to isolate the effects of QE from other contemporaneous policy measures. Furthermore, it is not clear what the long-term impact of QE on macroeconomic conditions is. In addition, several economists have raised concerns over the build-up of new financial stability risks stemming from such policies, especially inflation risks, as QE-programs can increase an economy's money supply substantially (Beck et al., 2019).

2.6 Inflation

In order to assess the general health condition of an economy, inflation is a highly relevant concept to understand. The following section will present different inflation measures, causes and consequences of inflation, and the effect of inflation expectations on financial markets.

2.6.1 Inflation and Price Indices

Consumer Price Index

Inflation is a measure of change in the general price level in an economy. There are a plethora of different techniques to measure inflation, where the consumer price index (CPI) is the most widely used. A CPI measures changes in the price of a basket of goods and services for a representative generic household. The composition of the basket is dynamic as consumption trends vary over time.

Personal Consumption Expenditure Price Index

Another relevant measure of inflation is the rate of change in personal consumption expenditure (PCE). The PCE measures spending by and on behalf of the personal sector. Hence, PCE includes the spending of non-profit institutions serving the personal sector. Additionally, the weights allocated to the items of the market basket are different from the CPI. As of this date, the PCE price index is the primary inflation index used by the U.S federal reserve as an inflation target.

Producer Price Index

The producer price index (PPI) measures the price level of goods and services bought and sold by producers. The index tracks changes to the cost of production for thousands of individual products and product groups. These movements tend to move in the same direction as the CPI, due to the fact that higher production costs will eventually be passed on to the consumers. The prices included in the PPI are computed from the first commercial transaction of products and services (U.S Bureau of Labor Statistics)

2.6.2 Causes of Inflation

Economists have tried to identify the causes of inflation for several decades. In 1675, Vaughan tried to separate the inflationary impact of the influx of gold from the inflation caused by currency debasement (Vaughan, 1675). Additionally, the distinction between demand-pull inflation and cost-push inflation goes as far back as the late 18th century (Laidler, 2000). In other words, the causes of inflation have contrasting views amongst economists.

Quantity Theory of Money

According to the quantity theory of money, the general price level is proportional to the money supply in an economy. Hence, in the long run, inflation is primarily caused by an expansion in the money supply. This relationship is expressed in equation 2.7, following (Gordon, 2012):

$$M_t V_t = P_t Y_t \tag{2.7}$$

In equation 2.7, M_t denotes the total amount of money in circulation, V_t is the velocity of money, V_t is the price level in the economy and Y_t is the volume of transactions of goods and services. In the long run, the velocity of money is assumed to be constant. Furthermore, the real GDP, a proxy for Y_t, is considered to be constant over time. By differentiating this equation with respect to the price level P_t, we find that the growth rate of prices is a function of the growth in money supply, less than the growth in real GDP. This is shown in equation 2.8 as:

$$\pi^* = g_m - g_y \tag{2.8}$$

The implication of the monetarist view is that an increase in money supply is what determines the level of inflation. Therefore, the argument summarizes the fact that inflation is solely a monetary phenomenon.

There are several limitations with the monetarist view on what triggers inflation. Among others, the velocity of money is considered unpredictable across time, and the real GDP tends to vary over time. Moreover, it is difficult to define what constitutes the total amount of money. Table 2.3 summarizes various types of money as defined in the United States.

Table 2.3: Different Measures of the Money Supply

M0	Total of all physical currency
MB	M0 + Federal reserve deposits
M1	M0 + Checkable deposits
M2	M1 + Savings accounts + Money market accounts + Retail Money market mutual funds + Certificates of deposits smaller than $100,000
M3	M2 + Institutional money market mutual funds + Certificates of deposits larger than $100,000 + Eurodollar deposits + Repurchase agreements
M4	M3 + Commercial papers + Treasury-bills

Source: (Board of Governors of the Federal Reserve System, 2021d)

Keynesian Theory

According to Keynesian economics, inflation is separated into demand-pull inflation and cost-push inflation (Gordon, 2012). Demand-pull inflation is a result of excess of demand over supply, while cost-push inflation is inflation following negative exogenous shocks from the supply side. In addition, inflation can be a result of inflation inertia, where the a level of persistent inflation can standardize practices like raising wages even when inflationary pressure eases. The Keynesian view is often seen as an opposite to the monetarist view, claiming that V_t and Y_t are influenced by the volume of money in the short run. For further views on causes of inflation we refer the reader to (Goodfriend and King, 1997).

Monetarist and Keynesian View on Sustained Inflation

In 1984, Frederic Mishkin found that there has been a convergence of views in the economics profession on the causes of inflation (Mishkin, 1984). Research shows an agreement between both Keynesian and monetarist economists to Milton Friedman's statement "Inflation is always and everywhere a monetary phenomenon". However, this proposition only holds when inflation is considered a long-run phenomenon and not temporary price movements. Empirical evidence supports this statement, where studies found a correlation of 0.96 percent between inflation rate and growth in money supply (Mishkin, 1984). Consequently, it shows that high inflation rates are almost always a result of an increase in money supply.

The best way to support the Friedman proposition is to analyze the Monetarist and Keynesian model in an aggregate demand and supply framework as described above. The

monetarist model suggests that sustained inflation results from a growth in money supply. Hence, changes in the money supply is the only factor that will shift the aggregate demand curve continuously. The Keynesian model, in contrast to the monetarist model, does allow for other factors such as fiscal policy to affect the aggregate demand curve. Thus, it would seem reasonable that sustained inflation might occur as a result of expansionary fiscal policy such as financial stimuli packages. However, Frederic Mishkin shows that this is not the case. Sustained inflation cannot exist unless there is an accelerated growth in money supply, regardless of the underlying theoretical framework.

2.6.3 Consequences of Inflation

Determining consequences of inflation is a difficult task. In most macroeconomic models, inflation just adds an equal amount to all prices and nominal interest rates on assets. Consequently, there are few easily identifiable costs (Romer, 2012).

Theoretical View on the Cost of Inflation

The consequence of inflation that is easiest to identify arises from the fact that when the nominal return on high-powered money is fixed at zero, higher inflation causes people to reduce their holdings of high-powered money. This will result in less loanable funds being available to companies for investment as people will increase their holdings of currency to sustain their living standard (Romer, 2012).

Another consequence of inflation is its large effect on incentives for saving and investment, as a result of a distorted tax system (Romer, 2012). In the United States, income from interest and capital gains, and deductions from depreciation and interest expenses are computed in nominal terms. Hence, the net effect of inflation through these channels is to raise the effective tax rate on capital income. Consequently, the attractiveness is being altered towards investments in owner-occupied housing relative to business capital.

Lastly, central banks might use monetary tools to deal with problems of high inflation by increasing interest rates. This will result in increased borrowing costs and thus having a negative effect on both investment and consumption. To summarize, the consequences of high inflation inhibits a country's economic growth. Both firms and households would face great uncertainty resulting in negative implications for the economy.

Empirical Research on Cost of Inflation

Several studies have researched for the empirical relationships between inflation and economic growth. Generally, these studies have been on the side of identifying a negative relationship between the two. Table 2.4 summarizes important research and its findings.

Table 2.4: Empirical Research on Costs of Inflation

Study	Notes	Findings
Barro (1995)	100 countries over 1960 - 1990	Inflation has a negative effect on growth
Bruno & Easterly 1998	26 countries over 1961 - 1992	Discrete crisis of high inflation retard growth
Gosh & Phillips 1998	145 countries over 1960 - 1996	The negative relationship between inflation and growth extends to single-digit levels of inflation
Khan & Senhadji 2001	140 countries over 1960 - 1998	1-3% inflation is positive for industrialised countries. Higher inflation has negative effect on growth
Kremer, Bick & Nautz 2013	124 countries over 1950 - 2004	Optimal inflation rate is 2% for industrialised countries. Higher inflation has negative effect on growth

The empirical studies presented above suggest that inflation at a rate higher than the optimal long-run target will hamper economic growth. These are important findings in which we will bring more attention in an attempt to answer the research question of this thesis.

Consequences of Inflation in the United States Today

During the past decades, several empirical studies have sought to measure the interactions between the nominal U.S. tax system and inflation. Bullard and Russell (2004) suggest an output loss of approximately 1 percent for each 1 percent increase in inflation above the natural level for price stability (Bullard and Russell, 2004). Additionally, Feldstein (1999) has investigated how interactions between the tax system and inflation discourages savings while increasing housing demand (Feldstein, 1999). There is a uniform agreement amongst economists that stable low inflation is a prerequisite in maintaining the public's confidence in policymaking, following Friedman (1968).

2.6.4 Impact of Inflation on Financial Instruments

During the past decades, several academic research papers have focused on economic mechanisms that link unexpected inflation to asset prices. For example, attempts to study the impact of unexpected inflation on asset returns includes research by Fama and Schwert (1977). They found the impact of unexpected inflation to be weaker than the one of expected inflation (Fama and Schwert, 1977). It is essential to distinguish between permanent and temporary inflation shocks when determining the impact on financial instruments. Asset prices such as bonds and equities are long-lasting and will therefore be more sensitive to long-term inflation.

Bonds

Treasury bond prices are without doubt affected by unexpected inflation. Their current prices reflect an expected real interest rate, an expected rate of inflation and a risk premium (Neville et al., 2021). When facing an unexpected surge in inflation, the expected inflation embedded in the yield increases and the bond price tends to decrease. If the new level of inflation is expected to be permanent, bonds with high duration will be more sensitive than those with shorter duration. Additionally, increased uncertainty around the level of inflation may affect the risk premium.

Equities

Equities are more complicated than Treasury bonds. However, there are several ways in which increased inflation can affect stock prices. First of all, unexpected inflation is often associated with future economic weakness (Neville et al., 2021). Even though overheating of the economy may cause companies' revenues to increase in the short term, if the inflation results in the economy show weakness, this will affect future expected cash flows negatively. Secondly , high levels of inflation creates economic uncertainty, thus harming the companies' ability to plan, invest and grow. Furthermore, although firms operating in monopolistic markets can increase their output prices to mitigate the impact of an inflation shock, most companies can only partially pass on the increased input costs. Hence, margins will shrink. Thirdly, unexpected inflation could lead to an increase in risk premiums, thus reducing equity prices. Finally, high-duration stocks, such as growth stocks which promise dividends in the future are especially sensitive to increased discount

rates that result from high inflation (Neville et al., 2021).

Recent research has also shown that the starting point of inflation plays an important role when determining the effect of inflation on equity returns. Increasing inflation is found to be positive for stock returns if the current rate is below 1 percent, and escaping from deflation (Neville et al., 2021). In all other cases, rising inflation has a negative effect on real equity returns.

Commodities

Commodities include agricultural products and raw materials that can be traded. Common examples of these commodities can be: Grains, oil, coal and metals. These goods are essential for everyday life and as economic forces push the prices of goods and services upward, commodities tend to respond quickly during inflation. Consequently, commodity prices can be seen as a leading indicator of inflation since they are sensitive to changes in both supply and demand.

There is a broad agreement amongst economists that investing in commodities is a powerful way to hedge against unexpected inflation. New research has introduced the concept of inflation beta – an asset's predicted reaction to a unit's increase of inflation (Wang, 2021). She found that over the last decade, commodities rose between 7 percent and 9 percent for every 1 percent of unexpected inflation the economy experienced. The fact that commodities serve as a significant hedge against unexpected inflation is further confirmed by the empirical research of (Neville et al., 2021).

3 Data Sample

This chapter includes an overview of the data sources, as well as the process of collecting and refining the data. In addition, we will discuss the validity and reliability of the provided data.

3.1 Data Collection

In our analysis, we will primarily use the time series data collected from the U.S governmental departments such as the Federal Reserve, U.S. Bureau of Economic analysis (BEA) and U.S Bureau of Labor Statistics (BLS). The data sources for the most central time series are presented in the sections below. Since our primary focus is on the immediate policy responses following the COVID-19 outbreak, large parts of the data are recent and collected for the years of 2020 and 2021. At the same time we consider long time-series data, in order to include historical crises. This will enable us to explore the economic development in the years preceding the two most recent recessions in the United States. In table 3.1, we have presented the most central time series.

Table 3.1: Central Data Sources

Data	Description	Time-period	Source
Output	Seasonally adjusted Real Gross Domestic Product nominated in chained 2012 dollars	2009 - 2021	U.S. Bureau of Economic Analysis
Stocks	S&P500 index of monthly observations	1995 - 2021	S&P Dow Jones Indices
Housing Prices	Real housing prices deflated by CPI	1995 - 2021	OECD
Inflation - CPI	CPI for all urban consumer. Seasonally adjusted and monthly frequency	2011 - 2021	U.S. Bureau of Labor Statistics

To further supplement our discussions, we have used selections of qualitative data, such as; press conferences and statements from the Federal Open Market Committee (FOMC). In the following sections, we will present data sources and the choice of data in which our analysis largely relies upon. All other data is summarized and presented in table A1.1 in the appendix.

3.1.1 Output

In order to measure output gaps, we will need estimates of potential Gross Domestic Product (GDP), which cannot be observed directly. In chapter 4, we will introduce the HP-filter as our preferred method for estimation. We will utilize seasonally adjusted real GDP as our metric for output. The time series is measured quarterly and nominated in chained 2012 dollars. Our measure of GDP is adjusted for inflation to provide the most comprehensive picture of the current economic conditions in the United States. This is in line with the U.S Bureau of Economic Analysis which provides the data.

3.1.2 Inflation

We will use the consumer price index (CPI) as our measure of inflation. The data measures the average monthly change in the price of goods and services paid by urban consumers. Later in the analysis, we will have included measures of personal consumption expenditures (PCE) and producer price index (PPI) to illustrate the current inflationary pressure in the United States. All data is collected from the U.S Bureau of Labor Statistics and is seasonally adjusted to remove undesired effects such as weather, seasonal changes and holidays. For decision-making purposes, authorities often use core inflation by excluding volatile factors, such as; food and energy. However, during the pandemic, these commodities have experienced massive inflation beyond what is considered as normal fluctuations. As a result, we argue that these are important to include due to the fact that they heavily influence the financial leeway of Americans.

3.1.3 Housing Prices

To analyze developments in the U.S housing market, quarterly data from the Residential Property Prices Indices (RPPIs) from OECD is applied. The database collects residential housing prices over time. From the database, we have retrieved the U.S real house price index, extracting quarterly observations. The U.S real house price index is given by nominal housing prices deflated by the PCE inflation measure, delivered by the U.S Bureau of Labor Statistics. The housing prices are indexed with the base year of 2015 and seasonally adjusted (OECD Data, 2021). The index will serve as a proxy for house prices, and is evaluated against a trend parameter in the HP-filter.

3.1.4 Stock Prices

For the stock market, we will use the SP 500 which is widely regarded as the best single gauge of large-cap U.S equities (SP Dow Jones Indices, 2021). This index measures 500 leading companies in leading industries in the U.S economy, and is float-adjusted market cap weighted/weighed. The data is collected from SP Dow Jones Indices LLC, and measures monthly end of period prices. As this is a price index and not a total return index, dividends are excluded. We argue that the SP 500 provides a good estimation of the general condition in the stock market in the United States as it covers approximately 75 percent of all U.S equities. Later in the analysis, we will apply the HP-filter to measure the performance of the stock market against a trend parameter. Consequently, we can then assess the deviations that might provide evidence to help answer the research question of this thesis.

3.2 Reliability

Reliability refers to the extent to which a measurement of a phenomenon provides consistent and stable results (Wilson, 2014). Consequently, the degree of reliability in the data depends on consistency and replication. As the data applied in our analysis is available to everyone and can be downloaded directly from the source, it can easily be replicated. The method used to process and refine the data is described in chapter 4 to ensure consistency and transparency. Furthermore, we use historical time series with a high frequency of observations that are collected within a fixed time frame to make them consistent. Since we base our analysis primarily on data generated by reliable governmental institutions, we argue that our data has a high degree of reliability.

3.3 Validity

Validity refers to whether the data measures what it is intended for (Wilson, 2014). In other words, we need to ensure that the data is appropriate for the purpose of the thesis. When assessing the validity of our data, it is important to evaluate both internal and external validity. As we are studying macroeconomic features in light of an ongoing pandemic, there may be scenarios where internal validity is challenged with regards to

causality. However, our objective is not to draw conclusions based on causal relationships. We use the time series data to support arguments, to picturize economic challenges and provide indications that would help in answering our research question. Furthermore, our analysis is based on data from the present time. Most of the data series are updated either daily, monthly or quarterly, in which it would be possible to obtain slightly different results in the future. However, as of today, the data is considered appropriate for our purpose of evaluating the present economic condition in the United States. Consequently, we argue that the data series are valid.

4 Methods

Macroeconomists have struggled to make sense of their models after integrating new COVID-19 observations, as the pandemic led to economic disruptions worldwide. Since March 2020, the huge variance in macroeconomic series such as domestic product, unemployment, manufacturing product, and inflation rates have distorted estimated coefficients. This has been shown for U.S data in research by Schorfheide and Song (2021), Lenza and Primiceri (2020) and Carriero et al. (2021). Consequently, it is difficult to isolate the effect of fiscal and monetary stabilization policies during the pandemic. After March 2020, the variance impacts parameters of conventionally estimated models, such as the Phillips Curve and Vector Autoregressions (VAR), making empirical analysis covering this period a real challenge Bobeica and Hartwig (2021). Consequently, we have chosen an approach of analyzing the developments in the economy by assessing the Hodrick-Prescott filter. Through this chapter we will explain the reason behind our choice, advantages, and limitations of the method.

4.1 Hodrick-Prescott Filter

As the majority of the analysis is based on the macroeconomic time series, the Hodrick-Prescott filter (HP-filter) will be applied. The HP-filter is a mathematical formula, often utilized in macroeconomics, to remove cyclical fluctuations of a raw data time series (Hodrick and Prescott, 1997). Most macroeconomic time-series fluctuate around a growing time trend, where the trend reflects the forces described in the theory of economic growth (Sørensen and Whitta-Jacobsen, 2010). The analysis will in this case focus on explaining the fluctuations around a trend component. Thus, the HP-filter will be applied, as it is desired to analyze trends and short-term fluctuations separately.

