The U.S. Housing Crisis: Analyzing the Differing Arguments of John Taylor and Alan Greenspan

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ABSTRACT

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Many agree that the recent U.S. Housing Crisis was the worst economic crisis since the Great Depression. After every crises economists look back and try to identify the main trigger. For this particular crisis, the underlying causes are highly debated. The first part of this dissertation focuses specifically on the recent U.S. Housing Crisis and analyzes the differing arguments made by John Taylor and Alan Greenspan. Taylor accuses the Federal Reserve of keeping interest rates too low for too long while Greenspan counters that the federal overnight rate had become useless in affecting housing prices and that the main cause of the crisis was due to the extremely high global saving rate. To evaluate this argument the effect of overnight interest rates on housing prices is tested from 1980-2010. The model analyzes the effects of interest rates during the pre-bubble period as well as the post-bubble period.

The same model was tested substituting for the actual interest rates the interest rates that followed the Taylor rule. The results indicate that while the actual interest rates the Federal Reserve set did not significantly affect U.S. housing prices, following Taylor's interest rates could have ameliorated the extent of the crisis. While this may seem somewhat contradictory,

Taylor has repeatedly stated that there were various factors that led up to the housing bubble and triggered its burst. Perhaps, the interest rates set by the Federal Reserve proved to be insignificant in affecting housing prices (and the corresponding monetary policy at the time was not very effective), but if the Taylor Rule was followed, monetary policy could have been more effective and interest rates would have had a greater explanatory role in determining housing prices.

The empirical results are mixed, finding some support for each position and suggesting that this is an important subject for further research using more detailed models of the housing market and of the effects of international capital flows on U.S. interest rates and credit growth.

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Chapter 1- Introduction

The main objective of this dissertation is to identify and empirically test the conflicting arguments of Stanford Economist John Taylor and former Chairman of the Federal Reserve, Allan Greenspan, regarding the extent of the influence the Federal Reserve's monetary police had on the recent financial crisis.

1.1 Background

In 2007, a number of leading European and U.S. banks were severely impacted by the collapse of mortgage-backed instruments. To the dismay of financial institutions, these toxic assets comprised a major portion of the bank's asset base. The high demand in the housing market was triggered in part by historically low (many would argue below equilibrium) interest rates. This 'artificial' demand contributed to a bubble in the housing sector that subsequently burst once the Fed raised interest rates, paving the way for a series of delinquencies. Buoyed by the booming housing market, banks granted loans to subprime borrowers who under 'normal' conditions, would have been rejected. With the end of the house price increases along with a rise in interest rates, these subprime borrowers failed to pay back on their house payments which resulted in a plethora of loan foreclosures. The rising defaults led to a credit crunch because financial institutions suddenly became very wary of lending to each other. For example, a steep rise in liquidity costs resulted in the "first bank run" in Britain in over 150 years.

The enduing credit crisis was the result of a sustained period of global imbalances and bubbles in asset prices. The Federal Reserve continuously kept interest rates at unprecedented low levels for a significant part of the decade, setting the stage for cheap credit. Many business leaders and financiers across the world considered U.S. households as "consumers of last resort" to sustain

the global boom. Robert Brenner described the demand-boosting policies of the Fed and Treasury as 'market Keynesianism' (Blackburn, 2008, p.63-66).

1.2 Monetary Policy

The global economy is slowly recovering from the worst recession since the Great Depression. Currently, there is an ongoing debate about the factors that led to the recent credit fiasco and the steps that should be adopted to avoid similar situations in the future. The role of monetary policy, in particular, has once again been brought under heavy scrutiny. More specifically, certain economists are calling for a modification of how monetary policy is currently used. Instead of primarily being a weapon for inflation targeting, more relevance should be given to the affects it can have in promoting financial stability.

Milton Friedman, in his paper, *The Role of Monetary Policy*, argues that after the Great Depression, Keynesian economics became wildly popular and it was often accepted that monetary policy was impotent. As Friedman states, "Monetary policy was a string. You could pull on it to stop inflation but you could not push on it to halt recession. You could lead a horse to water, but you could not make him drink." Keynes believed that in times of high unemployment, real interest rates cannot be lowered merely through monetary policy. If investment and consumption were only minimally affected by interest rates, lower interest rates would not have much of an effect. Keynes and his colleagues were in favor of using fiscal policy over monetary policy in order to achieve financial stability.

Monetary policy was not given much attention until the early 1950's when it was argued that changes in the real quantity of money can affect aggregate demand, even if it does not alter interest rates (the Pigou effect). According to some, the expansionary form of monetary policy

pursued by the Fed after 2001 laid the foundation for the housing crisis. Of coarse, there are others who believe that the factors leading to the crisis had no relation with monetary policy. According to those in that school of thought, neither policies on interest rates nor price stability are enough to maintain financial stability. They argue that separate policies specifically designed for financial stability are required. Although the central bank has the responsibility of both these policies, the objectives of the two are different and can be achieved via distinctly separate instruments.

For many, it has become conventional wisdom to put the blame of the crisis on Alan Greenspan and his policies as the chairman of the Federal Reserve. Many noted economists have targeted the historically low interest rates as the cause of the crisis. This mentality appears to be justified as the Fed has the ability to influence interest rates by increasing liquidity in the market. For example, between January 3, 2001 and June 25, 2003, the federal funds target rate was reduced from 6.5% to 1%. The Fed cited weakening sales, production and lower consumer confidence for its decision of lowering the federal funds rate. Many agreed that this was the right move and praised the decision. Then president-elect George Bush stated, "I'm pleased the Fed has cut interest rates. I believe the cut was needed. It's a strong statement to ensure our economy does not go into a tailspin,". Likewise, General Electric CEO Jack Welch said, “We had a chance to all rejoice a little bit at Mr. Greenspan's aggressive actions here at lunch. We raised a glass of water to Mr. Greenspan for taking that action, and we all think it's in the right direction." The Fed was so determined to avoid a recession that many, including John Taylor, think that it kept the interest rates too low for too long. Starting on June 30, 2004, the Fed reversed this policy in 17 equal increments and gradually raised the target rate to 5.25% by June 29, 2006. On September 18, 2007, the Fed yet again reversed its decision and in a series of 10 moves, reduced

the target rate to practically 0 (0%-0.25%). These actions resemble those of an institution desperately trying to use monetary policy to either thwart or mitigate crises.

However, there are other factors that can influence interest rates as well. One such factor is the sudden rise in the global savings rate which has an inverse relationship with the interest rate. It's not shocking that Greenspan (and now Bernanke) are clinging towards the latter view as the leading cause behind the crisis. Recently, when speaking to a commission investigating the origins of the financial crisis, former Fed chairman Alan Greenspan stated, "In the business I was in, I was right 70% of the time, but I was wrong 30% of the time." Yet, Greenspan doesn't believe that this recent crisis falls in that 30%. He firmly states that a significant increase in the savings of some nations (predominantly China) contributed to the financial crisis. He defends his policy by putting forth the following argument: The Fed regulates only the interest rates in the overnight markets and has no control over "the long-term interest rates and the long-term mortgage rates driven by it".

According to Greenspan, a surge in worldwide savings was the reason behind the low long-term interest rates. The Fed has control over the overnight rate through the federal funds rate, but the changes in these rates do not necessarily have a significant effect on the mortgage rates (Dow Jones & Company, Inc, 2011).

