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## What Happened to The Federal Reserve?

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## What Happened to The Federal Reserve?

### Abstract

I want to focus on the Federal Reserve in relation to the past two business cycles our economy has gone through (since March of 2001). My research question pertains to the composition of holdings of the Federal Reserve between recessions and expansions, and I will also examine the size of these holdings relative to GDP. The main research question I want to ask from my project is: Has the Fed fundamentally changed from the recession we faced in 2001 until now? When I talk about a fundamental change, I am trying to see whether or not the composition of the Fed's balance sheet (assets) has changed since 2001. If their mandates and objectives are still the same, then I believe I should see a statistically similar spread of holdings for the Fed during the same economic conditions. I expect there to be more change in the balance sheet when comparing trough to trough due to the different measures used to combat the recessions in 2001 and 2008, Horwitz *The Park Place Economist*, Volume XXV 107 respectively. I expect much less change in the composition of the balance sheet when comparing peak to peak because as things return back to normal in the economy, I think the Fed's assets would as well.

Although I will not run a statistical test on the Fed's balance sheet relative to U.S. GDP, I will use descriptive statistics to show changes that have occurred in the past fifteen years. This can be a useful tool that will complement my test on the composition of the Fed's balance sheet because I can observe what changes were made, and how large those changes were.

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# What Happened to The Federal Reserve?

**Xander Horwitz**

## **I. Introduction**

The Federal Reserve System, often referred to as the Federal Reserve or simply “the Fed,” is the central bank of the United States. It was created by Congress to provide the nation with a safer, more flexible, and more stable monetary and financial system. The Fed was created on December 23, 1913, when President Woodrow Wilson signed the Federal Reserve Act into law. Today, the Federal Reserve’s responsibilities fall into four general areas.

- Conducting the nation’s monetary policy by influencing money and credit conditions in the economy in pursuit of full employment and stable prices.
- Supervising and regulating banks and other important financial institutions to ensure the safety and soundness of the nation’s banking and financial system and to protect the credit rights of consumers.
- Maintaining the stability of the financial system and containing systemic risk that may arise in financial markets.
- Providing certain financial services to the U.S. government, U.S. financial institutions, foreign official institutions, and playing a major role in operating and overseeing the nation’s payment systems. (Federalreserve.gov, 2016)

In its 100 years of existence, the Fed has played a relatively active role in the financial well-being of the U.S. economy. Every economy is filled with ups and downs, and we can note these ups and downs through peaks and troughs in the business cycle. Determining peaks and troughs is not an exact science, but generally speaking our economy fluctuates between business cycles that last roughly seven years. The business cycle is the fluctuation in economic activity that an economy experiences over a period of time. A business cycle is basically defined in terms of periods of expansion or recession. During expansions, the economy is growing in real terms (i.e. excluding inflation), as evidenced by increases in indicators like employment, industrial production, sales and personal incomes. During recessions, the economy is contracting, as measured by decreases in the above indicators. Expansion is measured from the trough (or bottom) of the previous business cycle to the peak of its current cycle, while recession is measured from the peak to the trough. In the U.S., the National Bureau of Economic Research (NBER) determines the official dates for business cycles. (Federalreserve.gov, 2016)

I want to focus on the Federal Reserve in relation to the past two business cycles our economy has gone through (since March of 2001). My research question pertains to the composition of holdings of the Federal Reserve between recessions and expansions, and I will also examine the size of these holdings relative to GDP. The main research question I want to ask from my project is: Has the Fed fundamentally changed from the recession we faced in 2001 until now? When I talk about a fundamental change, I am trying to see whether or not the composition of the Fed’s balance sheet (assets) has changed since 2001. If their mandates and objectives are still the same, then I believe I should see a statistically similar spread of holdings for the Fed during the same economic conditions. I expect there to be more change in the balance sheet when comparing trough to trough due to the different measures used to combat the recessions in 2001 and 2008,

respectively. I expect much less change in the composition of the balance sheet when comparing peak to peak because as things return back to normal in the economy, I think the Fed's assets would as well.