Following Sørensen and Whitta-Jacobsen (2010), we will use an example of HP-filter used to decompose the time series of real GDP. Consider Y_t to represent GDP at time t, where Y_t is a product of Y_t^g – the trend value of Y_t, and a cyclical component Y_t^c which fluctuates around the trend component with a mean value of 1, denoted as:

$$Y_t = Y_t^g \cdot Y_t^c \tag{4.1}$$

The assumption of Y_t^c having a mean value of 1 implies that $Y_t = Y_t^c$ on average. Equation 4.1 show that if Y_t^c, the amplitude of fluctuations remains constant, the absolute amplitude of fluctuations will rise at the same rate as the trend level. As a result, the percentage deviation from the trend will tend to stay constant over time. Furthermore, it is convenient to work with the natural logarithms of the variables, instead of working with the variables themselves. The reason for this, is that the natural logarithm of a variable approximates the percentage change. Thus, we transform the variables to their natural logarithm such as:

$$\ln Y_t = \ln Y_t^g + \ln Y_t^c \tag{4.2}$$

For simplicity, we refer to the natural logarithms of the variables as lower-case letters: y, g and c. Shown as:

$$y_t = g_t + c_t \tag{4.3}$$

The objective of the method is to estimate the cyclical component and growth component separately, given only observations of y_t. The HP filter seeks to minimize the weighted average of the cyclical component and the variation in the growth rate of the trend. This is done by minimizing the sum of the squared bicycle components and minimizing the sum of the squared deviations between the trend components multiplied by λ:

$$\min \sum_{t=1}^{T} (y_t - g_t)^2 + \lambda \sum_{t=2}^{T-1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2 \tag{4.4}$$

The first term $y_t - g_t$ measures the cyclical component of the time series, while the term multiplied by λ measures the change in the estimated trend growth from one period to the period after. The value of λ determines the relative weighting of the two objectives of the HP-filter. Thus, it introduces a trade-off between: Minimizing the change in the estimated trend growth over time, or the variance of the cyclical component. For a low value of λ, excessive weighting is given to the assumption that all observed fluctuations in the time series reflect changes in the underlying trend. Thus, a higher value of λ can result in a substantial gap between the trend and cyclical component, as it will be assumed that

the trend is smooth, being on the verge of a linear trend line.

Choosing the value of the smoothing parameter can be challenging, as there is no objectively correct value of the parameter (Grytten and Hunnes, 2012). As a result, the choice of λ introduces arbitrariness when using the HP-filter. Hodrick and Prescott (1997) recommends a $\lambda = 1{,}600$ to extract business cycle fluctuations in quarterly data. In the literature, it is a somewhat established idea that it can be convenient to use a $\lambda = 100$ for yearly data, $\lambda = 1{,}600$ for quarterly data and $\lambda = 14{,}400$ for monthly data (Grytten and Hunnes, 2016). However, the increased variance in economic variables increase the possibility of wrong estimations, due to the end point problem discussed below. Considering this problem, we will use higher smoothing parameters as the trend line will be affected by the latest volatile observations.

4.1.1 Assumptions and Weaknesses of the HP-Filter

The HP-filter has some drawbacks and assumptions that might lead to problems in the analysis. Firstly, the traditional HP-filter is two-sided (HP-2), where it includes observations from time t and backwards, as well as using information beyond time t to filter y_t. Consequently, the HP-2 revises its inference on all observations in the sample, as new observations become available (Wolf et al., 2020). Thus, the method includes imprecise estimates at end- points of the time series, which can generate new cycles even though not observed in the dataset (Cogley and Nason, 1995). This could be problematic as we are interested in analyzing the most recent developments in the collected time series. An alternative is to apply the one-sided HP-filter (HP-1). The HP-1 only includes observations from time t or earlier. Thus, the HP-1 has less emphasis on the latest observations in the data series, which reduce the problem of imprecise estimates at the end- points. This reduces the HP-2 real-time problem. However, one drawback of the one-sided filter is that it fails to discard low-frequency fluctuations to the same degree as the two-sided filter (Stock and Watson, 1999). Due to the problem of discarding low-frequency fluctuations, HP-1's s is mainly attractive for predictive tasks. Thus, it's found to be reasonable to use the traditional HP-2 filter, due to the advantages of the time series analysis. Furthermore, due to the HP-2's simplicity and prevalence, the method seems to be suitable for the purposes of the analysis.

An assumption of the HP-filter is that expansion phases and contraction phases in the cycles have the same length. This is clear from the fact that the HP-filter mathematically squares the first term of the minimization formula. In this way, positive and negative deviations will be given equal weight, which means that the average of the cyclic component will approximately equal to 0. This is a strong assumption as an upturn period usually lasts longer than a downturn period. The downturn period often comes quickly and unexpectedly after a period of long upswings (Romer, 1999). Although the HP-filter has its limitation, it serves as a good indicator for analyzing trends and deviations. In addition, its simplicity makes it easier to circumvent the problems of increased variance in important macroeconomic variables, relative to other conventionally used estimation models. We therefore judge the method to be a suitable choice for the purposes of this thesis.

5 COVID-19 Pandemic

The COVID-19 pandemic is causing havoc on societies all over the world, and has led to a sharp downturn in the American economy. During the COVID-19 crisis, great uncertainty around future development has occurred alongside weakened financial stability. According to Grytten (2020), the COVID-19 crisis is a real economic crisis initiated from the supply side of the economy. This is further backed by research conducted by the Federal Reserve, who found that in 2020:Q2 roughly two-thirds of the decline in real GDP is due to an aggregate supply shock (Bekaert et al., 2020). The main argument for categorizing the pandemic as a supply shock is that businesses have fully or partially shut down their operations after restrictions from the government.

The following section will present the consequences of the real economic crisis in the United States. To further present how the COVID-19 crisis and implemented measures have affected production and price development in the economy, we will apply the AD/AS framework.

5.1 COVID-19 as a Real Economy Crisis

As a result of the outbreak of COVID-19, the Real Gross Domestic Product (GDP) in the United States decreased at an annual rate of 31.7 percent in the second quarter of 2020. When put into historical context, this was the largest drop in economic output since record keeping began in 1947 (Bureau of Economic Analysis, 2020). In order to slow the spread of the virus, the government mandated social distancing practices and instructed all non-essential firms to shut down. Consequently, sectors such as tourism and air transportation experienced evaporating demand. Other sectors have experienced issues on the supply side as a result of forced business shutdowns and the fact that workers are confined to their homes. The impact of the corona crisis on the real economy is illustrated in Figure 5.1.

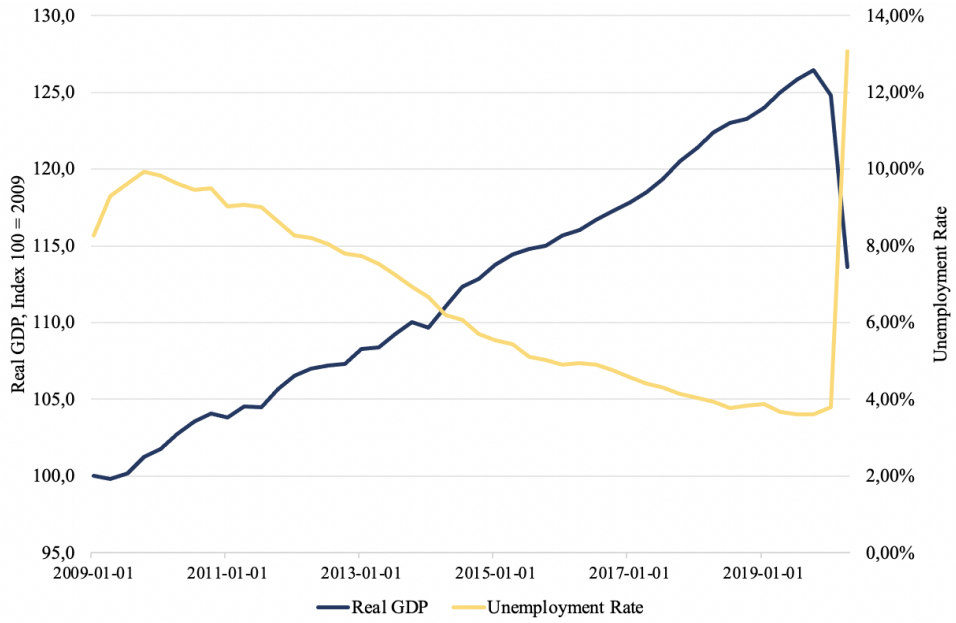


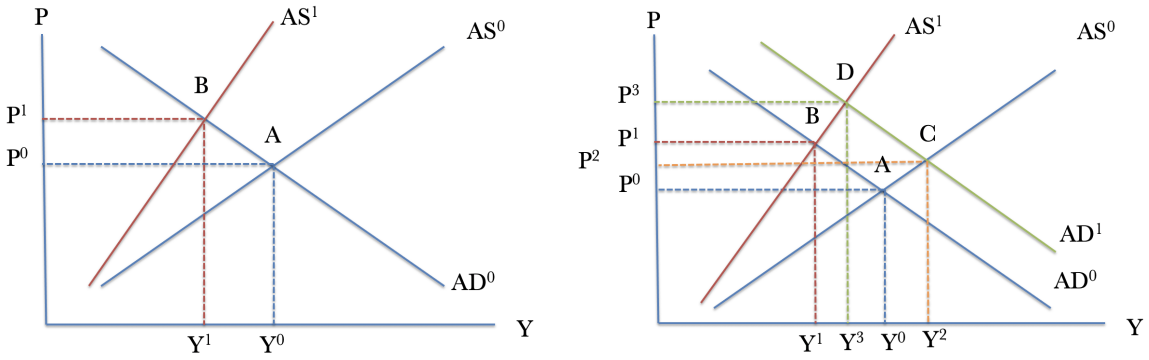
Figure 5.1: The COVID-19 Effect on Real GDP and Unemployment, Source: Bureau of Labor Statistics (2021)

As a result of lower production and lost income, firms have been forced to initiate layoffs and termination of employees. From figure 5.1, we see the tremendous surge in the unemployment rate passing 14 percent of the total labor force in April 2020. Although some people were able to work from home, the numbers of unemployed increased sharply in the early stages of the pandemic.

Following the real economic crisis, the government implemented aggressive fiscal and monetary policy in an attempt to ensure recovery of the American economy. When determining fiscal and monetary policy responses, it is crucial to distinguish demand shocks from supply shocks, as these require different stimuli. While it is intuitively clear that the financial crisis of 2008 constituted aggregate demand shocks, and the 1970s oil crisis had an aggregate supply shock, the economic fluctuations during the pandemic combine a wide range of different effects. Hence, the following section will elaborate on the complexity of the pandemic using the AD/AS framework.

5.2 The COVID-19 Supply Shock

By applying an AD/AS model, we will show the negative supply shock and the government's response to the crisis. The illustration is shown in figure 5.2.



(a) Negative Supply Side Shock

(b) Effect of Expansionary Policy

Figure 5.2: The COVID-19 crisis in the AD/AS framework (Grytten, 2020)

At first, the economy is assumed to be in an initial equilibrium at point A. The forced shutdown has triggered an exogenous shift in aggregate supply causing imbalances in the economy. The effect of the shutdown is a shift in the AS-curve from AS0 to AS1, which results in higher prices and lower output. This shift in equilibrium to point B creates pressure on inflation. We are now faced with a situation where the authorities want to mitigate the effects of the crisis by offering financial relief packages, while keeping interest rates close to zero. The goal of the expansionary economic policy is to push equilibrium to point C, where total output (Y2) has increased and the price level (P2) has cooled down. However, the economy ends up in point D with slightly higher production (Y3) and significantly higher prices (P3). The reason behind this is that the provided stimuli has boosted demand while the supply side is hampered by the pandemic. This is an unfavorable situation for the economy as it contributes to higher inflation and financial instability in the long run.

It is important to point out that this is a hypothetical representation of how the covid-19 pandemic and the government intervention has affected the American economy. Later in our analysis, we will discuss the magnitude of the fiscal and monetary policy response to the pandemic. Furthermore, we will link the policy responses to the current inflationary regime in the United States.

6 Fiscal Policy

The expansionary fiscal policy response to the pandemic in the United States has been unprecedented. From the initial response to the crisis, the government has spent more than $5 trillion on legislation related to the pandemic (Commitee for a Responsible Federal Budget, 2021). This translates into roughly 25 percent of the total GDP. Although the response of the United States can be categorized as aggressive, most countries have increased spending to ensure economic recovery (International Monetary Fund, 2021).

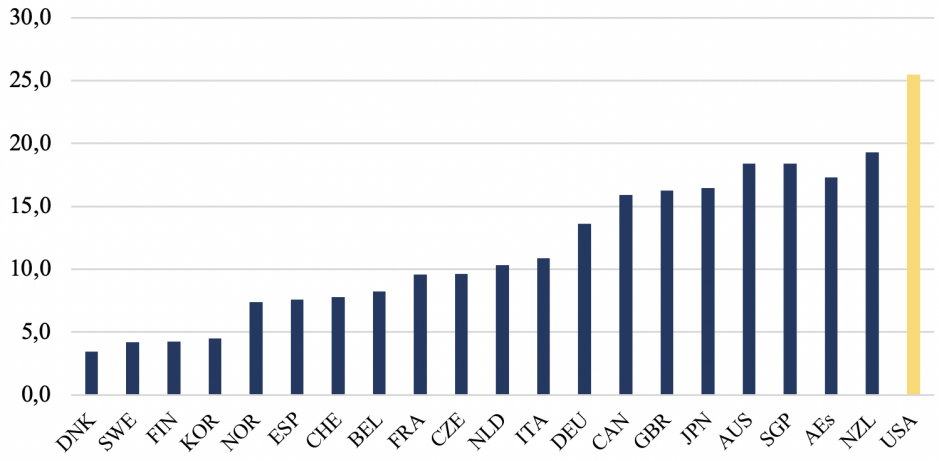


Figure 6.1: Discretionary Fiscal Support in percentage of GDP (IMF, 2021)

As we reach the end of the second year of the pandemic, this section seeks to evaluate these extraordinary actions. We aim to discuss whether the composition of the U.S fiscal packages has been appropriate when dealing with the unique circumstances of the pandemic. Furthermore, we will raise concerns around the possible repercussions for the future.

6.1 Fiscal Policy Response

"The fiscal response to the pandemic in the United States runs the gamut from highly useful and appropriate to largely ineffective and wasteful"

- Christina D. Romer

The statement above fits well with the research question of this thesis, as we want to investigate whether the policy response has been well-targeted in boosting the American economy. The author argues that the COVID-19 pandemic is fundamentally different from ordinary recessions, and thus requires distinct policy responses (Romer, 2021). Hence, we will present the different packages before describing their provisions.

On March 27, 2020, the CARES Act was signed into law as the largest stimulus package in U.S history (Commitee for a Responsible Federal Budget, 2021). The CARES Act appropriated nearly $2.3 trillion aimed at delivering critical assistance to the U.S economy. Another relief package was signed into law on December 27, 2020 and named The Consolidated Appropriations Act. This package allocated $900 billion to direct payments to households, unemployment benefits and financial assistance to affected firms (Commitee for a Responsible Federal Budget, 2021). On March 11, 2021, President Joe Biden signed the American Rescue Plan that promised direct relief to the American people (The White House, 2021). The size of this relief package was approximately $1.9 trillion. These three financial relief packages represent the largest and most influential actions launched by the government. In addition to the described packages, several supplementary legislations have been signed into law during the pandemic. The Congressional Budget Office reports a $3.1 trillion US fiscal deficit in 2020, which is equivalent to 15 percent of the country's gross domestic product. In fiscal year 2021, the deficit totalled nearly $2.8 trillion, or 12.4 percent of the GDP (Congressional Budget Office, 2021). There have only been two instances in the modern history of the United States where the deficit has reached double digits (Neville et al., 2021). Table 6.1 provides an overview of the total spending on pandemic-related stimuli divided in provision categories.

Table 6.1: Breakdown of Fiscal Stimulus

Provision	Impact on deficit
Enhanced Unemployment Benefits	$748 billion
Direct Assistance to Local Governments	$597 billion
Health Care Spending	$599 billion
Direct Payments to Households	$870 billion
Paycheck Protection Program	$808 billion
Other Loan and Grant Provisions	$222 billion
Other Spending Provisions	$938 billion
Tax Reductions	$426 billion
Total	$5210 billion

Source: (Commitee for a Responsible Federal Budget, 2021)

6.2 Desired Policy Response

The first step in assessing the desirability of various fiscal measures is to consider how pandemic recessions differ from ordinary ones. Traditional recessions involve a decline in aggregate demand, initiated by various factors, such as increased consumer uncertainty, contractionary monetary policy or financial distress. As described earlier, the COVID-19 recession has experienced a significant drop in aggregate demand. Businesses within the travel industry, leisure and dining experienced evaporating demand in the beginning of the pandemic. However, the parallel between ordinary and pandemic recessions ends there.

One difference between a normal recession and a pandemic is the harm that different types of workers endure. For instance, some non-medical professionals such as consultants and customer service representatives can easily switch to working from home during a pandemic. However, for those in sectors that are heavily affected by the pandemic, such a drop in demand will severely affect their jobs. These sectors include brick-and-mortar, retail, and hospitality.

A second difference is the objective of the policy. During a traditional financial crisis, the government seeks to increase aggregate demand in any way possible. In a pandemic, the goal is to stimulate as much output as possible while protecting the full employment that can happen safely. Furthermore, the effects of aggregate demand stimulus are not felt across the economy during the COVID-19 pandemic. This is a direct opposite to the

traditional Keynesian view where spending in one area flows into spending throughout the economy. Such a knock-on effect is absent when parts of the economy are shut down.

Aforementioned, the pandemic recession is a crisis initiated from the supply side of the economy. The combination of a decline in both aggregate supply and aggregate demand is another characteristic where the COVID-19 crisis differs from ordinary recessions. As a result of the unique characteristics of this pandemic, the fiscal policy should focus on measures to stimulate production and affected businesses. This leads us into the following section where we will discuss the targeting of different provisions within the fiscal packages.

6.3 Evaluation of the Fiscal Stimuli

This section will evaluate and discuss the impact of the U.S fiscal policy and how it has affected the economy. Based on the discussion above, we will assess to what degree the fiscal response has targeted the most affected part of the economy, namely: the supply side. We aim to focus on the largest provisions within the fiscal packages, namely: unemployment insurance, the Paycheck Protection Program and direct payments to households.

Unemployment Insurance

The expansion of unemployment benefits accounts for about 14 percent of the $ 5.2 trillion fiscal packages. In the broad picture, we find the unemployment insurance (UI) program to be well-reasoned in response to the unique situation of the pandemic. The main target of the UI program was to help individuals maintain consumption if they lost their jobs or were put on temporary layoff due to the shutdown. During the second quarter of 2020, the unemployment rate had risen to 12.8 percent, and more than 20 million Americans were either classified as permanently unemployed or temporary layoffs (U.S. Department of Labor, 2021).