The monetary policy followed by the Federal Reserve has been heavily criticized by John Taylor in his book 'Getting Off Track'. He argues that the main culprit behind the recent financial turmoil is Alan Greenspan and his policies. Taylor justifies his strong accusations by saying that Greenspan uncharacteristically shifted his policies in the early part of the decade and stopped following the 'Taylor rule'. The Taylor rule is an equation derived by Taylor that recommends

the ‘appropriate’ short-term interest rates the Fed should maintain after incorporating changes in key economic variables. Taylor states that the short-term interest rates dropped in 2001 to tackle the dot.com bubble bust. If the Taylor rule was followed, then Greenspan should have tightened interest rates starting in 2002. From 2002 to 2005, the interest rates should have been increased gradually until they reached a level of 5 percent. Upon reaching the equilibrium rate of 5 percent, they should have been maintained at that level through all of 2006.

Contrary to the Taylor rule, the Federal Reserve followed a lax monetary policy and interest rates maintained a downward spiral from 2002 to 2004. As late as mid-2004, rates were not raised from their unprecedented low levels and failed to reach the prescribed equilibrium rate of 5 percent until 2006. Eventually, the worldwide economy had to bear the results of this faulty policy. The loose monetary stance of Greenspan is said to have fueled the boom in asset prices. According to Taylor and other critics of Greenspan, this could have been avoided by the timely adoption of the Taylor rule. Taylor repeatedly emphasizes that only action that was required by the Fed to avoid the crisis was to follow the same policy that had worked fairly well in times of economic stability during the period he refers to as ‘The Great Moderation’. He exposes the correlation (and goes as far as implying causation) between the housing boom and the loose monetary policy of the Fed. The housing prices started an upward trend and increased sharply in 2003. After the market got overheated the housing market started a downward spiral throughout 2006.

Greenspan’s defense against Taylor’s arguments is that the short-term rates do not statistically affect the long-term interest rates. While he does acknowledge that historically, there was a strong correlation between the short-term and long-term interest rates, he says that this correlation currently was not as strong. Taylor, however, points out that the adjustable rate

mortgages (ARM) that comprised nearly one-third of the total mortgages were directly influenced by the short-term interest rates set by the Fed. Furthermore, Taylor also dismisses the notion that a global savings glut was the predominant factor behind the crisis. He argues that the global savings glut arising from economies like China was nullified by an equal savings deficit in the U.S. (Lee, 2009).

All these varying viewpoints have raised the demand for a thorough probe of the financial crisis. John Taylor argues that government interventions and subsequent actions worsened the problem instead of improving it. The interest rates held by the Fed during 2003-2005 were below the monetary guidelines. It is believed by many that the best approach to prevent the ensued boom and bust cycle would have been to use history as a guideline instead of the unprecedented measures that were taken. The higher the level of monetary excesses is, the larger the impact on the housing boom.

The boom and bust phases of the recent crisis were exacerbated by various complicating factors such as securitization and adjustable rate mortgages that compounded risk. Evidence shows that the very low interest rates presented a great temptation for investors, increasing their willingness to take risk. There exists an inverse relationship between the delinquency & foreclosure rates and the inflation in housing prices (Taylor, 2011).

Taylor gives credence to the prevailing theory that in order to promote home ownership in the U.S., the government supported lending to subprime borrowers. This created a bubble in asset prices in the housing sector in addition to adding to the low quality credit burden. As pointed out by Taylor, sub-standard lending practices and taking excessive risk are associated with the low interest rates that resulted from an overly lax monetary policy. Taylor's argument focuses only

on monetary policy. He strongly rejects ideas that the excessive global savings was the force driving down the interest rates during 2002- 2004 (Marques, 2010, pp.157-159).

1.3 Asset Bubbles

With the tech bubble and the housing bubble occurring in less than a decade, Hyman Minsky's Financial Instability Hypothesis has been receiving a lot of attention. Minsky believes that bubbles are common because they are an inherent component of capitalistic economies. According to the Financial Instability Hypothesis, capitalist economies commonly witness phases of debt deflation and inflation that can, at times, get out of control.

The fall of the "sub-prime market" in 2007 is labeled by many as a "Minsky moment". More and more people are starting to believe that the subsequent deep recession and financial system implosion that resulted from the crisis corroborates the "financial instability hypothesis of Minsky.

Minsky's hypothesis states that business cycles in the past have been caused by "internal dynamics" existing in capitalist economies. Further, the regulations and interventions intended to keep an economy in check also contribute to business cycles.

An asset boom is caused by an increase in bank credit and is often characterized by a rise in speculative practices. When some people begin drawing out their profits, asset prices soften. This triggers a period of 'distress' once speculators begin believing that the markets will start a downward trend. Often, there exist some sort of specific market signals such as the failure of a firm or bank precipitating the crisis. In the anticipation of a collapse, investors rush to liquidate their positions. The sporadic exit of investors creates a panic situation. This panic phase continues until asset prices fall to such low levels that they are usually met with an intervention

by authorities. In Minsky's view, these chain of events eventually lead to a credit crisis. The model put forth by Minsky states that a crisis is partly caused by endogenous factors and partly by the exogenous disturbances.

1.4 Objectives

(A) The main objective of this dissertation is to evaluate the factors that triggered the financial crisis. There have been conflicting views regarding the root of the crisis. In order to assess the significance of these views and to achieve the abovementioned research objectives, the following questions have been formulated:

1. How do the differing arguments of Alan Greenspan and John Taylor regarding the role played by monetary policy in instigating the financial crisis test empirically?

2. If the Federal Reserve had followed the Taylor rule, would the housing crisis been as significant as it was?

(B) Different types of economic crises have occurred throughout history. This recent crisis, like many of the ones before it, had certain unique characteristics that set it apart from others. A better understanding of the cause of the crises should help make future ones less likely. As mentioned, there are various views regarding the factors that triggered the recent financial turmoil. However, to this day, there is no consensus among economists regarding these factors. Alan Greenspan believes that monetary policy played an impotent role in instigating the crisis. In his views, the crisis originated due to a surge in global savings. His views have been challenged by John Taylor who is convinced that the crisis is merely the result of lax monetary policy and artificially low interest rates. This dissertation seeks to scientifically test the theories echoed by each economist.

1.5 Structure of Dissertation

This dissertation is divided into six chapters - Introduction, Literature review, Model Outline, Statistical Result, Analysis and Conclusion. In the introduction, an overview of the causes and effects of the crisis have been discussed. In addition, the varying views regarding the role of monetary policy in the credit crisis has also been briefly explained. While the effects monetary policy had on the crisis is highlighted by some economists like John Taylor, it is discarded by others, such as Greenspan. These differing views are discussed in greater detail in the literature review portion of the paper. The literature review also discusses various empirical and theoretical theories regarding the role of monetary policy in the financial crisis. In the Model Outline section, the empirical model on which the statistical tests are conducted is explained. The results of the tests are explained in detail in the Statistical Results and Analysis chapter. Finally, the Conclusion summarizes the findings of the paper and explores areas of future research.

Chapter 2- Literature Review

2.1 Preamble to the Credit Crisis

In the last few decades, there has been significant improvements in the financial markets, thereby improving the overall operational efficiency of the economy. Earlier, the risk and payment systems used to come together. Bonds were characterized by a series of coupon payments and a payment of the principal at the maturity date. In the current markets, it is possible to strip the bonds such that the principal and coupon can be separately purchased. To put it more simply, advancements in the financial sector have made it possible to buy or sell any type of payment stream.

The separation of financial instruments from their basic fundamental pieces has had a profound impact in the way risk can be sold or bought. With this sophistication, risk can now be transferred in theory to institutions and individuals who are in a better position to bear it. This has been a great step towards efficiency and has facilitated the insurance of all types of activities, thereby encouraging various activities which otherwise would not have been taken up.