Although I will not run a statistical test on the Fed's balance sheet relative to U.S. GDP, I will use descriptive statistics to show changes that have occurred in the past fifteen years. This can be a useful tool that will complement my test on the composition of the Fed's balance sheet because I can observe what changes were made, and how large those changes were.

Obviously, no recessions are exactly the same. That is exactly the case when one observes the recessions we faced as an economy in 2001 and 2007, respectively. Both of these recessions involved financial crashes, with the 2001 recession revolving around technology stocks (known as the dot.com bubble), and the 2007 recession revolving around the housing market and many large-scale banks (the subprime mortgage crisis). While the 2007 recession had a larger impact in terms of GDP growth, they were both labeled recessions for comparisons sake.

## II. Literature Review

The Fed has been around for over 100 years and their methods of implementing monetary policy have covered all ends of the spectrum during their existence. Williamson (2016) describes our monetary history and our existing measurements of past monetary phenomena, research that carries out new measurements from existing historical records, and the monetary theory that allows us to organize our thinking about those measurements. Historical research along these lines can be used to discriminate among theories, to refine those theories, and to formulate better monetary policy. Historical research can be helpful, but it does not always pay off. We can have the best theory available from the best minds, but textbook theory doesn't always exactly fit into real-world application. Different economic disasters call for different measures, and there are not always clear answers. In theory, a policymaker may find themselves in the midst of a crisis, be fully aware of the crisis unfolding, but be unable to stop it. The existence of a financial crisis may indeed reflect a failure of regulation (Williamson, 2016).

The massive bank bailout of 2008 has severely increased the Fed's balance sheet as they underwent a massive purchase of subprime mortgages. Rotemberg (2015) says that the financial crisis of 2007-2008 has led several observers to declare that the pursuit of financial stability ought to become a central objective of the Federal Reserve. This would, to some extent, represent a return to a past practice that was subsequently abandoned. The Federal Reserve's 1923 Annual Report officially announced that a key goal of monetary policy was the avoidance of speculative lending by commercial banks. At a 1980 FOMC meeting, on the other hand, Federal Reserve Bank of Cleveland President Willis Winn's expression of concern with "speculative activity and ... credit" used in commodity markets was interrupted by Chairman Volcker who asked if they should not permit speculative loans.

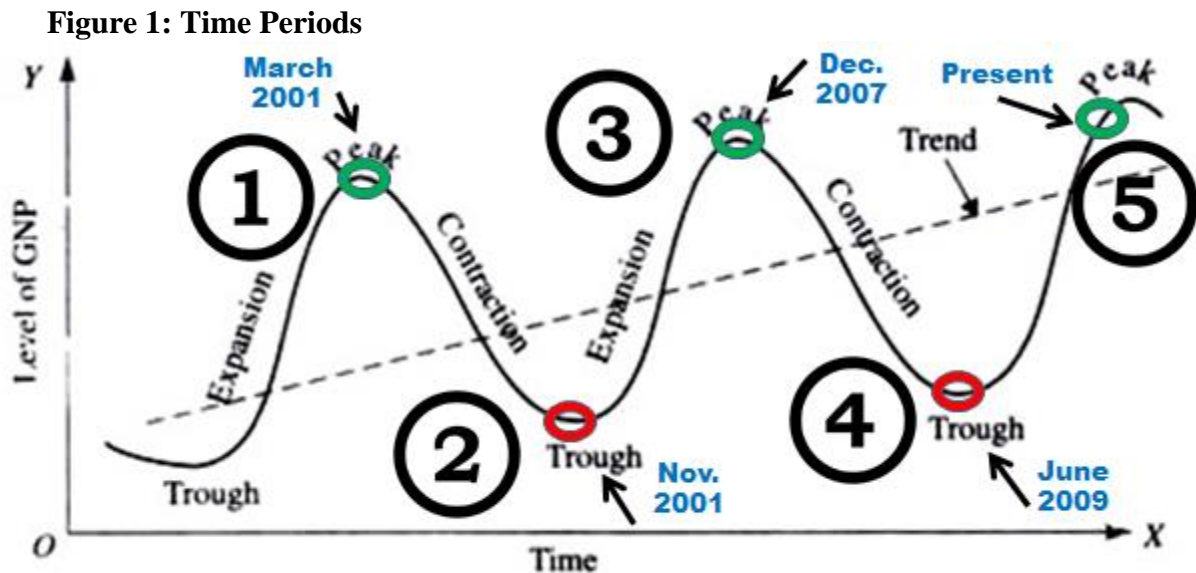
Williamson (2015) also comments on the Fed's actions during the Great Recession. He says that after the Great Recession was over in 2009 and the Fed's key crisis interventions had more-or-less ended, the Fed embarked on a program of unconventional policy that continues to the present. The unconventional program consists of three elements: (1) a zero-interest-rate policy; (2) large-scale asset purchases, or quantitative easing (QE); and (3) forward guidance. We can observe some of these elements in the Fed's balance sheet over the past fifteen years as they have had a massive increase in mortgage-backed securities assets in their balance sheet (part of the quantitative easing program).