The CARES Act expanded the current UI program to be eligible for all unemployed workers including the self-employed and workers with short work history, who previously had been ineligible for regular UI. As a result, the recipiency rate rose to almost 100 percent towards the end of the third quarter in 2020 (U.S. Department of Labor, 2021). Prior to the pandemic, the ratio of those receiving benefits to the total number of the

unemployed was 30 percent. Consequently, one could argue that these measures have been effective to target the portion of the population most affected by the COVID-19 pandemic.

We argue that the expanded UI program is primarily targeted towards aggregate demand. By providing aid to those directly affected by the pandemic, the government obtains reduction in poverty and increased consumer spending. As unemployed workers lose the majority of their income, we would argue that they are likely to spend the aid on necessities such as groceries and rent, as opposed to savings. Hence, the allocated money is likely to flow through the economy and increase aggregate demand. One drawback of the UI program is that it could potentially incentivize more people to become unemployed instead of working. However, we argue that the expanded unemployment insurance program is effective in reducing inequalities and increasing aggregate demand.

Paycheck Protection Program

The primary purpose of the Paycheck Protection Program or PPP is to help businesses retain their existing employees. The program was designed as forgivable loans to businesses with less than 500 employees (later adjusted to under 300 employees) in order to maintain payrolls and cover various fixed costs. These loans account for about 16 percent of the total fiscal support. Due to the characteristics of the package, we will examine whether the deeper rationale was to preserve the firms or jobs. Hence, we seek to evaluate if the PPP has delivered a supply side stimulus, as intended.

At first glance, the Paycheck Protection Program appears to be targeting the supply side of the economy. Empirical evidence from 2020 suggests that firms which applied for PPP loans were much less likely to go bankrupt, were more likely to pay their bills on time, and were more likely to maintain their current employee structure (Hubbard and Strain, 2020). Furthermore, Bartik et al. (2020) estimate that the marginal survival rate of small firms increased by 9 percent to 23 percent, as a result of the PPP. Consequently, we argue that the PPP partially helped smaller firms withstand sharp declines in revenues while staying connected to their employees.

Even though the PPP is initiated as a supply side stimulus, it has ramifications on the demand side of the economy. Recipients of PPP loans were required to spend at least

60 percent of the proceeds on payroll costs (U.S. Small Business Administration, 2021). Hence, a large amount of the allocated money ended up in the pockets of employees and increased their propensity to spend. According to Faulkender et al. (2020) the PPP program resulted in 18.6 million jobs preserved. Consequently, we argue that the PPP has provided additional support to the demand side of the economy. The argument of keeping the unemployment rate as low as possible is sensible, but at the same time it is accelerating the increase of aggregate demand. Workers who otherwise would have lost their jobs are being subsidized by the government and kept on pay rolls. In isolation, this appears to make economic sense. However; when put in context of the pandemic, this could be problematic in several aspects. As long as there are strict restrictions on production, it is pointless to maintain a strong working force if the workers do not have a place to work once the pandemic is over. However, if the employees can return to work once the pandemic is over, the PPP can be seen as a supply-side stimulus in the long run.

In order to survive through the pandemic, it is essential for small firms to receive financial support to cover fixed costs, such as rent (Hubbard and Strain, 2020). Therefore, it is crucial for the government to play a bigger role in the survival of smaller firms, which ultimately will stimulate the supply side of the economy.

Direct Payments to Households

About $870 billion of the fiscal response packages was allocated for one-time stimulus payments Commitee for a Responsible Federal Budget (2021). This translates into 17 percent of the total fiscal spending. These lump-sum payments went to everyone below a certain income threshold set by the government, and were split in three rounds of $1200, $600 and $1400. Because of their broad reach, these payments gave many households a boost during a difficult time. However, we believe that the "one size fits all" policy is likely to fall short in providing relief to people that are most affected, and it could potentially have undesired spreading consequences for the rest of the economy.

Based on a large survey conducted by the U.S census bureau, households were more likely to spend their first stimulus check, and save or pay off debt with their second and third payments. These findings are summarized in figure 6.2. A further breakdown shows that U.S households spent around 40 percent of the checks, and the remaining 60 percent were either saved or used to pay down debt (Coibion et al., 2020). Additionally, instead of

spending on durable goods, most of the stimulus money went to non-durable consumer products such as food and household goods that had already seen large spikes in spending even before the stimulus package was signed into law.

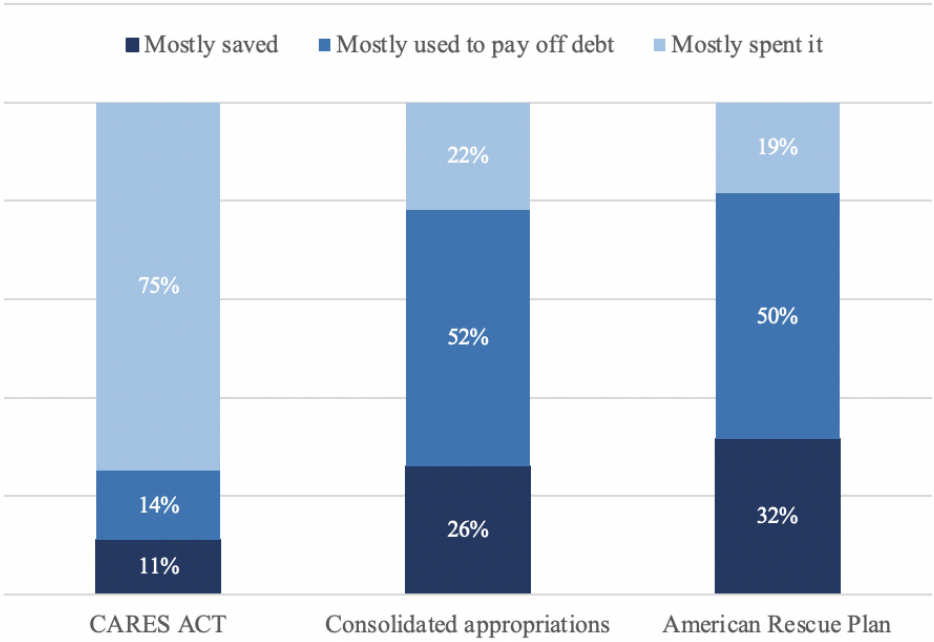


Figure 6.2: How Direct Payments Have Been Spent (United States Census Bureau, 2021)

First and foremost, the one-time stimulus payments appear to be very poorly targeted. While it is rational to claim that the payments were helpful to the most affected U.S households, surveys have shown that most of the money went to people who were not economically affected by the pandemic (Coibion et al., 2020). Consequently, the financial aid has been poorly targeted towards those who were truly harmed by the COVID-19 lockdown. This is in direct conflict with the Keynesian idea that general stimulus ultimately flows through the entire economy. Generally, during a recession, measures that increase aggregate demand help jobless workers throughout the economy. During a pandemic however, we could argue that stimulus efforts are not able to help workers in sectors that are currently closed.

Another concern with the direct payments is the potential increase in aggregate demand and its ramifications for the American economy. In the short run, aggregate demand is expected to increase as a result of spending the stimulus checks. Additionally, it is argued

that most of the money went to sectors that were not severely harmed. This further substantiates the argument of excessive aggregate demand. Furthermore, the accumulated savings of American households has increased significantly during the pandemic, as shown in figure 6.3. This is consistent with the findings of (Coibion et al., 2020). Once the society re-opens and supply side bottlenecks are gone, we could see a burgeoning of consumer demand driven by accumulated savings following the pandemic.

Figure 6.3: Personal Saving as a percentage of disposable Income (BEA, 2021)

Summarizing the Provisions

Overall, we argue that the U.S fiscal support has failed to encounter the effects of the COVID-19 pandemic, by mostly providing demand side stimulus to an economy in need of supply side stimulus. Even though the U.S. government views the PPP as supply side stimuli, we argue that it has demand side ramifications in the short run. To a large extent, the fiscal packages have provided stimuli to boost demand, while the supply side is hampered by the pandemic. This is in line with the described scenario visualized in the AD/AS framework, where the fiscal stimulus appears to have facilitated a demand pull inflation.

6.4 Impact of the Fiscal Policy Measures

Based on the magnitude and composition of the fiscal packages, there is much to suggest that the U.S economy has been overstimulated. Following the financial crisis in 2008, policymakers received criticism for their lack of appetite for fiscal policy intervention

(Ball et al., 2014). In the period between 2008 and 2012, the federal government spent roughly $1.8 trillion in fiscal stimulus (Commitee for a Responsible Federal Budget, 2021). Almost two years into the COVID-19 pandemic, the government has enacted $5.2 trillion of fiscal stimulus. However, when comparing the response of the two different crises, it is important to link the scale of the problem with the magnitude of the response. Figure 6.4 shows the negative output gap for the financial crisis and the COVID-19 pandemic, and its corresponding fiscal stimuli in percentage of GDP.

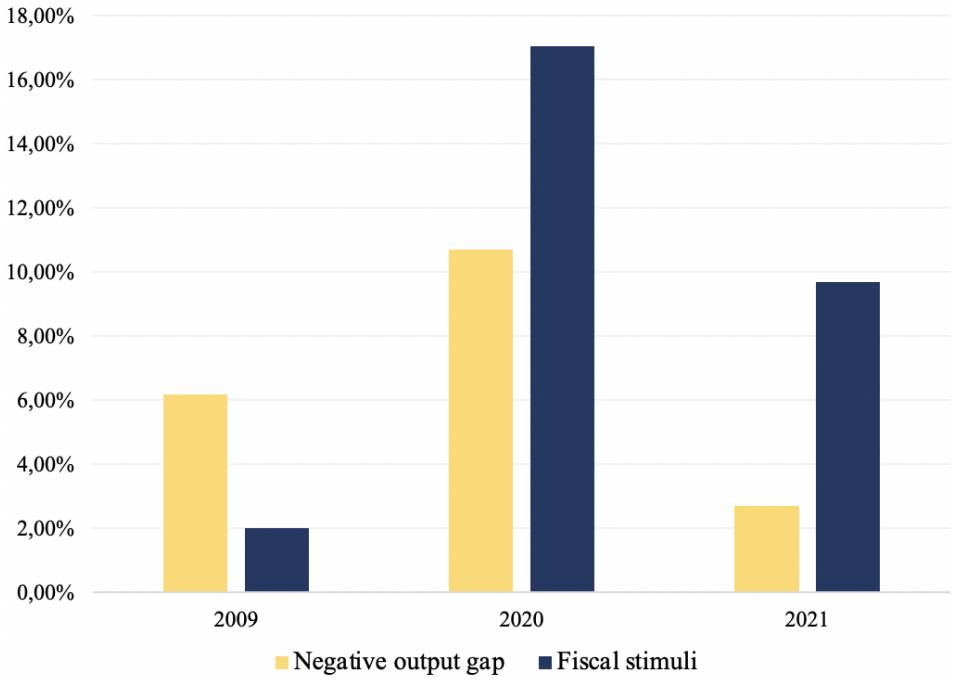


Figure 6.4: Output Gaps and Fiscal Responses in percentage of GDP (CBO, 2021; BEA, 2021)

The year of 2009 is chosen to illustrate the initial fiscal support as a response to the financial crisis. The IMF estimates that 2 percent of the total GDP was initiated during the year of 2009, and the rest of the $1.8 trillion stimulus was provided in the period between 2010 and 2012 (International Monetary Fund, 2009). To further substantiate our concern over too much fiscal stimuli, we see from figure 6.4 that the provided fiscal support during COVID-19 is significantly higher than the total negative output gap for the period. At the time where the American Rescue Plan was enacted, we see that the American economy has recovered from the initial COVID-19 shock. Despite this, the government approved a stimulus of roughly 10 percent of GDP in the face of a gap that is below 3 percent. The estimates indicate a negative output gap of around $330 billion for

Q2:2021 (U.S. Bureau of Labor Statistics, 2021). These are just estimates, and in reality, the output gap could be higher or lower.

However, based on the numbers presented in figure 6.4, the U.S government indicates a need for $1.9 trillion to close a gap of $330 billion. If the U.S government's intention is to close the output gap, the stimulus of $1.9 trillion would imply that they are assuming the fiscal support to yield a cumulative fiscal multiplier of 0.2. From the empirical research, a cumulative fiscal multiplier of 0.2 seems highly unlikely. We know that the majority of the fiscal stimulus provided during the pandemic have been government spending, not tax cuts. Following the empirical results presented in table 2.1, the cumulative fiscal multiplier of government spending is ranging from 1.1 to 3.3 after the second year, with further effects after three years.

According to the research on U.S fiscal policy, it highly unlikely that the government need to spend approximately $5 for a $1 increase in GDP. Considering evidence from empirical research, it is possible to argue for a lower multiplier in the initial year, as we have observed offsetting effects, as increased savings, and payments of debt. However, the offsetting effects are not expected to last. We argue that the effects of the fiscal support will come to sight when the economy fully reopens, considering the large savings overhang. Consequently, it is reasonable to believe that the fiscal support will have a strong effect on the U.S economy over the upcoming years. We argue that the fiscal stimulus provided by the U.S government will close the output gap and provide more stimuli to the economy than necessary. It seems like the government is overdoing its requisite response by providing the $1.9 trillion stimulus package that is three times the size of the projected output gap.

6.5 Reprecussions for the Future

The main purpose of the fiscal packages was to provide immediate and direct relief to Americans bearing the brunt of the COVID-19 crisis. However, the fiscal response to the pandemic in the United States has been both useful and wasteful. While it is clear that spending on public health measures and unemployment compensations are important in light of a pandemic recession, we fear that the total amount of fiscal stimuli will lead to an overheating of the economy.

In our view, this Fiscal Stimuli appears to be economically risky. Consequently, we argue that the unprecedented amount of fiscal support can result in a surge in demand, which the supply side cannot provide, leading to increased prices. As a result, the Federal Reserve will possibly have to manage a surge of inflation.

7 Monetary Policy

The COVID-19 pandemic has led to acute stress not only in the real economy but also in many parts of the global financial system. During March 2020, the Federal Reserve acted quickly and decisively to make use of all instruments in the conventional monetary policy kit, in addition to re-employing unconventional tools to counter the economic effects of the pandemic. The Fed went even further and launched a new series of innovative measures, including the creation of numerous liquidity and credit facilities to support financial markets and the flow of credit to businesses and households.

When concerns over the impact of the pandemic rose from early to mid-March,2020; financial markets faced an unusually high selling pressure. In the United States, fixed income funds experienced an outflow of 12 percent within one month (Ma et al., 2020). Some of these funds were more vulnerable to capital outflow than others, especially with less liquid bond mutual funds, and funds holding bonds in industries directly affected by the pandemic (Falato et al., 2021). Furthermore, institutional prime money market funds experienced a huge downturn, where total assets under management reduced by around 30 percent within two weeks (Li et al., 2021). Consequently, the fear of the economic impact of the pandemic initiated a financial crisis in the early stages of March 2020.

This chapter is introduced by presenting the standard monetary policy actions, followed by a presentation of the more creative credit-interventions run by the Fed. Towards the end of the chapter, we will assess how monetary policy has influenced important macroeconomic variables.

7.1 The Standard Monetary Actions

The Federal Funds Rate and Forward Guidance

When the pandemic struck the U.S, two unscheduled meetings were held on March-3rd and March-15th by the Federal Open Market Committee (FOMC). The FOMC decided to cut the federal funds rate (FFR) by 1.5 percent with immediate effect to the range of 0 to 0.25 percent, bringing the FFR to the zero-lower bound. In the statement following the 15th of March meeting, the FOMC also used forward guidance. The committee stated

that "they would not increase the FFR until the labor market conditions had reached levels consistent with the Committee's assessments of maximum employment and inflation had risen to 2 percent and was on track to moderately exceed 2 percent for some time." (Board of Governors of the Federal Reserve System, 2020a)

Open market operations

While lowering the FFR, the FOMC introduced a massive increase in repo-operations to ensure sufficient supply of reserves and support the functioning of highly important funding markets. Furthermore, by increasing repo-operations, the Fed mitigated the risk of money market pressures affecting the policy implementations. The repo-operations temporarily increased the supply of reserve balances in the banking system, providing liquidity to crucial markets, acting as the lender for last resort (Clarida et al., 2021).

Quantitative Easing

Despite an unprecedented increase in repo-operations, both Treasury and agency MBS markets showed signs of dysfunctionality, as market liquidity dropped substantially. This is shown in figure 7.1 by analyzing indicative U.S treasury bid-ask spreads – a measure shown to be a strong predictor of market liquidity (Fleming, 2001). As a response to the illiquidity, the Fed started to purchase massive amounts of financial securities, a key tool employed during the Great Recession. On 15th of March, the FOMC stated that the Federal Reserve would increase its holdings of Treasury and agency mortgage-backed securities by at least $500 billion and $200 billion, respectively. On 23 of March, the FOMC authorized the Fed to purchase financial assets in the amounts needed to promote smooth market functionality and secure an effective transmission of the policy implementations to other parts of the financial system. The scale of quantitative easing required to maintain functionality in crucial financial markets declined in the spring of 2020, as the market functionality improved substantially 7.1.

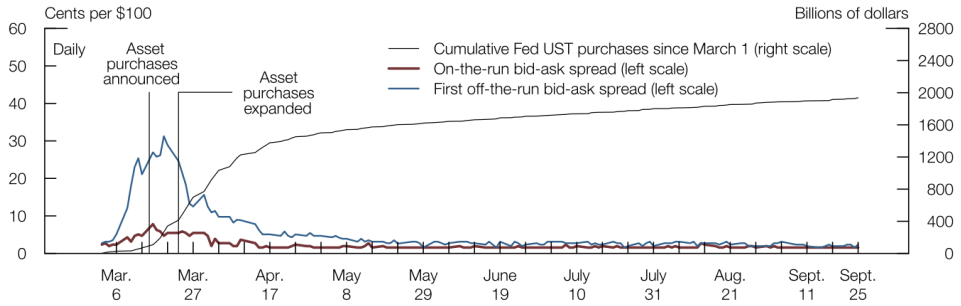


Figure 7.1: Indicative Bid-Ask Spreads of 10-Year U.S. Treasuries, Source: Federal Reserve Bank of New York (2021a)

Furthermore, the QE was heavily used to circumvent the zero-bound limit on the short-term FFR. The Fed resumed using unconventional macro-tools to lower long-term Treasury and mortgage interest rates, where the effects are shown in figure 7.2. On 10th of June, 2020, the FOMC decided that at least $80 billion a month in Treasury securities and $40 billion in residential and commercial mortgage-backed securities would be purchased monthly, to provide further accommodation and support to the economy (Clarida et al., 2021). The level of asset purchasing has been constant until November 2021, when the Fed announced that they would start tapering the asset purchasing each month (Board of Governors of the Federal Reserve System, 2021c). From the start of 2020 to Q3 2021, the Fed's portfolio of securities held outright grew from $3.9 trillion to $8.6 trillion.