This separation and bearing of risk eventually reached across to consumer lending. The underlying debts on credit cards, automobile loans, housing mortgages etc, were pooled together with asset issues. These pooled assets were structured so to lower the risk exposure of the buyer of the securities (which were backed by these assets). In addition, this enabled an easy access of credit to the borrower that otherwise would not have been granted.

Everything seemed to go smoothly until 2007 when it was discovered that the loan quality of some of the housing mortgage pools was sub-standard. This laid the stage for the recent 'global contagion' that soon followed. In 2007, the Chairman of Federal Reserve, Ben Bernanke,

observed that the originators of the subprime mortgage performed the role of the investors' agents with the latter acting as principals. This paved the way for a myriad of opaque and highly complex securities whose valuation was beyond the understanding of any individual. The lack of transparency and discipline resulted in 'overpriced securities' (Cecchetti, 2008).

2.2 Contagion and its Reasons

The term contagion refers to the spread of the credit crisis across various economies. Considering the financial consequences and the economic instability that is followed by a global contagion, it is important to identify the measures that can be adopted to reduce the dispersion of the crisis. This is especially vital for the emerging economies because they are relatively more fragile and require a stable market conditions to flourish.

In times of bank runs, a number of bank customers withdraw their funds because they fear that the bank may soon become insolvent. The actions of depositors/lenders affects the future expectations of other depositor/lenders. If depositors begin actively withdrawing funds, this sends a signal to other depositors that the bank is in trouble. These types of actions and reactions form certain expectations and can result in a bank run. Sometimes the effect of destabilization is so large that the bank can go into bankruptcy. According to Diamond & Dybvig (1983), a shock realization determines whether an individual consumes now or postpones it to a later date. However, depositors that initially had planned to defer their consumption will probably withdraw funds if there is a probability of a bank run. If this happens, the liquid assets of the bank get exhausted. Therefore, the outbreak of the credit crisis is largely dependent on the behavior of the depositors. This can be seen in the recent crisis when investor panic eventually led to a virtual credit halt. The market conditions and investor sentiments made banks wary of even lending to each other which of coarse only further aggravated the crisis situation. The investors in the

market started liquidating their positions and thereby plummeting the worldwide stock indices to record lows (Cheung, et al., 2009).

2.3 Role of Monetary Policy

Some of the main plausible reasons that caused the recent financial crisis have been identified in the above sections. According to Brunnermeier (2009), cheap mortgage financing to sub-standard borrowers fuelled the boom in the U.S. housing market. Three factors were primarily responsible for the fall of the housing market in the U.S. (which in essence, constituted a very small segment of the financial market in the country) transforming into a global contagion. First, the "originate and distribute" banking model, together with the high rate of securitization, led to declining lending standards and made it impossible to re-price the complex structured products. This significantly eroded the confidence level of banks, thereby disrupting the inter-bank markets and credit flow. Second, banks relied heavily on short-term funding sources, hence raising the risk of funding. Finally, the ever-growing integration of global financial systems and the increasing interest towards structured financial instruments quickly transmitted the crisis to all the major regions of the world.

Gourinchas (2010) focused on the role of monetary policy in the recent financial contagion as well as the role played by exogenous influences, particularly the rising external deficits referred to as 'Global Imbalances'. According to Gourinchas, both explanations are not satisfactory as the sole reason behind the crisis. This opinion has also been corroborated by Caballero (2009), who suggested that the primary reason for the crisis lay in the "imbalance" between worldwide demand for secured liquid instruments of debt in the U.S. and abroad, and the limited asset supply. Per Gourinchas, the imbalance in safe assets impacted the monetary policy effects and the external deficit patterns of the U.S. (Gourinchas, 2010, p.1).

The rosy macro-economic picture that prevailed prior to the year 2005 was blemished by the overheated housing markets and the rising external deficits in the U.S.. During the period between January 1997 and January 2006, the S&P Case Shiller Composite-10 Home Price Index rose by 128% in real terms. The household leverage, i.e. the household debt as a proportion of disposable household income, increased substantially with the rise in the prices of real estate. However, there is a general perception by many economists that the developments on this front were mainly benign for three main reasons. The financial innovations, as evident from the increase in securitization, had a positive impact in the form of low borrowing costs and reduced risk borne by the lenders. Due to the limited supply of houses in the short-run, an increase in housing demand raised the housing prices. According to Greenspan (2005b), though concerns about the boom in the housing market were present, there was a perception that the domestic economy could easily bear the slowdown in the household prices in some highly speculative markets without an impact on aggregate conditions. In addition, central banks stated that they were vigilant and could offset any decline in aggregate demand by adopting a suitable interest rate policy.

During this period, the U.S. was facing a current account deficit, (which is measured as the surplus of imports over exports), signifying in part the weakness in domestic savings compared to national investments. The amount of this deficit increased from 0.5% to 1.9% of global output. A persistent deficit implied an increased reliance of the U.S. economy on outside sources for meeting financing needs. By 2005, a rise in global imbalances was perceived as a serious threat to the stability of the global economy.

Gourinchas (2010) states that stable monetary environments do not always indicate a “stable macroeconomic outcome”. According to Obstfeld, (2009) though the pre-crisis period was

characterized by stability in the rate of inflation, consumer prices and output, it was marked by an uncontrolled leverage (both on the part of households as well as financial intermediaries), which is believed to be one of the main reasons behind the crisis.

The excessive leverage conditions had mainly developed due to low real and nominal interest rates, which ultimately fuelled rising asset prices. After the emergence of the credit crisis, it became ostensible that interest rate regulation policy is not enough to achieve stabilization in output and to nullify any demand contraction. The federal rates rapidly reached levels of less than zero, which called for supplementing traditional monetary tools with vigorous fiscal measures and some non-conventional monetary tools (Gourinchas, 2010, p.1).

2.3.1 Effectiveness of Monetary Policy

The effectiveness of monetary policy is has been heavily debated by economists since the Great Depression. The debate is not only about the effectiveness of monetary policy in preventing a crisis (which is the main focus of this dissertation), but also its impact on recovery during a crisis. Both topics are equally important in order to avoid future repetition of similar crises. Pre-crisis, economists are divided; some feel as though monetary policy only played a marginal role and that failures of financial regulation and a low global savings rate was the main driving force behind the crisis. Others believe that the short-term interest rates were kept too low for too long after the dot.com bubble burst in 2000-2001. This disrupted the equilibrium and threatened financial and macroeconomic stability. This conflicting viewpoints will be discussed in depth in the first half of this dissertation.

It is important to briefly discuss the role of monetary policy during a crisis as well. This is an issue that is popular now because the economy still has not fully recovered from the crisis and the Fed continues to keep the short-term interest rates very low. The strictness of credit

standards and the failure of a fall in the cost of credit directed towards businesses and households, gave rise to the view that monetary policy was ineffective in the context of the crisis, despite an eased monetary policy throughout the greater part of the decade. These views have been seconded by Paul Krugman (2008) and have also been affirmed by the minutes of a meeting of the Federal Open Market Committee (FOMC). In fact, Krugman goes as far as to state that, "We are already, however, well into the realm of what I call depression economics. By that I mean a state of affairs like that of the 1930s in which the usual tools of monetary policy – above all the Federal Reserve's ability to pump up the economy by cutting interest rates – have lost all traction." (New York Times, November 14, 2008). These views are also in line with the earlier Keynesian discussions regarding failure of monetary policy in during the Great Depression. Based on these views, many arguments exist about the efficacy of monetary policy in coping with a credit crisis. The easing of monetary policies in times of crises, can be counterproductive because it can considerably weaken the ability of regulatory authorities in taming inflation. However, the abovementioned views have been challenged by several economists such as Mishkin (2009), who argues that in order to nullify the effects of the crisis, monetary authorities need to adopt a more aggressive easing of monetary policy. Friedman and Schwartz (1963) have argued that in the absence of sufficient liquidity allowed by the Fed (and an eased set of monetary norms), the impact of the recession would have been even more severe.