The independence of the Fed is something that is questioned by Pollock (2016). He says that every part of a democratic government should be accountable. No part of a democratic government, let alone one with such immense power and riskiness as the Fed, should be free of checks and balances and free from any serious accountability (Pollock, 2016). Whether or not the Fed's portfolio has statistically changed is something I will discuss later in this paper, but regardless they really don't answer to anybody. It is interesting to think about not only the changes they have made in their portfolio, but the size of these changes as well (they have definitely grown over the past fifteen years, shown later in the paper).

Ben Bernanke, the former Chairman of the Fed, wrote in 2013 about the first 100 years of the Fed and specifically about the financial crisis and the Great Recession. He said that the financial crisis and ensuing Great Recession reminded us a lesson that we learned both in the nineteenth century and during the Depression, but had forgotten to some extent, which is that severe financial instability can do grave damage to the broader economy. The implication is that a central bank must take into account risks to financial stability if it is to help achieve good macroeconomic performance (Bernanke 2011).

### III. Theoretical Model

The first thing I want to observe with regards to my research question are the two troughs we faced in the recent business cycles, in November of 2001 and June of 2009 (shown at points 2 and 4 in the graph below).



I will test whether the proportion of U.S. Treasury Securities (bills, notes, and bonds) to total assets in the Fed's balance sheet on the next page to see if they are statistically similar in these two instances because the Fed undoubtedly had to use different measures to counteract the financial turmoil in both cases. I am going to use data six months before and after each point. The Fed releases a statement of their holdings each week, so with a range of one year surrounding each data point, I will have 53 observations (representing 53 weeks of data, six months prior to November 2001, and six months after in the case of point number two).

The second and more important observation I want to make is what the means of the Fed's assets (U.S. Treasury Securities to Total Assets) look like at the peaks of our business cycle. I will use a mean test with a null and alternative hypothesis to gain information on what the Fed's holding looks like during the peaks of the business cycle. Experts can't conclude whether or not we are currently at a peak, because those observations are made after the fact by looking back at economic data, but in terms of unemployment and stable prices, we are supposedly in a pretty good place economically speaking right now. So my second observation will focus these time periods, March 2001, December 2007, and the present period. I will use the same method of measuring a year's worth of data surrounding each point (six months before, and six months after) except in the case of the present period. For the present period, I will use a year's worth a data prior to this point. This will still give me 53 observations. As mentioned before, if the Fed has not fundamentally changed in the past fifteen years, then I expect that their composition of holdings would be relatively (statistically) similar in the observed time periods.