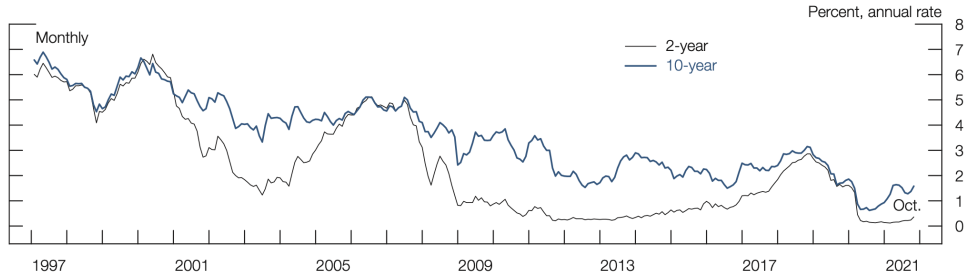


Figure 7.2: Yields on Selected Nominal Treasury Securities, Source: Federal Reserve (2021)

The use of the aforementioned policies has entailed major expansion of the Fed's balance sheet, shown in figure 7.3. At the start of the Great Recession, the Fed for the first time increased its holdings of Treasury securities as a response to the crisis. The response during the COVID-19 downturn is larger than during the great recession, and the Fed increased its assets quicker than ever before. The effects and complications of the expansion of the Federal Reserve balance sheet will be discussed in section 7.3.

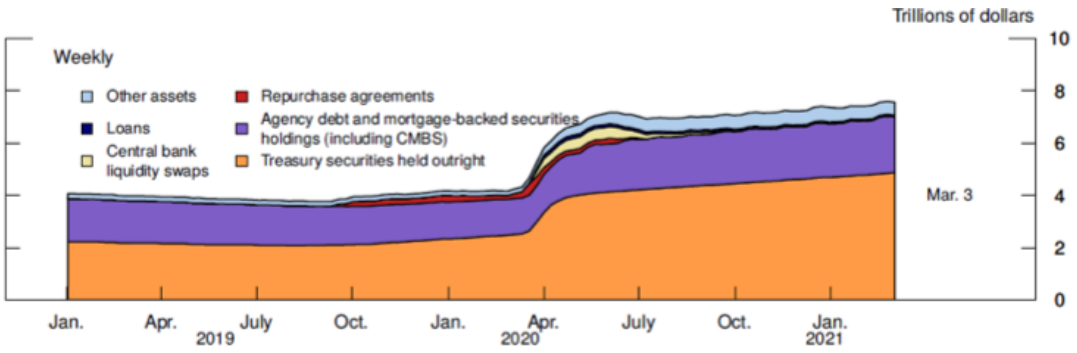


Figure 7.3: Federal Reserve Assets, Source: Federal Reserve (2021)

7.2 Credit-Policy Tools

As illustrated above, the already known unconventional monetary policy tools were quickly and heavily deployed in the beginning of the crisis. However, the effectiveness of the "traditional" policies showed indications of being limited by disruptions to credit flows. As the development in the U.S. economy was mainly driven by lockdowns and re-openings for firms and activities due to the virus spreading, evidence from several research articles has found that the credit policy run by the Fed, especially in the corporate bond market, had an impact on the entire economy. These monetary actions are highly relevant for our analysis, as lack of fiscal stimuli to the supply side may be compensated for by heavy monetary stimulus in areas affecting firms of all sizes. Thus, this section will assess the monetary accommodation to non-financial firms, and its implications.

As a result of the broad risk-off sentiment, equity prices experienced a huge drop, Treasury yields declined, and the yield spread on corporate bonds to Treasury yields widened significantly. Thus, the impact of the financial disruptions in addition with forced lockdowns, gave huge challenges to the supply side of the economy (Li et al., 2021). To understand how the pandemic caused disruptions to these markets, the effects of it, as well as how the Fed countered the disruptions, we must understand how external finance flows to non-financial firms.

Credit flow in a normal function economy

In figure 7.4, we will illustrate the flow of credit in a normal functioning economy. External finance usually flows from savers and investors (left box) via two channels: The banking system (upper box) or security market (lower box). When savers and investors deposit

capital in the banking system, banks can provide commercial and industrial (CI), and commercial real estate (CRE) loans to businesses. For small and mid-sized firms, bank loans are the main source of external credit. Savers and investors can on the other hand directly invest in financial securities, where corporate bonds and commercial paper provide the main source of external credit to large corporations. The illustration also shows how security markets fund non-bank financial firms (middle box), which also lend to businesses of different sizes (Bordo and Duca, 2021).

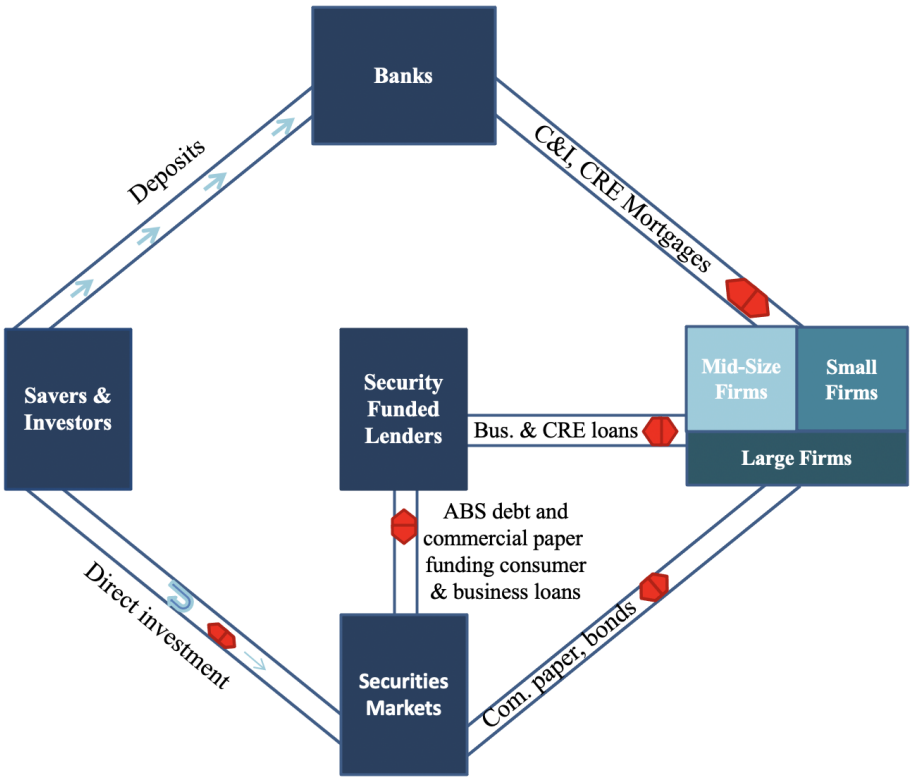


Figure 7.4: Financial Disruptions Block Channels of External Finance to Nonfinancial Firms

During the COVID-19 crisis, mainly two factors blocked the credit flows to non-financial firms. Firstly, the risk-off sentiment explained above, caused a blockage for capital to large firms from bond and commercial paper markets. In addition, security funded lenders (finance companies) could not raise capital from the security market by issuing asset-backed debt. Secondly, banks and security funded lenders feared an increase in default on loans and losing liquidity, which made these institutions reluctant to lend. Consequently, the sources of external credit financing were blocked in the beginning of 2020. Opening of these blockages has been the main motivation for the Fed's new credit-easing tools.

Reviving the Credit Channels for Large Firms

In late March, 2020, the Fed announced the creation of two programs: The Primary and Secondary Corporate Credit Facilities, PMCCF and SMCCF (Clarida et al., 2021). These programs would purchase newly issued and already traded investment-grade corporate bonds within certain credit ratings and maturities. To analyze the asset purchasing programmes, we have used the time series data on corporate bond yield spreads and Treasury yields. The reason is to analyze how the Fed interventions have prevented further reductions in economic activity from even higher widening corporate Baa-treasury spreads. Research of historical U.S monetary events by Friedman (1963) showed that the corporate Baa-spread could successfully be used as an indicator of financial crises, volatility in macro-variables and bank panics. Later this has been reinforced in the credit and financial frictions literature, where the most prominently studies are Bernanke (1983), Bordo (2008), Mishkin (1990), and Mishkin and White (2002). The literature shows by measuring yield spreads from the 1970's to the start of the Great Recession, that yield spreads on Baa-corporate bonds and 10-year Treasury bonds averaged at 2 percentage points in normal times, and in recessions it widens to 3 to 4 percent , due to greater risk aversion.

As illustrated in 7.5, corporate Baa-spreads increased together with the insured unemployment rate from around March until the Fed announced PMCFF and SMCFF. After the announcement, the unemployment rate still increased rapidly. However, as seen in the figure, the corporate Baa-Treasury yield spread stopped rising. The increase in yield spread stopped at around 4 percent. In contrast; during the Great Recession, the spread widened to 6 percent. According to Bordo and Duca (2020), the pre-COVID-19 equilibrium indicated that Baa yield spread increased with the square of the insured unemployment rate. Thus, the relationships between unemployment rate and yield spread would have predicted 2-4 percent higher spreads in April and May, than experienced. The introduction of the corporate bond programs from the Fed seems to have restrained further spikes in the cost of credit for corporations that are dependent on raising funds in the open market.

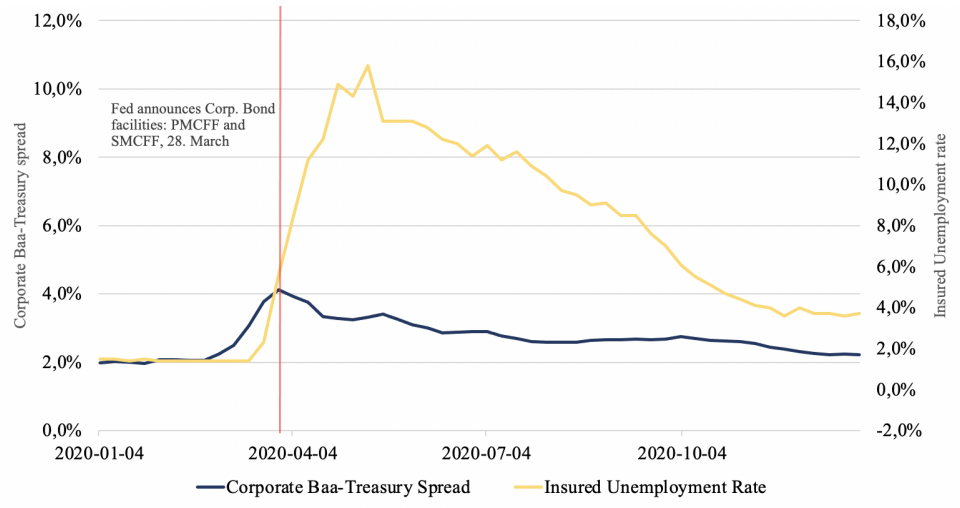


Figure 7.5: Corporate Baa-Treasury Spread and Insured Unemployment Rate, Source: Federal Reserve Bank of St. Louis

The result of the presented time-series is also consistent with detailed, difference-in-difference studies of Boyarchenko et al. (2020), D'Amico et al. (2020), and Gilchrist et al. (2020). These studies have found a causal effect of how the announcement of the Fed programs lowered corporate yields on bonds eligible for purchase by the Fed. Furthermore, Bordo and Duca (2020) finds that the Fed's intervention has prevented a further decline in the stock market, which could otherwise amplify depressed consumer spending, increase risk premiums and thus prevent a spike in the cost of business investment. The study estimates that the asset purchasing's effect on the Baa-treasury bond yield-spread prevented a further fall of 1 to 2 percentage points of real GDP in the mid-2020.

In a similar response, to restore the ability of non-bank lenders to make business loans, the Fed re-introduced the "Term Asset-Backed Securities Loan Facility" (TALF). Due to the market dysfunctionality, non-bank lenders (financial firms) were unable to securitize business, consumer, and commercial real estate loans. Thus, these institutions lost access to financing of their lending. The Fed responded by purchasing AAA-rated asset-backed securities, which provided liquidity to support financial institutions that lent to safer borrowers. Thus, the TALF program has proved the ability of non-banks financial institutions to make consumer and business loans and showed the same effects as during the Great Recession (Agarwal et al., 2010). How the TALF helped restore credit flows is illustrated in intervention number 2 in Figure 7.6.

Reviving Credit Channels for Medium -and Small Firms

As mentioned, the main source of credit to small and medium size firms is bank loans. In the spring of 2020, a credit crunch appeared: Banks made their credit standard tighter when approving and pricing loans, as the fear of higher default rates increased. In an April survey report, around 40 percent of banks responded that they tightened their credit standards on CI loans to small firms and mid-sized firms (Board of Governors of the Federal Reserve System, 2021a). To help small and mid-size businesses, as well as households, the Congress created the PPP program (Detailed explanation in section 6.3). The introduced round of PPP loans ($350 billion) was used at once. However, the second funding had over $100 billion in unused funds at expiration. Changes in rules for applying to the PPP program, in addition to banks' assessment of whether they have had funds for a spike in PPP loan requests have been pointed at for being the reasons for the unused PPP loans (U.S Government Accountability Office, 2021).

In early April, the Paycheck Protection Program Loan Facility (PPPLF) were introduced by the Fed. The PPPLF provide discounted loans to commercial banks at zero interest, using 100 percent of the value of the issued PPP loans as collateral, as PPP loans were already fully guaranteed by the U.S. Government. Thus, the Fed increased the desire to issue PPP loans, as they in a sense gave subsidy to the issued loans. Furthermore, the Fed announced the Main Street Loan Program, where they purchased qualified bank loans to middle-sized firms that were unable to raise funds through issuance of corporate bonds and were too large to apply for PPP (Clarida et al., 2021).

The effects of PPPLF and Main Street Lending may be more difficult to address than the effects of the corporate bond market. Studies show that there has been modest borrowing during the two programs. However, by analyzing bank call report data, Anbil et al. (2021) finds evidence that the PPPLF and Main Street Lending program significantly increased commercial banks' willingness to issue loans to small and mid-sized businesses. The study estimates an increase in banks issuing PPP loans doubled from 5 percent to 10 percent after the introduction of PPPLF, resulting in more PPP loans being issued. This is further backed by Lopez and Spiegel (2021), who used historical data to forecast growth in lending, in addition to call report data. The study finds the growth rate of small and mid-size business lending to be higher than predicted after the introduction of PPPLF

and Main Street Lending. The effects of PPPLF and Main Street Lending is illustrated in figure 7.6, as intervention 3 and 4.

Credit Flow After the Fed's Interventions

A consistent finding is that the Fed's new credit easing programs contributed to avoiding an amplification of the economic consequences of the pandemic. Thus, the resolution of financial frictions led to a quicker recovery of the COVID-19 crisis. This conclusion is justified by the abrupt change of the corporate bond yield-spreads and indications of less tightened credit standards. In figure 7.6; we will illustrate how the Fed, by implementing the credit-easing tools, has helped in reviving the credit channels for small, mid-sized, and large firms. Consequently, giving economic support to the supply side of the economy.

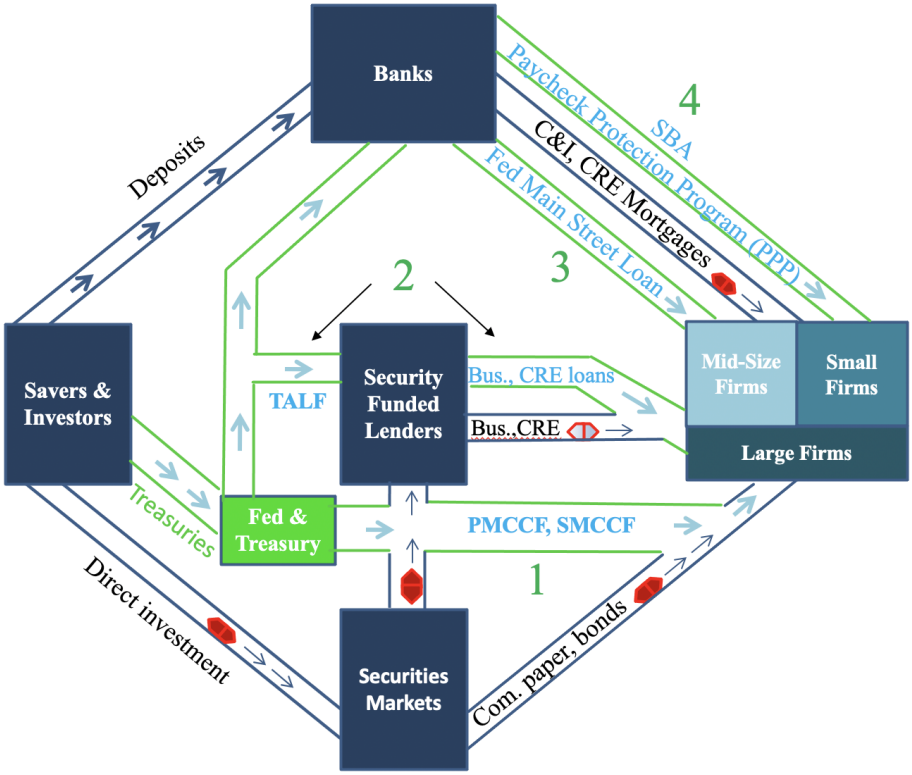


Figure 7.6: Fed Actions to Restore Financial Flows to Businesses of Different Sizes

The motivation behind the credit-easing interventions has been to provide better economic conditions for non-financial firms. From the discussion in section 6.3, we see that the fiscal policy has heavily stimulated the demand side of the economy, relative to the supply side. From the analysis of the effect on the Fed's measures, it is obvious that the Fed has provided much needed support to the supply side. However, the only part of the

credit-easing tools that has an isolated effect on the supply side is the PPPLF-program and Main Street Lending program. The other parts of the credit-easing tools have had a substantial effect on the general access to credit markets. Thus, the majority of the credit-easing policies have had a major impact on household lending. Consequently, the demand side of the economy has also been stimulated, through easy and cheap access to credit.