Their opinions are followed by the logic that monetary policy has been effective during the recent financial crisis. In fact, it is said that monetary policy has been more potent during times of crises (compared to normal situations) because not only did it lower interest rates on default-free or government securities, but it also lowered credit spreads. However, it cannot be said that monetary policy can nullify the concretionary impact arising from a financial disruption similar

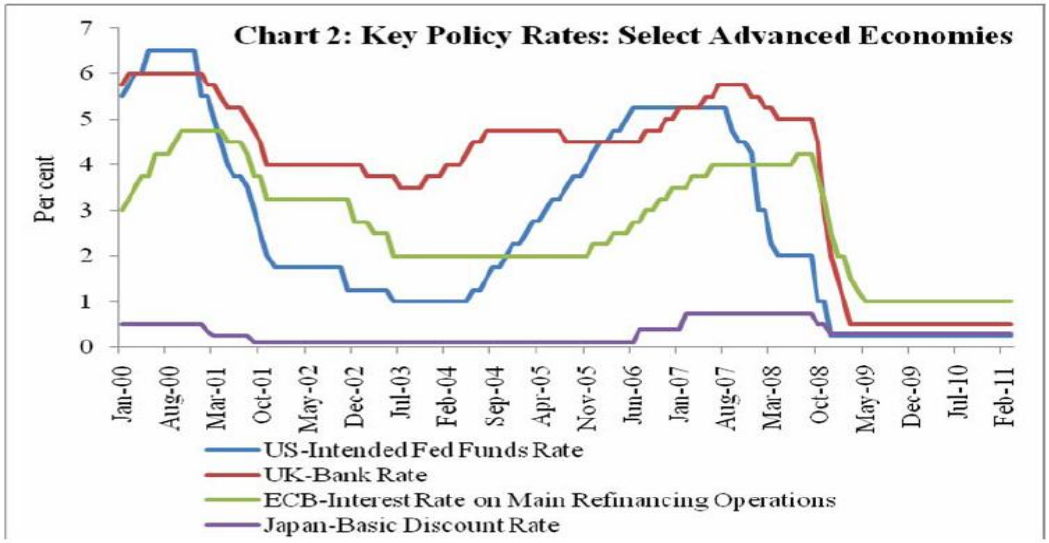
to the one that the economy most recently experienced. The recent financial crisis resulted in such levels of credit spreads widening and credit standards tightening, that even an aggressive easing of monetary policy failed to put a brake to the crisis (Mishkin, 2009).

2.4 Genesis of Credit Crisis

In the aftermath of the crisis it has become increasingly clear that it was not the result of any one factor, rather it originated due to the cumulative impact of microeconomic and macroeconomic factors. From a macroeconomic angle, the crisis was triggered by persistent global imbalances, excessive easing of monetary policy, and ignoring asset prices in the formulation of policies. The major microeconomic issues have been stated to be excessive growth of credit, high leverage conditions, deterioration of credit standards, unregulated financial innovations, absence of adequate corporate governance, and unsuitable structure of incentives in the financial industry as well as sloppy supervisory oversight.

2.4.1 Monetary Policy

In various advanced economies the interest rates remained at low levels for a considerable stretch of time, resulting in risk mispricing and thereby contributing to financial contagion.



Source: (Mohanty, 2011, pp. 2-4).

It is argued by many that the bubble in the housing market was the result of low interest rates. However, Greenspan, Bernanke and others vehemently argue that it is actually the long-term interest rates that stimulated the prices in the housing markets and not the Fed rates (or the overnight rates regulated by central banks), which has now become conventional wisdom for many. In the U.S. the bubble in the housing market was spurred by the sustained low level of 30-year fixed rate mortgage (FRM), which fell from its peak levels in the middle part of the decade.

During the period between 2002 and 2005, the 30-year monthly rate on home mortgages impacted the monthly prices of U.S. homes. Greenspan regressed the mortgage rate and the Federal rate on the home prices. The results yielded a highly significant t-statistic for mortgages of -5.20, but the t-statistic for federal rates was found to be insignificant at -.51. The correlation coefficient in the U.S. between the federal funds rate and the 30-year mortgage rates during 1963 through 2002 was considerably high at 0.83. This implies that in those years, the home prices

(the dependent variable), when regressed on overnight rates or long-term rates (as independent variables) would have *presumably* worked equally well.

According to Greenspan, towards the beginning of the century, there has been some sort of delink between the 30-year mortgage rates and the federal funds rate. The correlation between the two factors has dropped to insignificant levels of 0.17 for the period between 2002 through 2005. It is indeed during this period that the price bubble has been the most intense. Simply by looking at correlations, one can infer that while the federal funds rates did have an affect on the housing prices from 1963 to 2002, it did not have that same explanatory effect during 2002 and 2005. This is one of the main points behind Greenspan's argument. However, it is interesting to see why the strong correlation that existed between short-term rates and the mortgages rates for nearly 40 years, suddenly tumbled during the pre-crisis period.

The federal funds rate was dropped from 6.5% in the early part of 2001 to 1.75% by the end of 2001. The rate did not remain at this level and was further lowered to 1% by mid 2003, which was maintained for nearly a year. The main aim of the Federal Reserve behind the low federal funds rate was to safeguard against the declining inflation rate in 2003 (that had similarities with the deflation faced by Japan in 1990's). At the time, the Fed believed that the chance of deflation was negligible, but in the event of its occurrence, it could prove to be a serious danger. Although Greenspan has acknowledged that holding the federal funds rate too low for a long stretch of time fuels inflation of product prices, he also states that decreasing the rates reflected a means of risk balancing.

Per Greenspan, holding federal funds rates at low levels cannot be considered a significant factor in the housing price bubble. Milton Friedman has been one of the staunchest critics of the

Federal Reserve in his evaluation of their regime during 1987 to 2005. Yet, even Friedman (2006) averred that, "There is no other period of comparable length in which the Federal Reserve System has performed so well. It is more than a difference of degree; it approaches a difference of kind." (Greenspan, 2010).

The view that monetary policy was not the driving force behind the recent crisis is shared by Friedman, Greenspan, Lars E.O. Svensson, the Deputy Governor of Sveriges Riksbank, amd others. As the world economy is slowly recovering from the after-effects of the recessionary phase, there is an ongoing debate about the factors that precipitated the crisis and the measures that need to be adopted by regulatory authorities to avoid such crises in the future. There is an argument from some sections about the need to modify the current framework so as to shift priority from inflation targeting to focusing more at the considerations of financial stability. Many economists have blamed the aggressive monetary policy expansion exercised by the Federal Reserve after 2001 for instigating the financial crisis. These sentiments are echoed not only by economists, but by several politicians as well. In fact, after the crisis, for the first time, bills were introduced to audit the Federal Reserve (H.R. 1207 and H.R. 459).

On the other end of the spectrum, Svensson (2010), states that the factors that played a role in the recent financial crisis did not have any significant links with monetary policy. In his opinion, monetary policy's main objective should be flexible targeting of inflation, which if applied in the right manner (incorporating all the significant information relating to financial conditions), is by far the most appropriate practice in both the pre and post crisis period.