The economic theory used to link my research question to my model is monetary policy transmission theory. Monetary policy transmission theory refers to the different channels and dynamics by which monetary policy affects an economy's output, by affecting business and firms, banking behavior, and consumers. For example, an expansionary monetary policy (the type of policy used in response to both of these recessions) reduces interest rates which in turn raises investment spending by firms; also it raises spending by consumers on durable items like homes, automobiles etc. The implementation of monetary policy by the Fed comes with a definite change in the Fed's holdings (i.e. buying or selling bonds). In order to implement monetary policy, the Fed must buy or sell bonds, thus changing its holdings, but how will the composition of their holdings change? That's the interesting question. A new method of expansionary policy introduced by the Fed during the 2008 recession was the implementation of quantitative easing, and part of that program revolved around a bond purchasing program of buying agency mortgage backed securities. This is one of the ways the composition of their balance sheet changed, because this method had never been used before.

There are three key strategies that can be used by the Fed to achieve price stability: monetary targeting, inflation targeting, and monetary policy with no explicit anchor (also called interest-rate targeting). My theoretical model and paper revolve around the first strategy, monetary targeting, because I am observing the Fed's holdings (their assets). When they choose to change the money supply, their holdings are affected because they control the circulation of money and how much of it is in the system. Like I mentioned above, the composition of the Fed's balance sheet certainly changed when they introduced quantitative easing, because buying mortgage backed securities was an unconventional method never used before.

#### **IV. Research Hypotheses**

My project will revolve around this hypothesis:

The mean of U.S. Treasury Securities to Total Assets (holdings) of the Fed will be the same at points 1, 3 and 5 (the last two peaks of the business cycle and the present period) and the mean of U.S. Treasury Securities to Total Assets (holdings) of the Fed will be the same at points 2 and 4 (the last two troughs of the business cycle).

To test my hypotheses, I am going to use a two-tailed non-directional means test to compare Fed holdings compared to each other at specific time periods. I can obtain all of my data from [federalreserve.gov](http://federalreserve.gov), where they detail all of their holdings at quarterly time periods. This database

is exactly what I need to test my hypotheses because it shows in detail all of the Fed's assets and how they change from time period to time period.

My project is more of an empirical study that uses descriptive statistics and tests of differences in means than one that uses regression analysis, but I think a descriptive statistics empirical design is more adequate for this type of project. By using differences in means tests, I can determine whether or not my hypotheses are true. I can do use by using null and alternative hypotheses for my given variables.

### **V. Empirical Model**

I want to determine whether the make-up of the majority of the Fed's assets are statistically similar throughout the time periods. In my first test I compare the two troughs of the business cycle which involves a two-tailed test for means with the following null and alternative hypotheses:

Test #1:

- $H_0$ : The means of U.S. Treasury Securities to Total Assets of the Fed will be statistically similar during both recessions.
- $H_a$ : The means of U.S. Treasury Securities to Total Assets of the Fed will be statistically different during both recessions.

I believe that I will be able to reject the null hypotheses in this case. My second test revolves around the peaks of the business cycle, which I believe are more interesting to compare because the economy always seems pretty similar when it's doing well compared to when it's experiencing one of a multitude of problems. I will also be performing two-tailed proportion tests for this part of my model and comparing points 1, 3, and 5 as shown in my graph above. I'm going to run three tests; points 1 vs. 3, 3 vs. 5, and 1 vs. 5.

They will all have the same null and alternative hypotheses:

- $H_0$ : The means of U.S. Treasury Securities to Total Assets of the Fed will be statistically similar during the peaks of the business cycle (either 1 vs. 3, 3 vs. 5, or 1 vs. 5).
- $H_a$ : The means of U.S. Treasury Securities to Total Assets of the Fed will be statistically different during the peaks of the business cycle.