In context with the research question of this thesis, it is necessary to assess the complications that such massive stimulus may introduce. In a historical perspective, these interventions have been way more extensive and in a sense, more far-reaching than in other crises.

7.3 The Effect on Macroeconomic Variables

During the previous sections, we have seen that a set of new monetary tools have been introduced, and that at an unprecedented level. The lowering of the federal funds rate to zero lower bound could not provide enough stimulus to mitigate the crisis alone. Consequently, the Fed turned to unconventional policy tools, mainly through quantitative easing programs. Policymakers announced plans for QE in March 2020 but in contradiction to earlier programs, it was this time announced without a dollar or time limit. We have earlier shown how the asset purchasing programs from the Fed have helped stabilize financial markets and revive credit channels. Through this section, we will assess the possible complications and risks, while considering the speed, scope, and size of the programs. The focus in this section will mainly entail how the effects of the asset-purchasing programs can cause complications for economic factors in the long run.

In figure 7.7, we will present the development of the Fed's balance sheet, reserves held at the Fed by financial institutions and M2 money growth. After the Fed started paying interest rates on bank reserves held at the Fed (IOR) in 2008, they opened for the possibility to purchase financial assets with newly created bank reserves (Labonte, 2021). Four QE programs: QE1 2008, QE2 2010, QE3 2012 and QE4 2020, have since been initiated by the Fed. The general level of reserves and assets on the Fed balance sheet as seen in figure 7.7, are a direct result of these QE programs. From the perspective of the financial institutions, the "excessive reserves" has simultaneously become their assets,

replacing the sold assets.

The Increase in Money Supply

As a consequence of the QE-programs, the monetary base (M0), consisting of bank reserves and currency controlled by the Fed, has increased rapidly. The increase in M0 does not necessarily flow out in the economy, increasing M2 – broad money. However, we observe that there is a correlation between QE and M2 growth during QE1, QE2 and especially QE4.

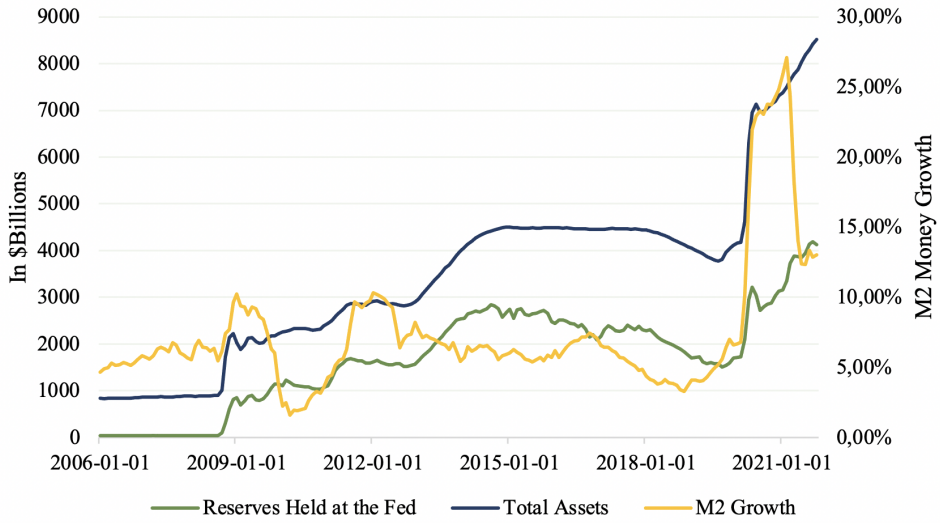


Figure 7.7: Money Supply Growth, Federal Reserve Total Assets and Reserves Held at The Fed, Source: Federal Reserve Board

Figure 7.7 provides an interesting illustration of the differences between the COVID-19 QE and earlier QE programs. Firstly, it is observed that the asset purchasing by the Fed has until the third quarter of 2021 been over three times the size of the QE1, initiated to counter economic effects of the Great Recession. This has resulted in an unprecedented increase in the money supply during QE4. The M2 money supply increased from 15.5 trillion U.S. dollars in February 2020 to 21.2 trillion U.S. dollars in October 2021 (Federal Reserve Board, 2021). Consequently, 26.5 percent of the total M2 money supply is new money introduced in the economy during the pandemic. This growth is reflected in figure 7.7, where we show the growth rate in percentage from a year ago. We observe that the growth rate of M2 in QE4 has increased substantially in comparison to other QE programs. The M2 money growth averaged around 20 percent during the crisis and is currently growing at a 13 percent rate, way faster than the real economy.

From figure 7.7, we observe that the M2 money growth does not always correlate with the QE programs. QE3, the second most comprehensive QE-program, has a negative correlation with M2 growth. The reason is that the newly created reserves only provide financial institutions with more cash in their accounts. Thus, the institutions can choose to store the cash in the banking system, lend to consumers and businesses, or buy other assets. Hence, during the earlier programs, especially QE3, more of the provided bank reserves have stayed in the banking system (Thornton et al., 2010). The QE4 program has been different from the earlier one. Firstly, QE4 is clearly the largest QE-program initiated by the Fed and consequently, financial institutions have received more liquidity than before. Secondly, through credit easing programs, the Fed has provided stimuli to directly revive and ease credit channels, in addition to directly target banks' and other financial institutions' willingness to lend. In early 2020, the Fed even dropped the reserve requirement ratio to zero, to further encourage lending (Board of Governours of the Federal Reserve System, 2020). Consequently, the excess reserves provided from the Fed have been introduced in the economy, increasing M2 at a pace never seen before.

From a broader perspective, it can be argued that the rapid increase in M2 is as a result of how the Fed is monetizing the government budget deficits. The Fed is mainly purchasing U.S Treasuries figure 7.3. Thus, as the Fed is buying U.S treasuries from the government with newly created bank reserves, using financial institutions as intermediaries , there will be no money extracted from the economy. However, the treasury purchase will provide the government with new money. Consequently, the debt-financed fiscal spending will influence the money supply (Blanchard et al., 2020).

The biggest danger of quantitative easing is the risk of inflation due to a rapid increase in the money supply. When the Fed introduces new money to the economy, the supply of dollars increases. Hypothetically, this can lead to a scenario where there is more money than goods supplied, driving up prices, potentially to an unsustainable degree. In that sense, Milton Friedman's 1970 famous quote seems more relevant than ever:

"Inflation is always and everywhere a monetary phenomenon in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output."

During the Great Recession, Friedman's reputation suffered. The price inflation remained low, even after the Fed expanded the money supply dramatically after the Great Recession.

Consequently, Monetarism, the theory Friedman for many is known for, appeared irrelevant. However, Monetarism is now given new life. As seen in figure 7.7, the M2 growth is currently far higher than during the earlier QE-programs. Consequently, we have an interesting future ahead and once again all eyes should be on the central bank. Further analysis on inflation is found in chapter 9.

Low Interest Rates

With the Fed still purchasing billions worth of financial assets, they continue to create pressure on long-term yields and introduce new money to the economy. From section 7.1, figure 7.2, we provide a time-series of the U.S 10-year and 2-year treasury yield. From the figure, we observe that we're in a record low interest rate environment. The low interest rates, in addition to credit-easing policies, have provided easy access to credit for households and businesses through the pandemic. From the Federal Reserve Bank of New York's Household Debt and Credit Q3 report, the total debt balance of the U.S households is at $1.1 trillion more than at the beginning of 2020. Furthermore, the balance is $890 billion higher than in Q3 2020, and $12.7 trillion observed in 2008, measured in nominal terms (Federal Reserve Bank of New York, 2021c). During Q1 2021, the household debt service ratio, a ratio illustrating how much of the household income is being spent to cover the households' debt, dropped to 8.23 percent, the lowest measured since 1980 (Federal Reserve Board , 2020). It is reasonable to believe that the increase in credit is a result of the credit-easing policies from section 7.2, low interest rates and consequently, a surge in demand for interest rate-sensitive spending.

The access to credit fuels consumer and business spending, however, it is not only consumer spending that is affected by a low interest rate environment. Given the low returns on fixed income assets, investors are more likely to invest in other assets that can deliver a higher return, like stocks and real estate. As a result, riskier assets often experience price increments during QE. If the low interest rate environment persists, it helps bid up the price for assets, and thus create asset price inflation (Shiller, 2007). The analysis on asset inflation is found in section 9.1.

Complications of the Monetary Policy

As discussed in section 2.4.2, policymakers can be tempted to make discretionary short-run expansionary policies to create temporary increases in output, rather than following rules. This temptation could lead to a time-inconsistent policy, as the public experiences short-run gains, but the policymakers will ultimately fail to produce the long-run goal. After the introduction of the IOR in 2008, the Fed has been able to run a highly discretionary policy, not only during the current crisis, but for the last decade. This has led to a rapid growth of the M2 money supply, in addition to low interest rates. Consequently, the introduction of the IOR, has led the Fed to become more established in financial markets and to a larger extent be engaged in the allocation of credit. As Taylor (2016) puts it: "The IOR enables the Fed to be more like a discretionary multipurpose institution rather than the rule-like limited purpose institution that has delivered good policy in the past and that can deliver good policy in the future".

The Fed response to the COVID-19 crisis has indeed been different due to speed, scope, and size, where the Fed arguably has served as a multipurpose institution during the crisis. However, the Fed's adaptability has been a major part of the recovery from the crisis as seen and discussed in section 7.1 and 7.2. When considering the excessive fiscal stimuli and fast recovery of the economy, it can be argued that the Fed is overdoing its requisite response. The inflation rate is at the end of 2021 running at over three times the inflation target and the unemployment rate is around 0.3 percent over the pre-covid level (U.S Bureau of Labor Statistics, 2021). The Fed is still running a highly expansionary policy, even as the economy has recovered more rapidly than expected. If the inflation does not show to be "transitory", it will be the Federal Reserve's responsibility to get the inflation rate down. Consequently, the short-term gains resulting from discretionary choices, could lead to the failure of the Federal Reserve's mandate of ensuring price stability.

8 Testing for Excessive Stimuli

Through the previous chapters, we have shown signs of excessive fiscal and monetary stimulus, as a result of the authority's initial response to counter the economic effects of the COVID-19 crisis. In this section, the hypothesis of overstimulation will be tested by applying the HP-filter on important economic measures, such as gross domestic product, the stock market, and the housing market. We will assess GDP and assets differently:

- We will analyze the rapid recovery of GDP as a result of the record-size fiscal packages and monetary policy. By applying the HP-filter, we can create a trend estimate which can be used to approximate output gaps. The reason for this is to create a basis for comparison between previous crises and provide evidence to support the fact that the negative output gap has been closed in record time. Additionally, we want to elaborate on the implications discussed in section 6.5.
- We will analyze the important assets such as stocks and housing against a trend parameter, to find evidence of overheating markets. From a historical perspective, it is shown that credit-easing and monetary expansion are closely related to overheating of asset prices (Grytten and Hunnes, 2014). If we find evidence of overheating in the stock and housing markets, it may indicate an excessive stimulus.

The deviation analysis will help provide evidence of overstimulation in the American economy, directly caused by the fiscal and monetary policy response. This chapter will mainly focus on the graphical representation of excessive stimuli, with less emphasis on fundamental factors.

8.1 Deviation Analysis by Applying the HP-Filter

We will construct a time-series of quarterly data for GDP and real housing prices, and monthly data for the stock prices, in the period prior to Q1 1995 – Q3 2021. By applying the time series, we will include both the Dotcom-bubble and the Great Recession of 2007-2009. This provides a good base of comparison to modern crises to assess the current state of the economy. As described in chapter 4, observations after March 2020 may cause disruptions in estimations as the variance increases substantially. These effects are

amplifying the end-point problem of the HP-filter, as the trend line will be heavily affected by the latest volatile observations. Consequently, to minimize the end-point problems, higher smoothing parameters will be conducted (Grytten and Hunnes, 2012). We apply a $\lambda = 40{,}000$ for the time-series with quarterly observations. For the stock market with monthly observations, a $\lambda = 1{,}000{,}000$ is applied.

Following Koilo and Grytten (2019), we will present the cycle components from the HP-filter in table 8.1, at the end of this chapter. The analysis mainly concentrates on cycle peaks, however troughs will be reported for the COVID-19 pandemic to illustrate the rebound from the initial crisis. Before the summarized table is presented, graphical illustrations of the HP-filter will be presented.

8.1.1 Gross Domestic Product

To further substantiate our concern over the size and magnitude of the stabilization policy, we have applied the HP-filter on GDP. In Figure 8.1, we will show the development of GDP against a trend parameter.

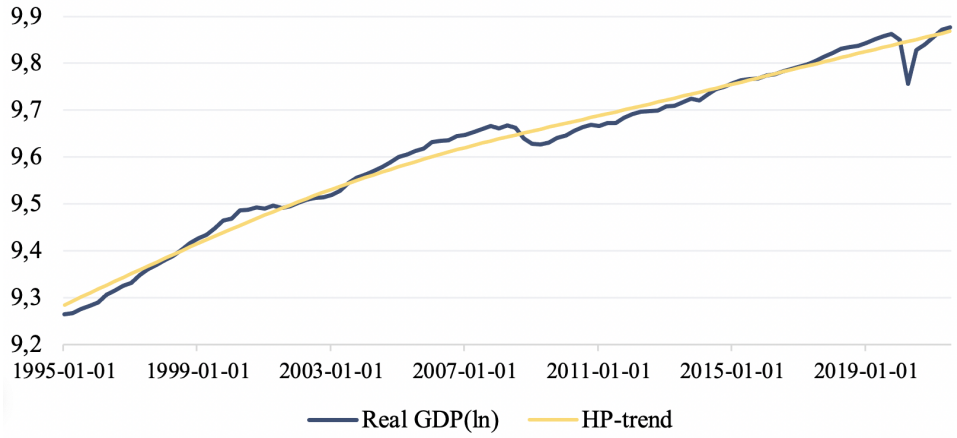


Figure 8.1: HP-Filter GDP

As mentioned earlier, the American economy experienced its largest drop in GDP in the beginning of the COVID-19 pandemic, resulting in a deviation of -9.1 percent against the trend parameter. Nevertheless, the model illustrates that the economy has recovered in a record speed thanks to the economic rescue measures taken. As of Q3 2021, the GDP showed a deviation of 0.85 percent above the trend-line. During the Great Recession of 2007-2009, the economy spent over 5 years to close the estimated negative output

gap of -3.35 percent. However, during the COVID-19 crisis, the negative deviation has been closed in 5 quarters, even though the initial deviation from trend was almost three times the size of the Great Recession. As discussed in section 6.3, we argue that this is a result of the authoritie's economic response and the difference in characteristics of the crisis. Based on the fact that output is above the trend, while the supply side is not fully recovered, could indicate excessive fiscal stimulus. When the economy is able to fully re-open from the pandemic, it is arguable that output will increase even further. However, it is important to mention that the sudden drop in output may enhance the end-point problems, as the trend-line could be affected by recent observations.

8.1.2 Assets

Stock Market

From figure 8.2, both the Dotcom-bubble (2000) and the Great Recession (2007-2009) are characterized by significant growth in the periods leading to a market collapse. The strong growth resulted in positive deviations from the trend line. The deviation analysis reveals major positive deviations during the previous crises', illustrating how the markets were overheating in the periods.

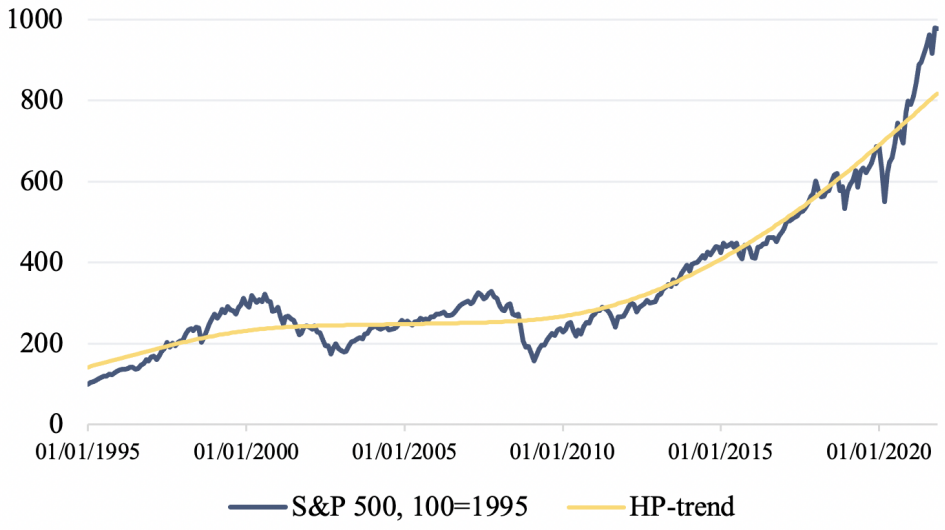


Figure 8.2: HP-Filter Stocks

Most remarkable are the deviations during the Dotcom-bubble with a peak of 36.3 percent in 2000, followed by the peak value of 30.32 percent in 2007 in the preceding year of the

Great Recession. The fall during the Dotcom-bubble was smaller than during The Great Recession. Where the following trough values were -29.2 percent (2003) and -39.6 percent (2009) below its trend value. From the Great Recession to the COVID-19 pandemic, the development is characterized by a stable growth with small deviations from the trend. The COVID-19 crisis resulted in a negative deviation of -21.3 percent that quickly turned into a positive deviation during the rebound, now up with over 20.7 percent over trend, the highest deviation since the peak in 2007.

The bull market from the period before the pandemic, in addition to the rapid growth during the rebound of the crisis, may enhance the end-point problems in the HP-filter. Consequently, the deviation of 20.7 percent is possibly an underestimation, considering that the rapid growth we want to analyze has already affected the trend line used to calculate the deviations. However, the HP-filter provides valuable information to our analysis, as it clearly illustrates that the current level of the SP 500 has the largest deviation from the trend line since the Great Recession, even with the possibility of underestimating the current deviation.

Housing Market

The housing market is characterized by long-term growth in two separate periods. In the years preceding the Great Recession, There is an observed positive deviation between the housing prices and the trend line. The deviation peaked at 17.4 percent from the trend in 2006. The rapid growth prior to the financial crisis turned to a negative deviation as the housing bubble in 2008 occurred, resulting in a trough of -13.8 percent below the trend line. In the period from the rebound of the Great Recession to the COVID-19 crisis, the growth has been stable.