In the views of Svensson, neither interest rates nor price stability policy is enough to achieve financial stability. For this, there must be separate policy dedicated to 'financial stability'. It is

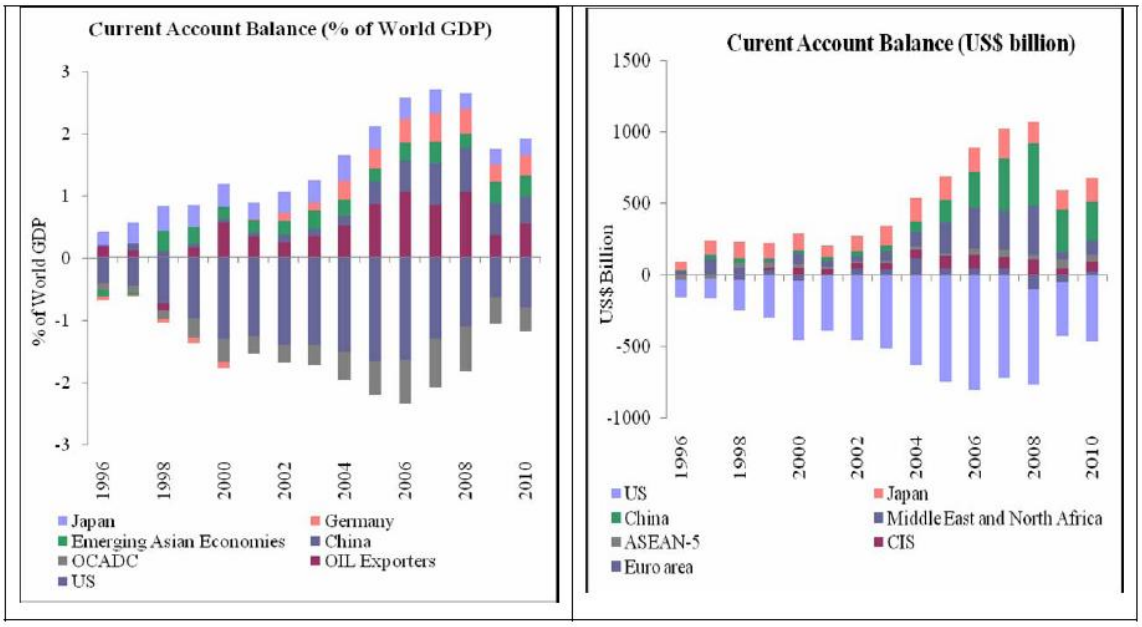
important to distinguish between financial stability policy and monetary policy, as both of them have a definite set of objectives and different set of instruments, even though both policies fall within the domain area of central banks.

Per Svensson, the factors that triggered the crisis include distorted incentive structures, macroeconomic conditions, failures of supervisory and regulatory authorities, information problems, and the policy of the U.S. government that supported home ownership by low-income groups (Svensson, 2010).

2.4.2 Global Imbalances

The Bank for International Settlements (BIS 2009) highlights that while the bust-phase was triggered via the subprime crisis, the inherent cause of the financial crisis was because of persistent global imbalances. Huge deficits in the current account of advanced economies, especially the U.S., coupled with large surpluses in the current account of emerging economies, particularly China, indicate that there was a flow of excess savings from developing markets to developed markets. Bernanke (2005) argues that this "savings glut" was an important factor in causing the credit turmoil (Mohanty, 2011, pp. 2-4).

Chart 1: Global Imbalances



Source: (Mohanty, 2011, pp. 2-4).

Mohanty (2011) states that it is not yet clear as to whether it was excess savings in the Chinese economy or excessive consumption in the U.S. markets that caused the upheaval across the global system. Besides, there is an argument that excessive reserves accumulation in emerging market economies, with China acting as the leader, led to a misalignment of foreign exchange rates. This hindered the orderly adjustment of global imbalances, creating a disproportionate adjustment burden on countries following a flexible exchange rate policy. Mohanty finds some merit in the abovementioned argument, but there is no certainty whether an exchange rate movement could have averted global imbalances without making an adjustment in the aggregate level of demand (Mohanty, 2011, pp.2-4).

Bernanke (2007) argues that large global imbalances, as reflected from the huge proportion of savings with reference to investment in several emerging markets, coupled with the low level of

savings with respect to investments in the developed countries, led to low real interest rates and high prices in asset markets. The low real rate of inflation coupled with years of "Great Moderation" (i.e. a sustained period of highly stable growth and a stable low rate of inflation) resulted in a systematic underassessment of risk, significantly lower risk premiums in the global financial markets, and huge credit expansions (Svensson, 2010).

Portes (2009) states that excessive foreign capital made borrowing cheap and easy in the U.S. The interest rates put in motion a haven for earning yields, thereby creating a multiplier effect based on distortions in asset markets, unrealistic expectations, and agency problems mainly in the housing finance markets. Obstfeld & Rogoff (2009) argue that appreciation in assets, particularly in the housing market, encouraged heavy consumer borrowing and spending. Gourinchas (2010) agrees with the theory that a savings glut was responsible for reducing the real interest rates after 2004 that fuelled leverage conditions. The excessive leverage reared an environment of financial instability and crisis. However, Gourinchas states that this way of thinking is incomplete because it fails to highlight the root problem, the imbalance of safe assets.

Caballero (2009) further emphasized that there was an increased demand for liquid, safe debt instruments from the commodity producers and emerging economies. It has also been stated that this demand for secure and safe assets was not restricted to emerging markets. In fact, the entire world was experiencing an increase in its appetite for safe assets. With the safe assets demand exceeding its supply, the financial system in the U.S. designed 'quasi' instruments by grouping risky assets and selling them off in tranches. This allowed the financial system in the U.S. to shift the safe instrument demand onto highly risky assets, encouraging the rise in global asset prices and allowing more borrowing (Gourinchas , 2011, pp.21-25).

2.5 Taylor Rule

John Taylor, a noted economist, presented a provocative and pointed idea concerning the financial turmoil that gripped worldwide financial markets since early 2007. Taylor put forward the argument that the crisis was essentially a byproduct of lax monetary policies pursued by the Fed. Furthermore, exogenous market forces like excessive savings in China and other Asian markets had no role in it.

According to Taylor, excessively expansionary monetary policy during the period from 2001 to 2006 was the main reason for the financial crisis (the "Great Deviation" as he refers to), which was in line with the real estate crises in the late 1980s in Norway, Sweden, Finland and Japan. Per Taylor, all these real estate crises were the result of uncontrolled credit and monetary expansion. A seminal article published by Taylor in 1993 provided a definition for loose monetary policy. This formula eventually came to be known as the 'Taylor rule'. According to the Taylor rule, the federal funds rate that is regulated by the Federal Reserve should take into account both GDP and inflation. The evidences provided by Taylor show that the federal funds rate from 2001 to 2006 was less than that prescribed by the Taylor rule by nearly 3%. The Fed officials naturally defended the deviation from the prescribed levels of monetary policy citing reasons of deflationary pressure due to the recession in 2001. Taylor blames this deviation for the acceleration of the housing boom that eventually led to a bust. The empirical evidences in support of Taylor's claim highlight that if the Taylor rule had been followed by the Federal Reserve, the housing market boom would have been reached in 2003 and a housing bust would not have happened.