**Table 1: Descriptive Statistics: The Mean Ratio of U.S. Treasury Securities to Total Assets**

<b>Time Period</b>	<b>Mean</b>	<b>Observations</b>
1	0.8621	53
2	0.8545	53
3	0.8038	53
4	0.2920	53
5	0.5498	53

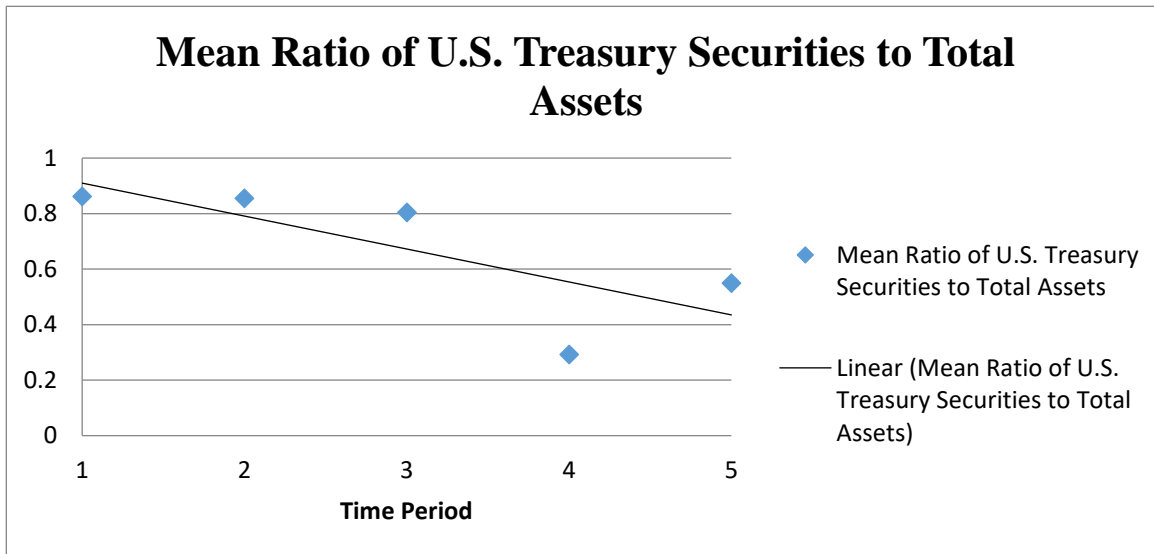
My expectation is that the null hypotheses are rejected because I believe that will get at the heart of my research question that the Fed is fundamentally different now than it was fifteen years ago, even though their mandates and objectives have stayed the same. I also cover the size of the Fed's portfolio during the past fifteen years by using descriptive statistics. I have plenty of degrees of freedom when running my tests because for the first four points (in my graph) I have collected

monthly data for six months prior to and for six months after the actual point. For my last point (point 5, which represents the present) I collected data for the previous twelve months.

The table below includes some descriptive statistics for my empirical model at each point (1-5).

The means for each respective time represent the proportion of U.S. Treasury securities to Total Assets of the Fed across the 53 observations (one year of data at each week). The graph below represents the means across the time periods. The first the three time periods have a similar composition of between 80-86% of the Fed's total assets being comprised of U.S. Treasury Securities (bills, notes, and bonds). However, there is a drastic change in the fourth time period due to the introduction of the Fed buying mortgage backed securities. Since mortgage backed securities are not considered U.S. Treasury Security, when the Fed purchased massive amounts of them, this drastically altered the mean composition of their portfolio and reduced the percentage of bills, notes, and bonds (treasury securities) in comparison to their entire portfolio.

**Figure 2: The Mean Ratio of U.S. Treasury Securities to Total Assets**



It's also interesting to note how the Fed's total assets have changed relative to U.S. GDP over the time period I am using for my tests (2001-2016). At the end of the first quarter in 2001, U.S. GDP was roughly \$10.5 trillion dollars (Bureau of Economic Analysis, 2016). The Fed's total assets were a little over \$600 billion (Federalreserve.gov, 2016), which equates to roughly 5.7% of total GDP. If we fast forward to the current time period, U.S. GDP is currently \$18.6 trillion, and Fed total assets are at \$4.5 trillion, almost 24% of U.S. GDP. That's quite an increase in percentage! Here's what it looks like in a table a graph (the time periods are the same time periods I am using in my hypotheses tests):

It's obvious that the Fed's total assets relative to U.S. GDP have increased drastically over the past fifteen years. They went from 5% in 2001 to almost 25% in 2016. The Fed just keeps getting bigger in relation to the U.S. economy, and a lot of this has to do with quantitative easing and the purchasing of mortgage backed securities.