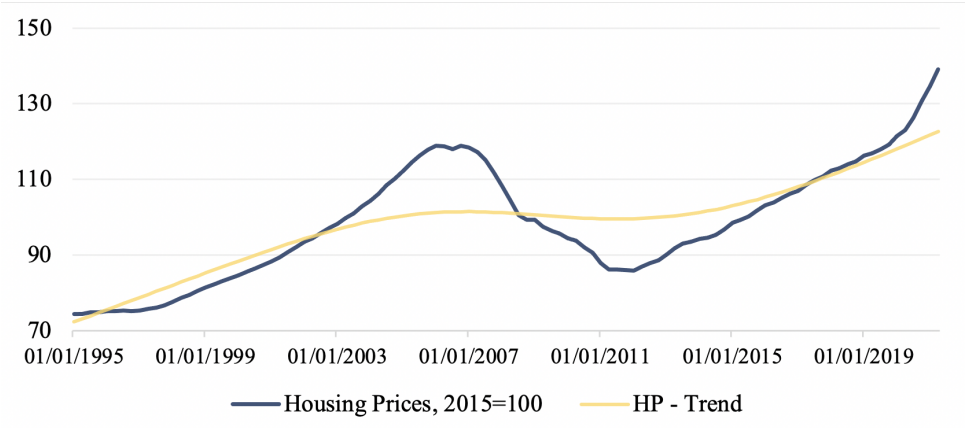


Figure 8.3: HP-Filter Housing

As the pandemic hit the U.S, the housing market did not experience a crash like the stock market. After June 2020, the housing prices increased at a substantially higher growth rate than earlier observed. This increase led to a positive deviation from the trend, peaking at 13.4 percent, a value not experienced since the housing bubble of 2008 – one of the important causes of the Great Recession (Holt, 2009). As for the stock market, the rapid growth in housing prices after June 2020, may enhance end-point problems in the HP-filter. As a result, the deviation of 13.4 percent could be an underestimation.

8.1.3 Summary of Estimation Results

In table 8.1, a summary of cycle components in the three periods is presented. The cyclical components of the Dotcom-bubble and the Great Recession are used in comparison with the current situation. The housing prices during the Dotcom-bubble seems to be unaffected by the stock market crash. Consequently, there is no peak deviation in this period. The test reveals that substantial overheating took place in the stock market preceding the Dotcom-bubble and Great Recession. It also shows an overheating in the housing market preceding the Great Recession.

We find evidence of the cyclical component in both the stock market and the housing market, peaking at its largest level since the great recession. These positive deviations serve as indicators of overheating, despite being lower than the previous crisis. However, these are minimum estimates, and could in reality be higher. Consequently, the hypothesis of overstimulation appears valid for the stock and housing market. Excessive monetary stimulus has led to an unprecedented increase especially in money supply. The excess

Table 8.1: Estimates of Cyclical Components from HP-Filter

	Dotcom-bubble	**Great Recession**	**COVID-19 Crisis**
Stock Market	36.30 %	30.32 %	20.70 %
	(2000)	(2007)	(2021)
	-	-	-21.36 %
	-	-	(2020)
Housing Market	-	17.60 %	13.40 %
	-	(2006)	(2021)
	-	-	2.80 %
	-	-	(2020)
GDP	3.17 %	3.18 %	0.85 %
	(2000)	(2007)	(2021)
	-	-	-9.10 %
	-	-	(2020)

liquidity provided to the economy, seems to have been placed in financial assets or housing. This is in line with the historical situations where an increase in money supply and credit-easing, have been a major reason for surging asset prices (Grytten and Hunnes, 2016).

For GDP, we observe positive deviations in the build-up to the two previous crises. During the Dotcom-bubble and the Great Recession, GDP peaked at respectively 3.17 and 3.18 percent. However, the most interesting finding is that GDP is currently above the trend line, showing a positive deviation of 0.85 percent. As a result, the economy appears to have recovered faster than first anticipated. Our concern manifests in the future developments of the economy. As discussed in section 6.4, we anticipate that the fiscal stimulus will continue to accommodate the economy. In addition, the Federal Reserve is continuing their highly expansionary monetary policy, providing further stimulus to the economy. Consequently, it is a reasonable assumption that the GDP will be further stimulated by the initial policy responses. Hence, we argue that the authorities are overdoing their requisite response.

By applying the HP-filter, we have found signs of overheating in the stock and housing markets. Asset prices have surged since the initial stabilization policies were implemented. The HP-filter evaluates the time series with no other considerations than price movements. Consequently, we will through the next chapters evaluate fundamental factors to further

investigate whether the increase in asset prices is driven by speculative behavior or fundamental changes. Thus, the first section of the next chapter will substantiate the findings from this chapter, to further analyze asset inflation and financial stability. Furthermore, due to indications of excessive stimuli from chapter 6.4 and HP-filter results, we will assess the increased inflationary pressure in the real economy.

9 Inflation

This chapter will provide a discussion on the current inflationary regime in the United States. Based on our findings in chapter 8, our objective is to provide evidence of asset price inflation, based on fundamental factors. Additionally, we aim to discuss how these price developments influence financial stability. Furthermore, we will analyze the traditional inflation indices by decomposing CPI components, to visualize the inflationary pressure in the real economy. Finally, we will address the problems of increasing inflation.

9.1 Asset Price Inflation

As traditional inflation measures do not include asset prices, we aim to analyze the developments in financial markets and housing markets to see whether we can find evidence of inflationary regimes. One of the reasons for analyzing asset prices is that financial assets store enormous amounts of value. Thus, excluding asset prices from traditional inflation measures can undermine the true inflation rate in the U.S economy. Asset prices are an important factor for financial stability, as it is crucial to have a well-functioning financial system in a modern economy. If the pandemic-related fiscal and monetary support contribute to a surge in demand for financial assets, it may have caused disruptions to financial stability.

In this section, we will analyze the price development in the stock and housing market to examine asset price inflation. According to the findings in chapter 8, the markets show large deviations from the trend. Such deviations could be a sign of overheating and indicating asset inflation. Consequently, we will analyze asset prices in light of important price drivers, to examine whether price development can be explained based on fundamental factors or speculative behavior. Finally, we will discuss the underlying factors that have affected development in the two markets, to assess whether these factors have disrupted financial stability and the risks it imposes.

9.1.1 Stock Market

In early-2020, the economic consequences of the COVID-19 pandemic triggered a financial crisis in the global financial markets, as explained in section 6.1. Panic, triggered by the

uncertainty of the pandemic, led to a stock market crash that included the three worst point drops in the U.S history. The S&P 500 hit the bottom on the 23rd of March. From the high on the 19th of February, 2020, to the bottom on 23rd of March , the S&P 500 had lost about 34 percent of its value as the U.S went into lockdown (S&P Dow Jones Indices, 2021).

The U.S financial market began its rebound on 7th of April. The rebound caused some confusion, as there was a major disconnection between the real economy and the financial markets. Unemployment increased week after week, individuals and businesses were under strict restrictions from the government, and there was no vaccine in sight. Section 7.1 and 7.2 have shown that this development was not a coincidence. Massive stimulus programs from the Fed and the government, including record high QE programs and a historically low interest rate environment, provided life support to the financial markets, consumers, and businesses.

By November 2020, the U.S markets returned to January levels. Even as the pandemic continued to roar and leaving scars in the real economy, the markets continued to grow. By the end of 2020, the S&P 500 had increased by 16.26 percent, and as of 20th January , 2021, the S&P 500 had reached a new all-time high. During 2021, this trend has continued and by the end of November 2021, the S&P 500 has increased by 22.5 percent (S&P Dow Jones Indices, 2021).

Fundamental Factors

In this section, we will investigate whether the price development in the stock market can be explained in terms of fundamental changes that determine equity valuations. If the relationship between valuations and fundamentals deviates substantially, it may be an indication of asset inflation, overheating and even financial bubbles in the stock market.

We will apply the Cyclical Adjusted Price-to-Earnings ratio (CAPE) to analyze whether there are deviations between the current valuation of the S&P 500 and underlying fundamental values. The reason for using the CAPE Ratio rather than simple P/E ratio, is to eliminate the extreme fluctuations in net income caused by volatility in profit margins over business cycles and crisis (Campbell and Shiller, 2001). The CAPE ratio is calculated by dividing the current level of the S&P 500 by the average inflation adjusted earnings per

share for the past 10 years. In figure 9.1, the CAPE ratio of S&P 500 in the period from 1st of January, 1900 to 1st of November, 2021 is presented. A long time series is applied, as it gives valuable information on how the current valuation of the S&P 500 compares to some of the most famous market crashes in the U.S history. As the illustration shows, the CAPE ratio has proved its importance in identifying potential bubbles and market crashes.

Figure 9.1: CAPE Ratio 1900-2021, Source: Shiller (2021)

According to the CAPE Ratio, there are clear signs that equity valuations have increased substantially relative to earnings since the rebound of the stock market in April 2020. Seen from a historical perspective, the rapid catch-up of the stock market has led to a significant discrepancy between market pricing and fundamental values. The CAPE Ratio of November 2021 is at 39.4. This is the highest value observed, only behind the Dotcom-bubble in 2000 where the ratio reached a level of 44.2. In comparison, the market reached a CAPE Ratio of 32.2 before "Black Tuesday" – the burst of a speculative bubble that effectively ended the "Roaring Twenties" and led the global economy into the Great Depression (Eichengreen, 1992). Consequently, the generous valuation of the stock market is a clear sign of asset inflation.

Critics of the CAPE ratio argue that the ratio is less useful as it is solely backward-looking, rather than forward-looking. This is a valid point, as equities are valued by expected future earnings, not historical ones. Thus, the current CAPE ratio could be explained by record high expectations of future earnings growth, or lower discount factors

as a result of decreased interest rates. However, in the November Financial Stability Report released by the Federal Reserve, analysts' predictions expect forward-earnings to slightly increase as the re-opening of the economy is happening, while long-term growth predictions are still within a historical average. Furthermore, by applying the analysts' forward price-to-earnings ratio, it is shown that the current valuation of the S&P 500 relative to forecasted earnings is at the highest level of its historical distribution (Federal Reserve, 2021). Another issue of the CAPE ratio is that accounting principles change over time. Consequently, there is a risk that the CAPE ratio is affected by "artificially" lower earnings in the later years, resulting in higher ratios, due to the changes in the computation of GAAP earnings (Siegel, 2016).

Both the CAPE ratio and forward P/E indicate that the stock market valuation has less relation to intrinsic value. The discrepancy of market valuations and fundamental values, in addition to the findings of the HP-filter, gives clear indications of asset inflation. Furthermore, there seems to be speculative behavior with less connection to the developments in the real economy. The reason for the increase is thus likely to stem from the unprecedented amount of money introduced to the economy during the COVID-19 pandemic.

Development of the Stock Market During the COVID-19 Crisis

From section 7.3, we have discussed the implications of the highly expansionary monetary policy. As a result of the Federal Reserve's large-scale financial asset purchases, we have seen a decrease in interest rates and an unprecedented increase in money supply. On an annualized basis, the Bank of America Global Research shows that inflow of equity funds in 2021 will amount to a figure of $1.6 trillion (Galouchko, 2021). This accounts for more money than the cumulative inflow over the past 20 years of $800 billion, between 2001 and 2020. From 2008 until 2020, when the global stock market experienced its longest bull market run in history, $452 billion were introduced to global equity funds. In January 2021, the U.S stock market accounted for nearly 56 percent of the total global market value (Statista Research Department, 2021). However, research from the Bank of America Global Research, shows that American equities have been favorable during the pandemic. In 2021 inflows to American equity funds are adding about $1.4 trillion of the total $1.6 trillion.

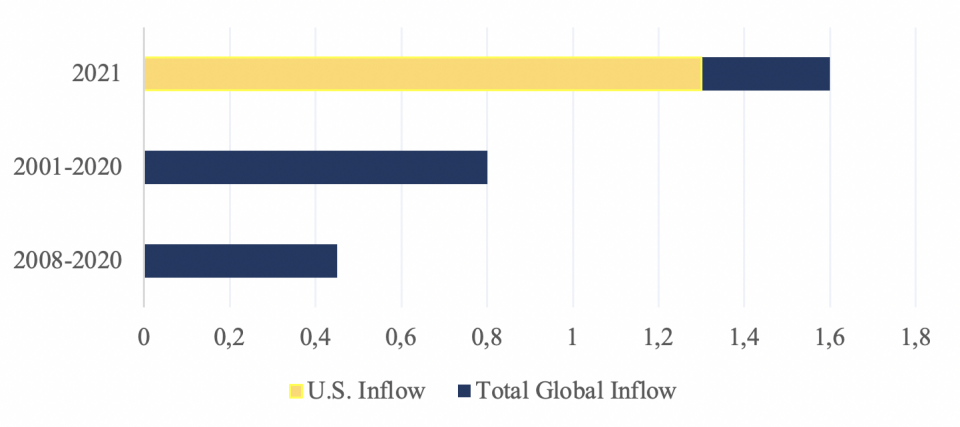


Figure 9.2: Inflow to Global Equity Funds (in trillion U.S. dollars), Source: Galouchko (2021)

This development is closely related to the monetary expansion observed in the U.S. If the money supply increases at a higher rate than the economy grows, excess money will be placed in inflation. This inflation is often reflected in increasing asset prices (Grytten and Hunnes, 2016). Consequently, the unprecedented increase of money supply has massive implications for the stock market, as the excess money introduced in the economy makes speculative behavior attractive, leading to unsustainable valuations. Furthermore, it is a reasonable assumption that the trillions of dollars having entered the global equity markets, has provided a pretense of "special times", amplifying the problem and making some investors believe that the valuations can be explained by fundamental factors (Reinhart and Rogoff, 2009).

By assessing the stock market, we have seen signs of speculative behavior. As an example, the number of companies that went public in 2020 reached a new record of 494, compared to 242 in 2019. In fact, the transactions of special purpose acquisition companies (SPACs) accounted for 50 percent of all IPOs during 2020 (Moats and Malone, 2021). This development is consistent with how market participants are engaging in more risky financial investments to profit from short-term fluctuations. Firms with high and uncertain growth expectations (growth stocks), have experienced a massive increase in market value, relative to the market, during the pandemic (Nasdaq, 2021). In addition, the market has undergone some wild trend with a massive influx to the so-called "meme stocks", such as GameStop (GME) and AMC Entertainment Holdings, where trading volumes rose to 40 percent the first quarter of 2021 compared to the previous (Ferré, 2021).

Other financial assets, such as cryptocurrencies, have also experienced a surge in interest as speculators rush to the market to cash in. NFTs – digital art – are also experiencing the same trend. Bloomberg reports that the cryptocurrency market, with Bitcoin being the leading asset, has a market valuation of more than $3.3 trillion as of November 2021, roughly a quadruple of its market value from the end of 2020 (Ossinger, 2021).

9.1.2 Housing Market

During COVID-19, the housing market has experienced an increasing pressure on prices. In light of these recent price rises, research argues in favor of a tighter housing market. Anenberg and Ringo (2021) found that the months' supply of homes for sale has fallen to historically low levels during the same period as the price growth. This tightening in the housing market is arguably due to a combination of higher inflow of buyers and lower inflow of sellers to the market. They further found that 93 percent of the decrease in months' supply is driven by increased demand (Anenberg et al., 2021). The pandemic forced many households to spend more time home, which can be one of the factors that led to an increase in the demand for housing services. Besides the fact that the pandemic has forced residents to change habits, we consider three fundamental factors driving the general upswing in house prices, leading to high demand and low supply.

Low Mortgage Rates

The loose monetary policy has given households easy access to credit. The Fed has constructed a record low interest rate environment making mortgages cheap. The low mortgage rates are a result of the Fed's $40 billion monthly purchases of agency mortgage-backed securities (MBS), directly targeted in lowering mortgage rates. The asset purchases of the U.S Treasuries are amplifying the pressures of keeping rates low all over the economy. In addition, the credit-easing tools from section 7.2, has made mortgages more available, as the Fed has encouraged lending. Consequently, the conducted monetary policy has been one of the main reasons for increased housing demand. Figure 9.3 shows that 44 percent of all outstanding mortgage balances has been originated since Q2 2020 (Federal Reserve Bank of New York, 2021b). The figure also illustrates that the boom in mortgage lending is driven by loans to people with high credit scores. Hence, the QE programs seem to encourage people that are already well off to buy second and third homes.

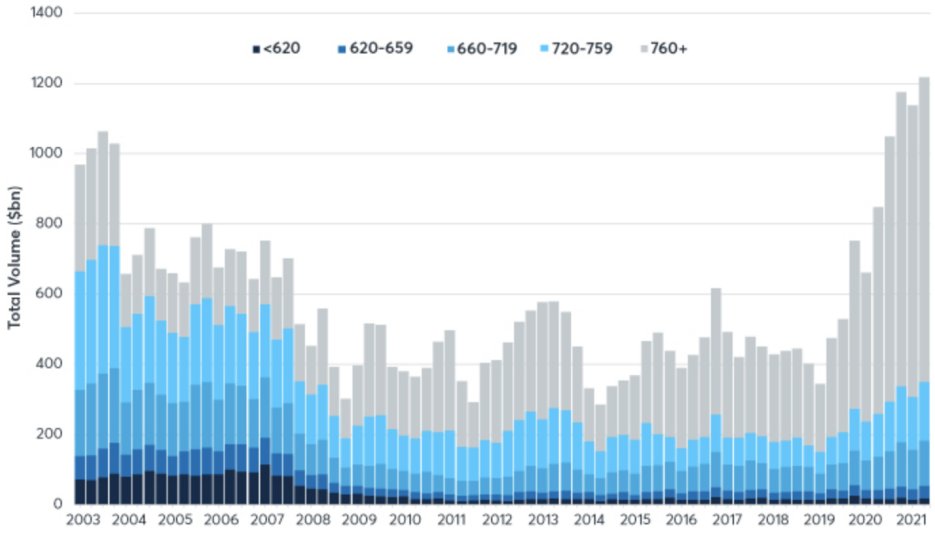


Figure 9.3: Mortgage Originations by Credit Score, source: Federal Reserve Bank of New York (2021b)/Equifax Data

Accumulated Savings

The accumulated savings from figure 6.3 in section 6.3 has helped stimulate housing demand. As seen in the figure, the period from March 2020 until October 2021 is characterized by rapid growth in the personal savings rate. Nearly $5.4 trillion of savings accumulated during the period, compared to the accumulated $2.6 trillion in the previous 20 months before the pandemic (Bureau of Economic Analysis, 2021). The increase in savings is principally a result of massive government stimulus checks, rising stock markets, and fewer spending choices.