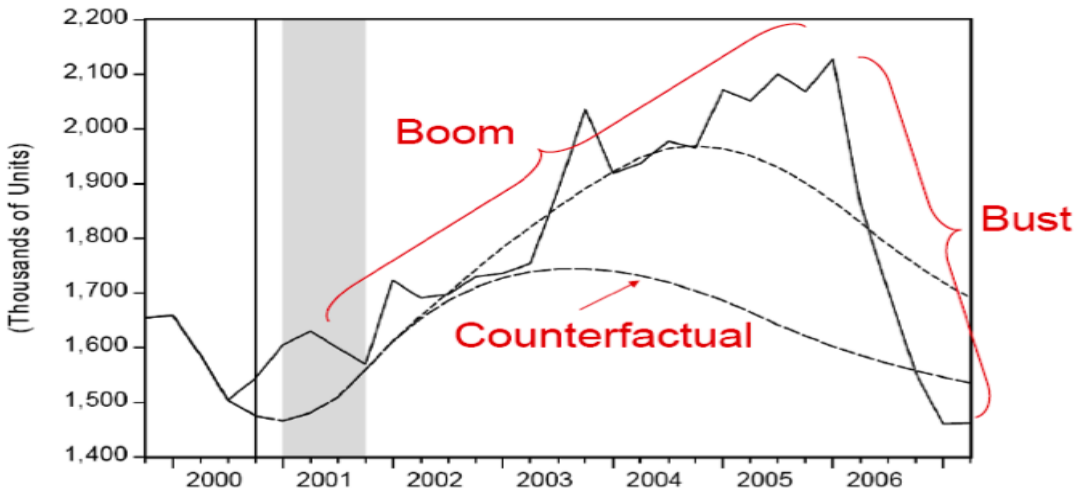


Figure 2. The Boom-Bust in Housing Starts Compared With the Counterfactual. (The line with shorter dashes shows *model* simulations with the actual interest rate.)

(Source: Taylor)

Taylor has also given credence to the prevailing theory that the U.S. government encouraged lending to subprime borrowers to promote a high rate of home ownership, which also shares blame for the creation of the housing bubble and the associated poor credit quality.

Taylor identified the loose monetary policy followed by the Central Banks as the main culprit for the crisis. He strongly rejected other explanations such as a global excessive savings driving down the interest rates between 2002 and 2004. Taylor acknowledges the existence of excessive savings by the Asian economies, but he brings forth the fact that the percentage of world savings with relation to world GDP was declining steadily since 1970. The research conducted by Taylor regarding the 'global savings glut' ignores the recent research of Ricardo Caballero, which puts the emphasis on an alternative role played by 'foreign savings' that he referred to as "Other Imbalance Hypothesis". Unlike the global savings glut theory, Caballero does not censure excessive savings in China and other Asian economies. Rather, he puts the blame on the

unavailability of safe assets having a high demand in both the markets within and outside the U.S. Faced by an unmet demand for safe assets, financial institutions designed and developed safe assets in the form of the securitization of low-quality assets, thereby exposing financial systems across the globe to high systemic risk.

Per Taylor, the Federal Reserve failed to assess the significant rise in interest rates in early 2007. While the Fed viewed the environment as having a liquidity problem, Taylor argued that the problem was with respect to counter party risk. Taylor illustrates that the Libor-overnight indexed spread (OIS), which is widely accepted as a measure of credit situation in money markets, was closely linked with the Libor-repo spread during the 2007 and 2008. According to Taylor, adopted policy measures like reducing the interest rates, direct lending granted to banks, and the "temporary tax credit" granted to consumers were destined to fail because they did not address the root of the malady, which was the risks in the balance sheets of banks. Rather, these initiatives made the matters worse by inducing a bubble in commodity prices.

One area that Taylor did not pay much attention to is 'moral hazard'. An example of moral hazard being at play is with respect to securitization and the resulting agency problems: if the institutions that grant loans are not in charge of holding them for its entire tenure, it is likely that banks that originally floated these loans had little concern regarding repayment prospects and risks.

Taylor failed to take into account the role played by complex securitization in exacerbating the excessive risk practices in the context of the housing markets. In the words of Taylor, the multi-layered mortgage backed securities were a serious concern as they added to the high balance sheet risk of financial institutions. Covet et al, show the risk-sensitivity of these multi-layered

mortgage backed securities to a minor increase in the probability of risk in the underlying asset such as a rise in the default rate (Marques, 2010, pp.157-159).

2.6 Negative or Low Real Interest Rates

Hoeing (2010) states that the real federal funds rate, which is the federal funds rate minus annualized "PCE inflation" (personal consumption expenditure), was negative for the most part of the 2000s. To find another decade with such frequent negative real interest rates, you have to go back to the 1970s, which also preceded a phase of economic turbulence. High levels of inflation in the 1970s was responsible for the sustained low levels of the real federal funds rate. In the early part of this century, however, the inflation rate remained low. Yet, the real federal funds rate remained negative between 2002 and 2004 as the Federal Reserve was trying to avert anti-deflationary threats.

2.7 Financial Stability and Monetary Policy

For the purposes of this dissertation, the relationship between financial stability and monetary policy can be viewed from two angles. First, it may be argued that the hike in policy rates should have been quicker and more aggressive during 2002 to 2006 in order to tackle the impact of increased global savings on long-term real interest rates while attempting to avoid any probable future instability.

The argument put forward by the Fed was simple. It stated that reacting to rising asset prices was undesirable from the viewpoint of:

- Price stability
- Identification of bubbles is difficult

- -Interest rate policy could deal effectively with the after-effects of a bust in an asset bubble if it posed a threat to the general economy and the efficacy of raised policy rates in pricking of asset bubbles was uncertain.

Asset bubbles with excessively leveraged investors, households, or firms can be a serious threat. This implies that regulatory authorities must keep a close check at investors leverage and total credit generated. A sound principle in policy formulation is that one objective can be achieved through one instrument. The assertion put forward by the Federal Reserve is that an objective to incorporate asset prices can have serious repercussions on price stability or it may not serve as an ideal instrument for preventing asset bubbles.

An ideal way is to use 'multiple instruments' for achieving 'multiple objectives'. Blanchard et al. (2010) emphasized that there are multiple instruments ranging from unconventional monetary policy (such as credit or quantitative easing) to cyclical regulatory tools. The reason for the failure of the Federal Reserve and some noted economists was not relating to policy, but relating to imagination: the possibility of a housing bubble raised serious concerns as the Fed was unable to stir the issue regarding the appropriate regulatory changes that could have possibly made some difference (Gourinchas, 2010, pp.16-18).

Second, others argue that had the Fed not aggressively cut rates, the recession would have been much more severe. Frederic Mishkin argues that despite the Fed cutting the short-term interest rates, a combination of increase in valuation risk and macroeconomic risk, along with liquidity shortages, has led to a huge increase in credit spreads (such as the TED spread and the junk bond spread). The result of this, he argues is that despite the historically low federal funds rates, interest rates relevant to household and business spending decisions had risen, along with credit

rationing. Had the Fed not maintained its low interest rates, the valuation risk would still be high and credit spreads would have been even higher which would result in the aggregate spending to be much lower.

2.8 Minsky's Theory on Financial Crises

The fall of the subprime mortgage market in 2007 has been widely touted as a "Minsky moment" by many. The implosion of the financial system that followed and paved the way for a deep recession only further serves as a confirmation of Minsky's "financial instability hypothesis" of capitalistic economies. This theory is corroborated by Martin Wolf (2008), who openly advocates Minsky's proposition.

Many economists like Jan Kregel (2007, 2008a, 2008b), Walen (2007) and Randall Wray (2007, 2008, 2009) have put forth the argument that the recent financial crisis can be best explained by the 'financial instability hypothesis' developed by Hyman Minsky. On the other hand, there are other views such as those of Foster and McChesney's (2009) Marxist view, Kotz's (2009) social structure of accumulation (SSA) view, and Palley's (2008s, 2009) structural Keynesian view, which trace the roots of the crisis back to the adoption of the neoliberal growth model.