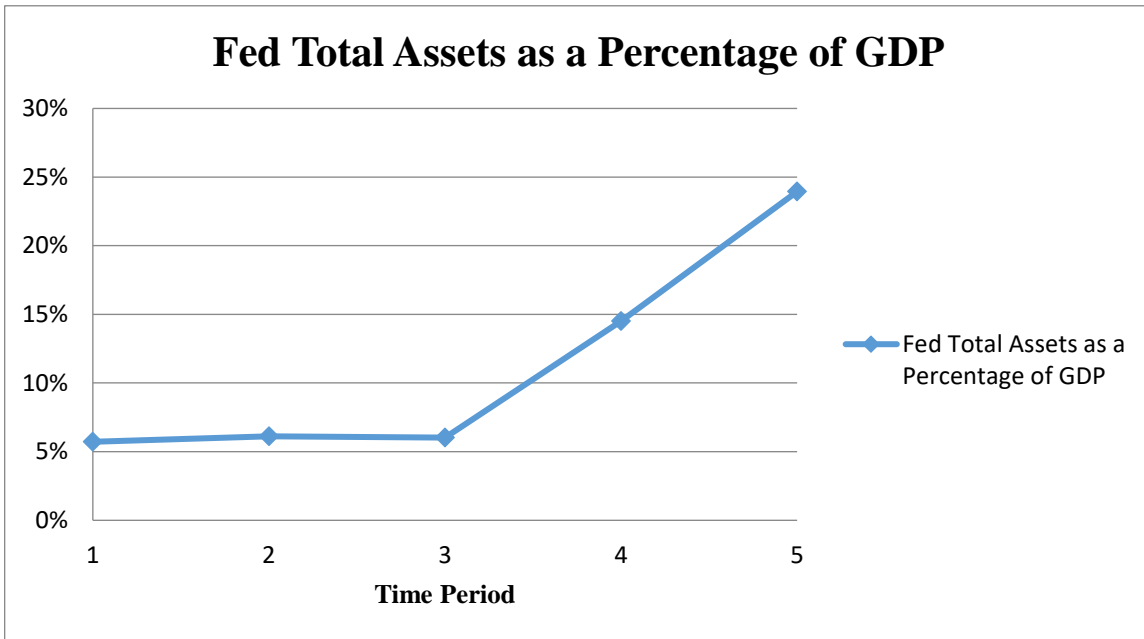
All of the tests that I ran were two tailed t-tests for means with equal variances. From the result, I can reject the null hypotheses that the means in each respective time period were statistically similar. Therefore, the test concluded that all of the means were statistically different from each other. The critical values for each test were 1.98.



**Table 2: Descriptive Statistics: The Percentage of Fed Total Assets to U.S. GDP**

Time Period	U.S. GDP	Fed Total Assets	Fed Total Assets as a Percentage of GDP
1	\$ 10,508,100,000,000.00	\$ 601,086,000,000.00	5.720%
2	\$ 10,639,500,000,000.00	\$ 649,682,000,000.00	6.106%
3	\$ 14,685,300,000,000.00	\$ 886,165,000,000.00	6.034%
4	\$ 14,340,400,000,000.00	\$ 2,079,783,000,000.00	14.503%
5	\$ 18,657,900,000,000.00	\$ 4,467,382,000,000.00	23.944%

**Figure 3: Fed Total Assets as a Percentage of GDP**



## VI. Results

I am fairly certain that I am able to reject the null hypotheses with my test regarding the two troughs of the business cycle (points 2 and 4 in my graph earlier in the paper) because the Fed had to use different measures during the two recessions we faced in 2001 and 2008. The emergence of mortgage backed securities in the mid-2000's housing market was something that didn't even exist during the early 2000's, and the Fed played a major role in purchasing these damaged assets starting in 2008, drastically altering their balance sheet. The Fed still has about \$1.7 trillion of mortgage-backed securities in their portfolio to this day.