Supply Factors

In addition to demand factors, there are also potential COVID-19 related supply factors stemming from increased key commodities used in housebuilding. Both lumber and steel prices have increased significantly during the pandemic (Bernstein et al., 2021). The price surge has been a key driver in slowing down the construction of new homes. Another factor that has contributed towards reduced supply of homes is the generous mortgage forbearance program provided in the CARES Act. By offering forbearance, lenders were allowed to pause or reduce mortgage payments, which may prevent forced sales of homes. The forbearance offering may also be an explanation of why the housing prices were kept stable during the pandemic, in contradiction to the stock market.

Fundamental Factors

In this section we will analyze whether the surge in housing prices can be explained in terms of fundamental changes. To evaluate the valuation of the housing market, we will apply the price-to-rent ratio(P/R), which is similar to the price-to-earnings(P/E) used to assess the stock market. A standardized price-to-rent ratio will be calculated to show how the current P/R ratio compares relatively to the respective long-term average. If the ratio increases over a longer period, in addition to being significantly above the long-term average, it indicates that the asset value is rising faster than the cash flow, in this case the rent. Consequently, investors are willing to pay a premium over fair value as they expect prices to increase further, a clear sign of asset inflation. From section 8.1, we already know that housing prices and rent is deviating from its historical relationship. However, it will be valuable to compare the current pricing to other historical events, such as the housing bubble in 2008.

The P/R-ratio is calculated by dividing the average housing prices over average rent. Housing prices are retrieved from the same source as HP-filter, where nominal housing prices are discounted by core PCE to obtain real values. For rent, data is retrieved from the index for tenants' rent from the Consumer Price Index (CPI), following Gallin Gallin (2008). The P/R-ratio is indexed to a reference value of 100 over the time series. Consequently, values above 100 indicate that the current P/R-ratio is above its long-run average. This provides an indication of housing market pressures. The P/R-ratio is presented in figure 9.4.

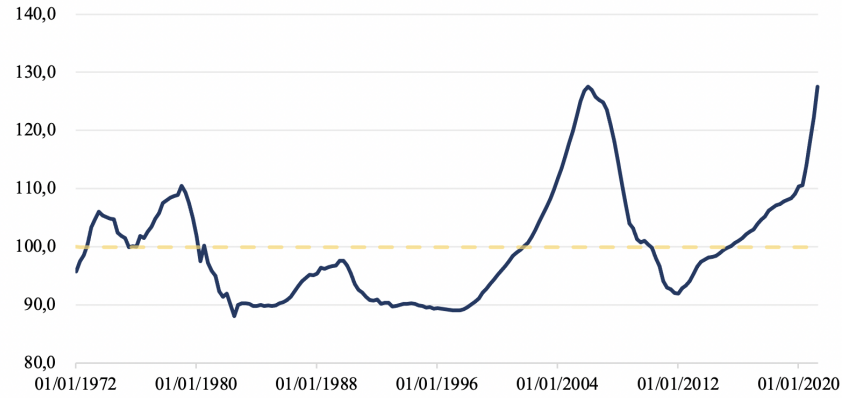


Figure 9.4: P/R Ratio (OECD, 2021)

According to the P/R-ratio, we observe an increase in prices over rent from the bottom value of 92 in 2012. The growth rate increases substantially after April 2020, leading to a P/R-ratio of 127.5 in Q2 2021. As seen from a historical perspective, the highest P/R-ratio during the housing bubble in 2008 was at 127.6, only 0.1 points over the current level. Consequently, the ratio is showing clear indications of strong housing market pressures and asset inflation.

9.1.3 Financial Stability

The empirical research of Eichengreen (1993) has delivered quantitative results on the crisis during the interwar period, showing that macroeconomic support on both national and international level, can lead to financial instability. As governments and central banks delivered support to counter the crisis, some countries experienced strong growth and bubble tendencies, while others suffered due to wrong trade and lending policies. This situation is described by Eichengreen as "elusive stability". Governments and market actors believe that the solution to counter a crisis is to promote financial stability. However, in the long run, the decisions led to financial instability because of counterproductive decisions from governments and central banks. Thus, "wrong" stimuli often leads to overheating of the economy followed by a crisis (Grytten and Hunnes, 2016).

Considering the massive amount of stimulus from both the U.S government and the Federal Reserve, it is interesting to assess whether the stimulus has provided financial instability in the sense of being "elusive stability". In the previous chapters, we have provided evidence of the Fed's importance in preventing a further collapse of the financial systems, countering the financial crisis that evolved in March 2020. Consequently, the initial effect of the Fed's interventions arguably provided financial stability to the U.S markets. However, after the markets rebounded, the Fed has continued with a highly expansionary and discretionary monetary policy, fueling the economy with even more liquidity. This will arguably introduce further pressures on the asset inflation observed and consequently be a risk to financial stability.

Following Kindleberger's theory of crisis anatomy, he states that financial markets go through three stages towards financial crisis (Aliber and Kindleberger, 2015). During the first stage, "mania", investors realize profits from an increase in asset prices rather than

from cash flows from the operations. “Mania” is a stage of financial instability that is not sustainable in the long run. Through this analysis, it seems obvious that the economy is in a stage of “Mania”, developing at an unsustainable growth rate. If the monetary expansion accommodates market actors to continue bidding up asset prices, the market can potentially fall into the second stage of Kindleberger’s model, “Panic”. In the second stage, investors realize that asset valuations deviate substantially from fundamental values. Consequently, market actors fear losses and seek to sell their assets in order to decrease potential losses. If the «Panic» stage leads to a broad “risk-off” sentiment, the investors’ desire to supply capital to the market is lower than the willingness to sell assets in order to get out of the market. Consequently, prices on assets will fall and businesses will experience liquidity problems, leading to the third stage of the model, “Crash”. Such a crash would introduce pressures on credit-institutions, as borrowers may experience losses and not be able to repay debt burdens. Thus, credit-institutions are reluctant to lend as they fear losses, and credit-flows are disrupted, just as they were during the start of the pandemic. Consequently, these types of financial instability can in worst case lead to financial crisis, leaving huge scars in the real economy.

The current situation in the markets is comparable to the “Mania” stage from Aliber and Kindleberger (2015). Consequently, the stabilization policy from the U.S authorities have initially led to financial stability, but by applying excessive stimulus we now observe signs of financial instability. Notably, we have seen clear signs of speculation-driven growth, with a discrepancy between valuations and the real economy, we are concerned that the assets are more susceptible to corrections. Furthermore, there is an increased risk that the U.S financial markets will enter stage 2 and 3 of Kindelberger’s theory of crisis anatomy.

To summarize, we are concerned that what is being done provides short-term gains through being highly discretionary, in addition to being substantially excessive. Generally, the current situation provides an indication of the Fed running an elusive stability.

9.2 Inflation in Consumer Goods

Over the past decades, inflation has not been a persistent and serious problem in developed economies. In November 2021, the consumer price index (CPI) rose to 6.8 percent year-on-year, the largest 12-month increase since 1982 (Bureau of Labor Statistics, 2021).

The recent resurgence in inflation is interesting in retrospect of the incredible fiscal accommodation. Based on the fact that the fiscal support in large parts has been demand-driven, there is much to suggest that this has contributed to pressure on prices.

In this section, we will analyze the development of traditional inflation indices, before assessing individual components of the CPI, to isolate developments in important consumer goods. Consequently, we will be able to show the increased inflationary pressure that the real economy is facing.

9.2.1 Traditional Inflation Indices

Over the course of the pandemic, inflation has become a growing concern for the Federal Reserve. Following the Federal Open Market Committee (FOMC) meeting in January 2021, the Federal Reserve Chairman Jerome Powell stated the following in the press conference: "As the economy fully reopens, there will be a burst of spending, because people will be enthusiastic that the pandemic is over, and that could create some upward pressure on inflation. However, we would see that as something likely to be transient and not to be very large" (Powell, 2021b).

Previously, we have discussed the effects of monetary and fiscal policy on aggregate demand and aggregate supply. At this point in time, supply chain disruptions are limiting how quickly production can bounce back and respond to the rapid increases in aggregate demand. Consequently, inflation is running well above the Fed's inflation target of 2 percent. The development is illustrated in figure 9.5, showing three of the most commonly used inflation measures, in which all have experienced large spikes in the recent months.

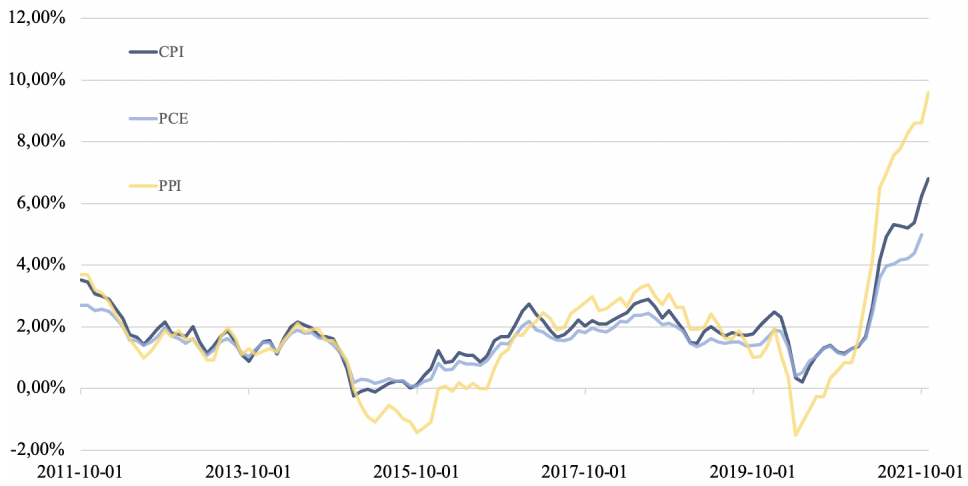


Figure 9.5: Inflation Measures (BLS, 2021; BEA, 2021)

Data from November 2021 shows that inflation was slightly above 5.0, 6.8, and 9.6 percent according to PCE, CPI and PPI, respectively. The personal consumption expenditures (PCE) is the central bank's preferred gauge for measuring inflation. However, the standard PCE is not the basis in the government's decision-making during the pandemic. The Fed is applying a trimmed mean PCE inflation rate that strips out extreme price movements. This stripped version of PCE eliminates the top 31 percent and bottom 24 percent of personal consumption expenditure price changes (Federal Reserve Bank of Dallas, 2021). Therefore, the Fed reports a trimmed PCE inflation rate of 2.6 percent for October 2021, which is significantly lower than the measures in figure 9.5. As a consequence, we argue that they are effectively shaping their policy-thinking based on the numbers they see fit. One concern with this approach is the dependency on which price moves are defined as "extreme". When prices are increasing, it could be difficult to separate the signal from the noise.

In the following sections, we will take a critical look at the Fed's view of inflation. By decomposing the basket of goods used in the CPI, we aim to measure the most influential price moves to see whether the central bank has neglected the current inflationary regime.

9.2.2 Inflation Within Components of CPI

At first glance, it is noteworthy that the Federal Reserve Bank excludes more of the top price movements than the bottom ones. As a consequence, the presented inflation rate for

decision-making purposes is lower than the standard CPI rate. One of the government's goals has been to provide financial aid to the people that are most affected by the pandemic. Therefore, we find it reasonable to have a look at the components that have been most influential on consumers' wallets. Based on CPI, which represents what Americans buy in their everyday lives, we will measure price changes within the important categories of housing, commodities, transportation and food and beverages. This will bring us one step closer in determining whether the COVID-19 stimulus has been counterproductive in boosting the American economy. If essential consumption items experience a surge in inflation, the effect of government stimulus can arguably be diminished.

Inflation in Shelter

The shelter component of CPI measures the cost of housing services that households consume and is divided into owned homes and rentals. Owner-occupied housing reflects both the property's value as an investment asset, and as a good that provides shelter for those who live in it. Based on a cost-of-living approach, we will have a look at the implicit value of the services home-owners "consume" from their own homes, and the price development of rental residences.

During the COVID-19 pandemic, the housing market has experienced an unprecedented price growth. Over the past 12 months (ending in September 2021), the Case-Shiller U.S National Home Price Index has increased roughly by 20 percent (SP Dow Jones Indices LLC, 2021), compared to an annualized growth of 6 percent, in the last 10 years. This uptick in prices is largely due to supply and demand factors described in section 9.1.2. However, data suggests that this recent boom in housing prices has not been fully reflected in reported inflation indexes. CPI for shelter has increased with only 3.5 percent year on year, while the headline inflation rate currently stands at 6.8 percent. Due to the fact that housing services make up roughly one-third of the CPI, this appears to be artificially low.

In figure 9.6 we compare the development of housing prices, rental prices and the rent component of CPI (CPI:rent). At first glance, we see that the increase in market rental prices has been significantly higher than CPI:rent. According to the Zillow Observed Rental Index (ZORI) the rental prices declined in the early stages of the pandemic before recovering and exceeding pre-pandemic levels. Moreover, we observe that the sales price for new homes has increased during the pandemic.

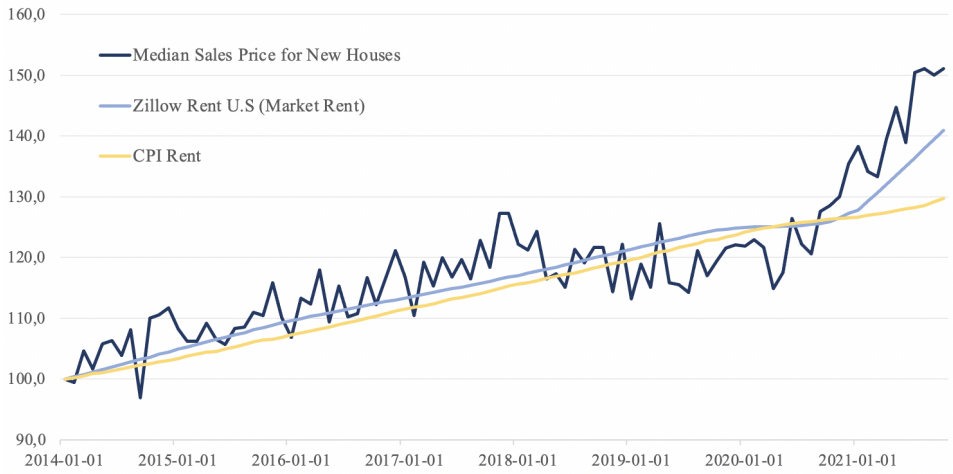


Figure 9.6: Median New House Sales vs. Rent, (BEA 2021; Federal Reserve Bank of St. Louis

Both rental prices and owner-occupied housing play an important role in measuring general inflation. When calculating CPI, the component for housing services is based on the amount of money tenants spend on shelter and the amount of money owner occupants would have spent had they been renting (OER) (U.S Bureau of Economic Analysis, 2017). This suggests that there are methodological weaknesses of the CPI component shelter, as the OER estimates are often adjusted at a slower pace than the actual housing prices. Additionally, we observe that the ZORI index is deviating from CPI:rent, in which we argue that rental prices have lagged effects that has not been reflected in CPI. This is further backed by Brescia (2021) who argues that the recent house price appreciation has not yet been reflected because of lagged effects. This would potentially mean that the "transitory" increases to the rate of general inflation are more prolonged than first anticipated by the Fed. Hence, we believe that the rapid increase in housing prices will imply substantial pressures to the CPI index.

Commodities

Commodity markets are reaching record highs, making an already doubtful outlook for inflation more complicated. Excessive financial liquidity together with unprecedented expansionary fiscal policy measures by most major economies, has influenced increasing commodity prices. A rapid increase in demand with supply-side bottlenecks has caused a mismatch between commodity prices and economic activity during 2020. The surge in commodity prices has continued in 2021. In the middle of Q4 2021, the SP GSCI, one

of the main commodity price indices, has seen a price increase of 41.8 percent. This is driven by the increase in energy prices (62.4%), followed by price increment in industrial metals (27.3%), agricultural goods, including grains (24.6%) (SP Dow Jones Indices, 2021), figure 9.7 illustrates the development in important commodity prices from January 2020. In today's context, where rapid economic revival co-exists with increasing inflationary pressures, we ask the question of how the U.S consumers are affected by the price increase of commodities.

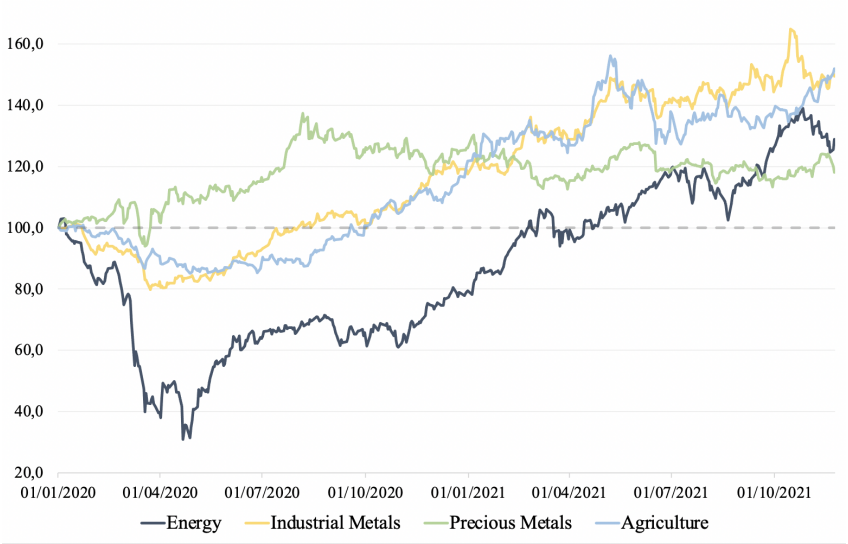


Figure 9.7: Price Development of Commodities (SP Dow Jones Indices, 2021)

As seen in figure 9.7, the price level of all the commodity categories is above their pre-pandemic level. In fact, the SP GSCI is at its highest level in 7 years (SP Dow Jones Indices , 2021). A central reason for the surge in commodity prices arises from supply-side factors. In normal functioning commodity markets, producers hold inventories to reduce the cost of adjusting production and avoiding stock outs (Pindyck, 1990). During the early stages of the pandemic, restrictions froze production in most commodity-producing and exporting economies, resulting in a severe decline of global commodity inventories, lowering the general supply (Serrano, 2021). The supply-side of the commodity market is still heavily affected by the pandemic until this day. Pandemic-induced supply disruptions, such as sporadic virus outbreaks, unexpected natural events, and lack of investments, especially in energy production, has forced producers to reduce inventories and keep supply low (Rees and Rungcharoenkitkul, 2021). Thus, the unprecedented fiscal stimuli and ultra-loose monetary policy in major economies have resulted in rapidly increasing

demand for commodities which the supply side cannot provide, resulting in the increased prices.