The interpretation of the crisis influences the policy response that follows. Had the crisis been a purely Minsky phenomenon, then financial re-regulation can tackle speculation and practices like excessive risk-taking. This approach has been recommended by Timothy Geithner, U.S. Treasury Secretary, and Larry Summers, Chief economic counselor of President Obama. In their view, financial excess was a major problem and normal growth can be restored once this matter is dealt with and solved.

Minsky's financial instability hypothesis argues that the financial systems in capitalist economies rest on two varying cyclical processes. The first cycle is described as the "basic Minsky cycle" and the second as the "super-Minsky cycle".

The basic Minsky cycle relates to the evolution of financing patterns in addition to capturing the financial fragility phenomenon in the balance sheets of businesses and households. The cycle starts with "hedge finance", the stage at which the expected revenues of borrowers are enough to repay loan principal and interest. This is followed by the stage of "speculative finance" with the expected revenues covering only interest. Finally, this cycle closes with "Ponzi Finance", when the anticipated revenues are insufficient to meet the interest obligations and borrowers rely on capital gains to honor their obligations. In the words of Minsky himself, "Ponzi' finance units must increase its outstanding debt in order to meet its financial obligations. A transition occurs over the course of an expansion as increasingly risky positions are validated by the booming economy that renders the built in margins of error superfluous - encouraging adoption of riskier positions. Eventually, either financing costs rise or income comes in below expectations, leading to defaults on payment commitments".

The basic Minsky cycle highlights the overoptimistic view of agents during times of economic growth that results in overvalued assets and revenues, increasing the risk appetite that is purported by the belief of everlasting good economic times. This breaks the market discipline.

The basic Minsky cycle is followed by the super-Minsky cycle. This cycle brings about a transformation in business institutions, market governance structure, and decision-making practices. The stability in capitalistic economies is based on these structures and referred to by Minsky as 'thwarting institutions'.

This process of transformation and erosion takes many basic cycles with the super-cycle being a long cycle. The economy witnesses a full-fledged financial crisis that can exert pressure on its survival when there is a super-Minsky cycle that can erode these thwarting institutions. Between these periods of crisis, there are some financial boom-and-bust cycles in the economy.

The theory behind Minsky's financial instability hypothesis looks appealing and elegant. Empirically it is seemingly in line with the developments that have taken place in the last thirty years. This period manifested three business cycles from 1981 to 1990; 1991 to 2001 and 2002 to 2009. All these business cycles were characterized by a "basic business cycle" characterized by excessive financial risk practices adopted by lenders and borrowers. Also, each of these periods was characterized by a "super cycle" that involved financial deregulation, financial innovation, changed investor risk attitude and regulatory capture. To the proponents of Minsky, like Whalen (2007), Wray (2007, 2008, 2009) and Kregel (2007, 2008a, 2008b), the financial instability hypothesis seems to present a complete view of crises. In the last twenty-five years there has been a huge increase in risk-taking and borrowing, thereby increasing the financial fragility at systemic and individual levels. Minsky's super-cycle slowly eroded the "thwarting institutions" that monitored the system, which let the housing bubble destabilize the banking system and harbored the reckless risk practices on Wall Street (Palley, 2011, pp.1-10).

However, it is argued by some that the crisis interpretation given by Minsky focuses mainly on financial markets. In contrast, other interpretations like structural Keynesian, Marxist and Social Structure of Accumulation (SSA) are of the view that the source of the crisis lay in the real economy (Palley, 2011, pp.1-10).

Foster and McChesney (2009) argue that the crisis is a representation of the return to historical tendencies of stagnation in capitalist economies. In a recent book titled, This Time is Different, Reinhart and Rogoff study in great detail centuries of crises worldwide. They write, "Our basic message is simple: We have been here before. No mater how different the latest financial frenzy or crisis always appears, there are usually remarkable similarities with past experience from other countries and from history." They go on to say, "If there is one common theme to the vast range of crisis we consider in this book, it is that excessive debt accumulation, whether it be by the government, banks, corporations, or consumers, often poses greater systematic risks than it seems during a boom. Infusions of cash can make a government look like it is providing greater growth to its economy than it really is. Private sector borrowing binges can inflate housing and stock prices far beyond their long-run sustainable levels, and make banks seem more stable and profitable than they really are." (Reinhart & Rogoff, 2009).

Kotz (2009) uses an SSA analysis mode, which has a strong resemblance with the approach of Foster-McChesney. For both economists, the crisis characterizes the contradictions that surfaced within the "neo-liberal regime" of capital and growth accumulation, which resulted from wage stagnation and the rising income inequality over the last three decades.

The financial crisis that originated in 2007 is widely analyzed as the "Minsky crisis". Paley (2011) views this interpretation to be misleading. The processes highlighted in the financial instability hypothesis of Minsky played a crucial role in the recent crisis. However, this role forms a part of a much larger drama in the economy partaking the "neo-liberal growth model" that came into effect around 1980. This growth model initiated an era of rising income inequality and wage stagnation. Instead of growth in wages to stimulate demand, it depended on inflation in asset prices and borrowing. This type of arrangement was unsustainable but a

combination of factors such as financial deregulation, financial innovation, increased risk appetite, and regulatory escape prevented the stagnationist tendencies of the model for a much longer time period than expected. Debt ceilings and bubbles are difficult to predict which explains critic's prediction of the model's early demise (Palley, 2011, pp.1-10). Palley does acknowledge that Minsky's theory does complement the views of SSA theorists and new Marxists regarding debt. Debt provides a means to consumers to continue spending despite wages remaining stagnant and the income gap widening. This especially holds true in the housing sector when house price inflation provides higher collateral that can be borrowed against. Because of this financial innovations, deregulation, and other factors that increase the availability of housing finance are very important because an increased supply of housing finance increases housing prices. This explains why historically in the neoliberal era there is a positive correlation between economic boom and house price inflation.

Chapter 3 - Model Outline

Financial crises have been pestering the world and global activities ever since nations around the world decided to liberalize their respective economies. In fact, there have been financial crises prior to economic liberalization as well, although the aftermath did not traverse much beyond the domestic precincts, primarily since international trade and transactions had been restricted. The reality of globalization is one of the main reasons why there have been rising concerns about the factors propelling financial crisis, as well as regulations or reform measures, which could prevent such a catastrophe all over the world today. It had often been suggested by eminent researchers that such dire situations could be prevented only if administrations of different nations adopt responsible measures in their monetary policies. This is the very essence of the theories suggested by Alan Greenspan and John Taylor.

3.1 Greenspan's Articulation

Greenspan, an American economist and former Chairman of the Federal Reserve (1987-2006) suggested that long-term interest rates, not short-term or overnight Federal funds rates, maneuvered the housing price bubble. In other words, he rejected that monetary policy was behind the culmination of the crisis even though the reformatory measures that were taken were intrinsic to monetary policy. Colander et al. (2009, p. 251) wrote that, "The confinement of macroeconomics to models of stable states that are perturbed by limited external shocks, but that neglect the intrinsic recurrent boom-and-bust dynamics of out economic system, is remarkable." While there is no shortage of academic research and literature regarding these intrinsic recurrent boom-and-bust dynamics, often this literature is ignored and downplayed. Greenspan, unsurprisingly, suggested the influence of these 'limited external shocks' actually led to financial

shocks in the nation. In the present case, the exogenous shock had evolved out of an 'excessive savings glut' in transitioning economies like India and China. This savings however, was not associated with an equivalent amount of investment throughout the world, thus driving the long-term interest rates to an all-time low. Nonetheless, the volume of investment in the United States itself had been quite high between 2002 and 2004 when the housing bubble was initiated and started to proliferate. The Federal Government however, had undertaken careful measures to adjust interest rates to an economically resilient position so as to cope with this exogenous factor. Hence, Greenspan suggested that the slowly expanding housing bubble in the U.S. had particularly been the consequence of a gradually increasing gap between aggregate savings and investment throughout the world. Depreciation in long-term interest rates cannot be alleged thus upon monetary policies adopted by the Federal Government. In other words, completely exogenous factors propelled the financial crisis. Simultaneously, changes in overnight interest rates cannot be blamed as a possible cause of the crisis. However, in order to frame a suitable model in this respect, it is necessary to depict appropriate proxies.