I wasn't exactly sure how my tests regarding the peaks of the business cycle would go when I first started running them. My initial line of thinking was that if the Fed's goals and mandates remained the same, their portfolio should have a similar makeup when economic stability resurfaced. That obviously wasn't the case as I was able to reject the null hypotheses in each test I performed, comparing periods 1, 3, and 5 together.

**Table 3: Results of t-test of Differences in Means**

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Tests	Two-tail Critical Value (5% level)	t-Statistic
1 vs. 3	1.98	3.51**
3 vs. 5	1.98	15.36**
1 vs. 5	1.98	211.20**
2 vs. 4	1.98	67.46**

\*(Indicates significance at the .05 level)

\*\* (Indicates significance at the .01 level)

## VII. Conclusion

My descriptive statistics showed a difference in the proportions of U.S. Treasury Securities to Total Assets, but I wasn't sure how they would differ according to a test for means during each respective time period (I used five time periods). My results support the conclusion that the Fed's balance sheet has fundamentally changed during the course of the past fifteen years, which was my original research question. While their goals and mandates have remained the same, it seems as if the Fed's responses to the recessions in 2001 and 2007 have altered the makeup of their portfolio for good. Is this a bad thing? It's hard to say. Pollock (2016) wrote about how no part of a democratic government, let alone one with such immense power and riskiness as the Fed, should be free of checks and balances and free from any serious accountability. I think that's one of the reasons we've seen some drastic changes in Fed's balance sheet, not only in composition, but in size. The Fed really answers to no one in terms of the decisions they are able to make, so they have the final word in the policies they want to implement.

The Fed's mandate is "to promote sustainable growth, high levels of employment, stability of prices to help preserve the purchasing power of the dollar and moderate long-term interest rates," according to their website. The Fed has been around for almost 100 years now, and they have faced many challenges when it comes to stabilizing the financial side of things in regards to our economy. Ben Bernanke, the former Chairman of the Fed, said in his 2013 paper that the financial crisis and ensuing Great Recession reminded us a lesson that we learned both in the nineteenth century and during the Depression, but had forgotten to some extent, which is that severe financial instability can do grave damage to the broader economy. The implication is that a central bank must take into account risks to financial stability if is to help achieve good macroeconomic performance.

When the U.S. is in a state of financial turmoil, we turn to the Fed to "fix" our problems. Whether it's buying or selling bonds or changing the federal funds rate, there are only so many things the Fed can do to "right the ship." Sometimes they use conventional methods like I mentioned above and sometimes they are forced to do things that they've had no experience in doing, like in 2008 when the housing and stock markets collapsed. Ben Bernanke perfectly spells out this point by mentioning that the Fed must take into account all aspects of the economy and how financial instability can cause major turmoil. The Fed's balance sheet today is made up of a lot less treasury securities than it was in 2001. In 2001, treasury securities made up over 83% of its total assets. Today, they make up only 55% of total assets. Like I mentioned above, the Fed

now holds many mortgage-backed securities that it has been purchasing throughout the past eight years in response to the housing crisis.

With the results I have found, I think we have to look at the Fed as an ever changing body. Yes, their overarching goals have remained the same, but the methods they have had to institute are undoubtedly different. The Fed is an independent agency – which means it can make decisions on its own (for better or worse), without needing approval from any other branch of government. However, it is subject to questions from Congress over its actions. The Federal Reserve chairman (Janet Yellen) regularly testifies to both the Senate and the House.

The Fed has been put in some difficult spots over the years. They are comprised of some very smart individuals who have to respond to some imperfect situations. When I say imperfect situations, I mean that the answer is not always lying directly in front of them in a textbook. That's the tough part about economics. There are so many great theories out there, but they are only theories and don't always offer the perfect answer. Buying mortgage-backed securities was an unprecedented move by the Fed, but it was something they had to do in their eyes in order to keep the economy afloat. The makeup of their portfolio has definitely changed over the years, but their actions have always supposed to be in the best interest of the economy, whether they work or not.

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