The CPI components directly linked to commodity prices are mainly food (around 15% of CPI) and energy (around 7% of CPI). Prices of agricultural goods have risen by 24.6 percent over the year. Producers and food retailers are getting affected by this surge in prices, reflected by a rise of 11.6 percent of food component of wholesale level (PPI) in October 2021 (U.S Bureau of Labor Statistics). This cost will eventually be passed on to consumers, and there are clear signs of it happening. In October, the food index component of CPI had risen by 5.3 percent, where in the last two months it had an increase of 2 percent (U.S Bureau of Labor Statistics). Meat, poultry, fish, and eggs are up 11.9 percent over the last year, and 20.7 percent from prices in July 2019 (U.S. Department of Agriculture, 2021). As the food component of PPI is more than double the size of CPI, there are signs that the food companies have not passed along all their costs to consumers yet. This is making way for a further increase in the cost at the supermarket for Americans, affecting the ones with low income the most.

The run-up in costs of food is not the only part affecting American wallets. The energy component of CPI has risen by 30 percent in 2021, mainly due to ripple effects in fossil fuel markets. Brent crude oil prices, the global benchmark, have recently reached a seven year high of $85 per barrel. Close substitutes as coal are also in high demand, as power plants throughout the year have been turning to coal, pushing the price level to its highest since 2001 (Pescatori et al., 2021). As a result, consumers are experiencing a high surge in prices directly related to these commodities. Consumers are paying 49.6 percent more for gasoline and utility gas is up 28.1 percent. Furthermore, the increase in energy commodities has a huge effect on companies' production costs. Companies all over the economy are affected by the surge in prices, thus energy commodities affect consumers directly and indirectly through the final prices of goods and services produced. This is further amplified by a massive increase in transportation costs.

Transportation

Transportation costs have typically been a small part of a finished product's price. As a result of supply chain disturbances in the transportation markets, the costs have skyrocketed, which affects companies that are already paying way more for raw materials

than usual. The ultimate consequence of this surge in costs is rising prices for consumers.

The COVID-19 pandemic has affected the dynamics of the shipping industry in various ways. port closures, port congestion , shortage of labor and a global shortage of shipping containers are factors that have contributed towards the hampering of global transportation. In the period between July 2019 and October 2021, the container freight rates increased significantly. The global container freight rate index moved from $1,342 to $10,194 during the same period (Placek, 2021). Other shipping segments such as dry bulk have experienced similar price movements. The Baltic Dry Index rose from $417 to $5,513 in the period between February 2020 and October 2021 (Baltic Exchange, 2021). As a consequence, these increased shipping costs will likely end up affecting the consumers indirectly as many manufacturers ultimately will charge higher prices for their consumer goods.

9.2.3 Transitory vs. Permanent

During the past year, the word "transitory" has dominated headlines in the United States when talking about inflation. The Federal Reserve are among those who categorize the current inflation as transitory, meaning that it will not leave behind persistently higher inflation in the post-covid era. Several economists are worried that inflation will become permanent unless further actions are taken in regards to a change in monetary policy.

Among factors that are expected to reduce the inflationary pressure, we find easing of supply constraints and progress of vaccinations as the most important ones. For instance, the prices of commodities and transportation costs are likely to decline once the constraints on the supply side ease. Many industries such as energy and industrial metals have experienced supply disruptions, which has made it difficult to catch up with the heating demand. The global shipping market faces many of the same supply chain disruptions. However, this market is highly cyclical due to the composition of available tonnage, and thus it could take time to increase the supply of vessels. Generally, the strongest argument for transitory inflation is rooted in the resolution of supply side bottlenecks. However, this depends on the development of the spread of COVID-19 and potential new variants of the virus.

In the past couple of months, higher prices have entered most consumer components, touching everything from durable goods to food. There are several factors that argue that this phenomenon appears to be sticking around. First, inflation has reached commodities outside energy and food reported at 12 percent in October 2021 (U.S. Bureau of Labor Statistics, 2021). Furthermore; in August 2021, Powell indicated a moderation in inflation for durable goods as shortages started to ease (Powell, 2021a). However, in October, the used-car segment saw an acceleration in inflation of roughly 30 percent (U.S. Bureau of Labor Statistics, 2021). In the same speech Powell also pointed out that "we see little evidence of wage increments that might threaten excessive inflation". This is in strong contrast with recent vacancy and quit rates. The Employment Cost Index measured that wages and salaries increased by 4.6 percent for the 12-month period ending in September 2021, which is the highest increase in over a decade (Bureau of Labor Statistics, 2021). Another concern is the rising inflation expectations. On November 16, 2021, market participants expected inflation to be at 3.17 percent on average during the next five years (Federal Reserve Bank of St. Louis, 2021). As mentioned earlier, the recent price increase in the housing market is not fully reflected in the CPI, which suggests that there could be substantial pressure to come.

Generally, we think that the current inflationary pressure in the United States will continue to last well into 2022. This is heavily dependent on when societies will re-open, new mutants of the coronavirus and monetary signals from the Fed.

Note: As of November 2021 the Fed has started to express concern over recent inflation measures. In a FOMC meeting, Jerome Powell said the following: "The level of inflation we have right now is not at all consistent with price stability" (Powell, 2021c).

9.3 Problems of Rising Inflatiion

By enacting excessive fiscal and monetary stimulus for an economy that appears to recover faster than expected, the United States has arguably put themselves in a challenging position. During the previous sections, we have shown that the inflation rate is rising well above the Fed's 2 percent target. In addition, we have shown evidence of asset inflation and increasing risk of financial instability. Considering that rising inflation is a direct result of the stabilization policy, we seek to address future complications for the U.S.

Inflation has important distributional consequences. Firstly, rising prices are harming American families by reducing their real earnings and undermining their purchasing power during the post-COVID economic expansion. This will heavily affect the poorest in society. When prices on necessities rise, it would offset the benefit of the fiscal support as the net effect of stimuli is reduced. Although inflation reduces the purchasing power of all households, the proportion of the population categorized as "wealthy" tend to own assets that are more suited for inflationary periods, and assets in general. The top 10 percent richest Americans own 89 percent of all U.S stocks held by households, illustrating the stock market´s role in increasing inequality (Board of Governors of the Federal Reserve System, 2021b). Considering how the stock and housing market have experienced a surge in valuations, it is undeniable that the authorities´ response has benefited the wealthy ones with the possibility of owning financial assets.

As the CPI inflation rate has been increasing substantially during the latest months, and currently measures 6.8 percent, we argue that actions must be taken. In a scenario where the increased inflationary pressure in the United States persists, the Fed might be forced to counter the inflation by running a contractionary monetary policy, eventually raising interest rates. If the economic stimuli leads to permanent inflationary pressures, the policy can be argued to be counterproductive. By countering the inflation with increased interest rates, they will create a "syntethic" crowding out-effect and consequently reduce the net effect of the stimuli, as interest rate costs increase. Thereby, the excessive stimuli has led to inflation, which affects households and businesses with increased expenses.

Another complication of a contractionary monetary policy is weakened financial stability. From section 9.1.3, we compare the current situation in financial and housing markets to "Mania", a stage of financial instability that is not sustainable in the long run (Aliber and Kindleberger, 2015). The overheating of the markets makes them susceptible for bigger corrections. Consequently, there is a risk that the markets could react in a negative manner to less support from the Federal Reserve, accelerating a possible crash in financial and housing markets, which would leave scars in the real economy.

If the inflation experienced would be persistent, we know from table 2.4, that there is a negative relationship between economic growth and sustained high inflation. Consequently, a high inflation rate would be counterproductive towards the goal of boosting the American

economy. However, when considering economic growth and inflation, a hypothetical worst-case scenario is presented: If supply side disruptions were to persist, in addition to its negative effects towards economic growth, the U.S could enter a period of stagflation with rising inflation amid a recession. The history of the United States shows that the stagflation in the 1970s came after several negative oil-supply shocks (Blinder and Rudd, 2013). However, this scenario is highly dependent on the reopening of the economy and development of global supply-chain disruptions.

Considering the complications of increasing inflation, we argue that the current inflation must be addressed before it becomes more of a problem. However due to the complexity of the crisis, initial responses and current development, the authorities are faced with a massive challenge. Consequently, they will have to pay the price for increased inflationary pressure, either by implementing measures to reduce it, or by countering negative ripple effects that comes with high levels of inflation.

10 Conclusions

This thesis studies the fiscal and monetary policy which constituted the United States' initial economic response to the unique COVID-19 crisis. The pandemic has been unprecedented in its scale, as the COVID-19 crisis has created a supply shock, a demand shock and a financial crisis all at once (Grytten, 2020). Through the thesis, we focused on the impact of fiscal stimuli provided by the government, the role played by the Federal Reserve in stimulating the economy, and the general effect of these interventions on economic recovery, with particular focus on inflation. Overall, the purpose of the thesis has been to answer the following research question: *"Have the stabilization policies in the U.S been counterproductive towards its goal of boosting the American economy?"*

To visualize the effects of the COVID-19 crisis and the corresponding economic policy response, we have applied an extended AD/AS model. Based on the assumption of a restricted supply side, the model has shown that the economy has increased its output at the expense of increased inflationary pressure. This suggests that the policy response has been excessive, and somewhat poorly targeted.

The drop in economic output at the early stage of the pandemic is known to be the largest in the United States' history. To counter the economic effects of the crisis, the U.S government have introduced record high fiscal stimulus, which so far has totaled $ 5.2 trillion. We find evidence of an overweight in demand-targeted fiscal stimuli. Especially unemployment benefits and direct payments to households have provided consumers in general with increased financial leeway. Even though the Paycheck Protection Program has helped small businesses survive through the pandemic, we argue that this proposition has been mainly targeted towards employees. This suggests that the supply side measures have ended up stimulating demand in the short run, as production is hampered by bottlenecks on the supply side. As a result, aggregate demand measures are inadequate in mitigating the comprehensive effects of a real economy crisis such as COVID-19.

Furthermore, we observe clear tendencies of excessive fiscal stimuli and overheating in the American Economy. This suggests that the U.S. fiscal policy has caused excess demand, and it can be argued that the government is overdoing the requisite response. In addition, we found evidence of a broad targeted policy that has provided support to people that have

not been economically affected by the pandemic. When adding the large savings overhang, there are reasons to believe that this money will eventually flow into the economy and create further pressure on inflation. "One size fits all" policies may be easy to implement. However, these are likely to fall short in providing effective relief to people and firms that are most affected by the pandemic.

To further encounter the effects of the COVID-19 crisis, the Federal Reserve made use of all instruments in their conventional monetary policy kit, as well as unconventional tools stemming from the Great Recession. The effects of the COVID-19 pandemic initiated a financial crisis, resulting in dysfunctionality in crucial financial markets. We have provided evidence of how the Fed's asset purchases improved market functionality substantially, by introducing massive amounts of liquidity to financial markets. In addition, we provide evidence of how the asset purchases have contributed in keeping long-term interest rates low. The asset purchases have entailed an unprecedented increase of the Fed's balance sheet, where the portfolio of securities grew from $3.9 trillion to $8.6 trillion in Q3 2021. The Fed went even further and launched a new series of innovative measures, including the creation of numerous liquidity and credit facilities to support financial markets and the flow of credit to businesses and households. Through these credit-easing interventions, we argue that the Fed has provided much-needed support to non-financial firms. However, discussions have shown that the new set of policies have provided credit-easing to the economy as a whole, not only the supply side of the economy. Consequently, the credit-easing tools has led to a further upward pressure of aggregate demand in addition to supporting businesses.

We argue that the Fed has been more established in financial markets and to a larger extent been engaged in the allocation of credit. Consequently, the Fed has implemented a highly discretionary policy, reflected in the speed, scope and size of the monetary policy actions. We found evidence that the monetary policy has resulted in an unprecedented growth in money supply during the COVID-19 crisis, where 26.5 percent of all money circulating in the U.S economy have been introduced since the start of the pandemic. As a result of the increased money supply, we argue that risk of inflationary pressures increases substantially. Consequently, the short-term gains resulting from discretionary choices, could lead to the failure of the Federal Reserve's mandate of ensuring price stability.

To test the hypothesis of asset inflation and overstimulation we applied the HP-filter on both the stock and housing market, as well as for GDP. When assessing the recovery of real GDP against a trend parameter, we found evidence that the U.S. economy has recovered faster than anticipated while the production is still operating below full capacity. The latter confirms our hypothesis from the AD/AS model, and suggests an unprecedented high demand-targeted stimuli and a lack of supply side measures. Furthermore, we found evidence of inflated asset prices consistent with the large monetary expansion.

To further substantiate the findings of asset inflation through the HP-filter, we analyzed fundamental changes in asset valuations. We have found clear signs of speculative behavior resulting from the monetary expansion and increased financial leeway from the fiscal support. Furthermore, the speculative growth has led to an unsustainable level of financial instability, implying that the authorities have implemented an elusive stability, following Eichengreen (1993).

By decomposing the components of CPI, we found evidence of inflation in consumer goods running far above the Fed's inflation target. Furthermore, we have argued that some CPI components have lagged effects. As a result, we strongly suspect inflation to become more apparent in the time to come. In addition, we have argued that inflation is likely to be persistent in the short-to-medium term. Consequently, the Federal Reserve will be forced to take action to comply with its inflation mandate. The ripple effect this creates will particularly harm low-income households, which alongside American firms were the primary target of the fiscal rescue packages.

Throughout this paper, we have found evidence of an increased inflationary pressure in the U.S economy, as a result of the authorities' stabilization policies. While it is clear that the authorities have acted fast, and partly implemented much-needed support, they end up causing themselves additional problems. Moreover, we are critical towards the "one-size fits all" fiscal policy, were parts of the stimuli has been highly wasteful, and contributed to the current inflationary pressure. Consequently, the United States will either have to pay the price of persistent inflation, or related costs of reducing it. Both scenarios contributes in offsetting the objective of the initial stabilization policy. Therefore, we are confident in claiming that parts of the economic policy response to the COVID-19 crisis has been counterproductive towards its goal of boosting the American economy.

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Appendix

A1 Data Sources

Table A1.1: Data Sources

Data	Description	Time-period	Source	Direct Link
Output	Seasonally adjusted Real Gross Domestic Product nominated in chained 2012 dollars	2009 - 2021	U.S. Bureau of Economic Analysis	https://fred.stlouisfed.org /series/GDPC1
Stocks	S&P500 index of monthly observations	1995 - 2021	S&P Dow Jones Indices	https://www.spglobal.com/spdji /en/indices/equity/sp-500/#overview
Housing Prices	Real housing prices deflated by CPI	1995 - 2021	OECD	https://data.oecd.org/price /housing-prices.htm
Inflation - CPI	CPI for all urban consumer. Seasonally adjusted and monthly frequency	2011 - 2021	U.S. Bureau of Labor Statistics	https://www.bls.gov/news.release /cpi.t01.htm
Unemployment	Seasonally adjusted unemployment rate as a percentage of the labor force	2009 - 2020	U.S. Bureau of Labor Statistics	https://fred.stlouisfed.org /series/UNRATE
Fiscal Policy Response in Percentage of GDP	Discretionary fiscal policy response to the COVID-19 Crisis in advanced economies	2020	IMF	https://www.imf.org/en/Topics/ imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19
Total Fiscal Spending	Total spending on pandemic-related stimuli divided in provision categories	2020 - 2021	Commitee for a Responsible Federal Budget	https://www.covidmoneytracker.org/
Breakddown of Direct Payments	Share of direct payments on spending, savings or debt payments	2020 - 2021	United States Census Bureau	https://www.census.gov/programs-surveys/household-pulse-survey/ data.html
Savings rate	Personal saving as a percentage of disposable income. Seasonally adjusted annual rate	2000 - 2021	U.S. Bureau of Economic Analysis	https://fred.stlouisfed.org/series /PSAVERT
Potential Output	Real Potential Gross Domestic Product nominated in chained 2012 dollars	2009 - 2021	U.S. Congressional Budget Office	https://fred.stlouisfed.org/series /GDPPOT
Insured Unemployment	Percentage of labor force receiving unemployment insurance benefits	2020 - 2021	U.S. Employment and Training Administration	https://fred.stlouisfed.org/series /IURNSA
2-year Treasury	Yield on nominal 2-year Treasury securities, annual rate	1997 - 2021	Federal Reserve Board	https://www.federalreserve.gov/releases/h15/ ?fbclid=IwAR3Fkq7NvQvw6c99O7VioAs9jR6 _vpiacBK8hp4fVcYwlUHMXmUTFgHmIlA
10-year Treasury	Yield on nominal 10-year Treasury securities, annual rate	1997 - 2021	Federal Reserve Board	https://www.federalreserve.gov/releases/h15/ ?fbclid=IwAR3Fkq7NvQvw6c99O7VioAs9jR6 _vpiacBK8hp4fVcYwlUHMXmUTFgHmIlA
Corporate Baa-Treasury Spread	Spread between Moody´s seasoned Baa corporate bond and 10-year Treasury constant maturity	2020	Federal Reserve Bank of St. Louis	https://fred.stlouisfed.org/series/BAA10Y#0
Money Supply (M2)	M2 growth, percent change from year ago, not seasonally adjusted	2006 - 2021	Federal Reserve Board	https://fred.stlouisfed.org/series/WM2NS#0
Federal Reserve Balance	Federal reserve balance: liquidity and credit facilities, total assets, and reserves held at the Fed	2006 - 2021	Federal Reserve Board	https://fred.stlouisfed.org/release/tables ?rid=20&eid=1193993
CAPE - Ratio	CAPE ratio of S&P500, data courtesy of Robert Shiller	1900 - 2021	Yale	http://www.econ.yale.edu/∼shiller/data.htm
Rent Prices	Housing rent price index, deflated by CPI	1972 - 2021	OECD	https://stats.oecd.org/Index.aspx? DataSetCode=HOUSE_PRICES#
Inlation - PCE	PCE chain-type index. Seasonally adjusted and monthly frequency	2011 - 2021	U.S. Bureau of Economic Analysis	https://fred.stlouisfed.org/series/PCEPI#0
Inflation - PPI	PPI. Seasonally adjusted and monthly frequency	2011 - 2021	U.S. Bureau of Labor Statistics	https://data.bls.gov/cgi-bin /surveymost?pc
Commodities	Commodity price index (GSCI) divided into energy, industrial metals, precious metals and agriculture	2020 - 2021	S&P Dow Jones Indices	https://www.spglobal.com/spdji/en/indices /commodities/sp-gsci/#overview