The model to be defined in this case will be structured such that housing prices are depicted as a function of interest rates, where interest rates will essentially be of two distinct types. The purpose of the model will be to assess the validity of Greenspan's claims about monetary policy moves being inconsequential determinants of a looming financial crisis. Specifically, there will be three distinct categories of interest rates. Overnight Federal Funds Rates will denote the short-term interest rate, while the 20-year Treasury Yield Curve Rates and the 30-year Mortgage Rates will represent long-term interest rates. Overnight Federal Funds rate is the main independent variable that is looked at. Taylor and others have argued the Fed's decision to keep these interest rates too low for too long was one of the main reasons behind the severity of the recent crisis.

These rates, set by the Fed, have impact over the activities of commercial banks in advancing loans because they are in essence, the rate of interest at which commercial banks transact amongst themselves. The higher the overnight interest rates are, the higher the rate at which the banks are willing to forward loans to potential borrowers, primarily because the banks also have to endure a greater opportunity cost while asking for loans from their peers. Hence, the obvious impact is a hike in rates at which banks forward loans to their borrowers which actually reduces demand. In other words, it could be anticipated that the higher the overnight Federal Rates of interest are, the lower the demand for loans in the economy.

On the other hand, interest rates actually reflect many exogenous events, which is what Greenspan had emphasized upon as a possible factor leading up to the financial crisis (Domash, 2002, p. 164). However, in order to denote long-term incidents, yield rates for Treasury bonds associated with a long period of maturity have to be considered. Hence, Treasury Bonds that corresponded with a 20-year maturity will be considered in this model. An additional element to be considered will be 30-year fixed mortgage rates. There is a general consensus in the literature that 30-year fixed mortgage rates have a statistically significant affect on housing prices.

Thus, keeping in mind the arguments advanced by Greenspan, an empirical model can be developed to attempt to examine the actual cause of the crisis. Since the crisis developed in the housing sector of the U.S., the dependent variable being considered in this case is housing prices.

In addition to the abovementioned explanatory variables, the other control variables used are volume of bank credit growth, personal income, Consumer Price Index (CPI), housing inventory, and a dummy variable that represents bubble and pre-bubble periods. All the above variables except housing inventory are demand variables and housing inventory is a supply variable. The

credit growth variable is expected to affect housing prices positively since excessive credit growth can result in increased liquidity, which in turn, fuels excessive housing price changes. Moreover, during housing price booms, improvements in the balance sheets of financial and non-financial sectors results in collateral value expansion, which increases banking credit, and in turn, increases housing prices.

Many have observed that as personal income rises, housing prices tend to rise. Therefore, personal income is often considered a demand factor. CPI is used to capture the overall inflation effects and the housing affordability. Housing inventory/units are a supply-side variable. This variable is used to show how during the housing boom, the demand was greater than the supply. The inventory of home sales showed a shortage of supply with the progress in the U.S. housing boom.

We have also added an interactive term between the federal funds interest rate and the dummy variable. Greenspan has suggested that the historical relationship (a direct, positive relationship) that existed between short-term interest rates and long-term interest rates deteriorated between 2002-2005. The interactive term between the dummy variable and federal funds target rate will attempt to test this idea.

Depicting in technical terms, the form of the model will be:

Housing Prices$_t$ = f (Overnight rate of Interest$_{t-1}$, 30-year Mortgage Rates$_{t-1}$, 20-year Treasury Bond Yield Rate$_{t-1}$,personal income$_{t-1}$, credit growth $_{t-1}$, CPI $_{t-1}$,housing inventory $_{t-1}$, Overnight Rate of Interest$_{t-1}$ * dummy variable, dummy variable)..... (1)

Housing Prices in this case are the median values as estimated by the Federal Housing Finance Agency. The reason for choosing median prices over average prices is to avoid the effects of outliers that tend to shift the mean. The chances of outliers are especially high given that these statistics include houses of all categories. Outliers can be considered measurement errors and can affect the validity of the data used in modeling. Hence, it is much more appropriate to use median housing prices.

The time range for all variables will be measured monthly between 1980 and 2012 (up to April). As in any time series analysis, the time lag plays an important factor. Therefore, the dependent variable has been denoted in a way so as to portray it as an outcome rather than an event occurring simultaneously with the independent variables. To look at the effects on long term rates that are most relevant for housing finance, the 20-year bond yield rate has been used, Confirmation of Greenspan's theory would mean that the coefficient of the Treasury Bond Yield Rate will be the main factor with statistical significance while compliance with Taylor's argument would mean that the federal reserve rates also contribute a statistically significant impact over the dependent variable.

The analysis is divided into pre-bubble (January 1980 to December 1996) and bubble (January 1997 to April 2012) periods. Although 2009-2012 are technically post-bubble, the economy has not fully recovered from housing market bubble and therefore those years were not excluded from the dataset. The descriptive statistics for each variable in the pre and bubble periods are given below.

Table1: The descriptive statistics for the pre-bubble period

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Federal Funds Rate (%)	204	7.960000	3.6828230	2.92000	19.1000
20-Year Treasury Rates (%)	123	10.09789	2.6721340	6.07000	15.1300
30-Year Mortgage Rates (%)	204	10.95711	2.8840130	6.83000	18.4500
Median Sale Prices of Homes ($)	204	103915.7	25111.330	62600.0	144900
CPI Growth (%)	204	0.357416	0.2823753	-0.54695	1.43043
Housing Inventory (1000s)	204	91266.82	6473.1060	78920.0	101361
Bank Credit Growth (%)	204	0.577980	0.4423405	-0.87156	2.21399
Personal Income ($)	204	15083.98	3840.7720	8361.00	21681.0

Table2: The descriptive statistics for the bubble period

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Federal Funds Rate (%)	184	2.9770650	2.2153940	0.0700	6.54000
20-Year Treasury Rates (%)	184	5.0536410	0.9681125	2.6700	7.20000
30-Year Mortgage Rates (%)	184	6.2192390	1.0925910	3.8900	8.52000
Median Sale Prices of Homes ($)	178	199829.20	34056.140	141000	262600
CPI Growth (%)	184	0.1990089	0.3050714	-1.79383	1.37685
Housing Inventory (1000s)	183	108129.10	3298.7900	101374	114260.0
Bank Credit Growth (%)	184	0.5346269	0.7611417	-1.66821	5.23252
Personal Income ($)	184	30306.110	4943.6680	21762.0	37752.00
Dummy*Federal Funds Rate	184	2.9770650	2.2153940	0.07000	6.54000

In addition to these, the correlation between capital flows (measured as current account deficit)

and credit growth is also looked at. Usually, the current account balance offers a general overview of a country's balance of trade (including the trade of goods and services, income receipts, and transfers). If a country has a surplus/deficit on its current account, there is an offsetting net financial flow consisting of currency, securities, etc (which is referred to as the capital accounts balance). Note that reserve flows are included when discussing capital flows. Capital flows move in the opposite direction of trade, meaning that when a country has a large current account deficit (such as the U.S.), it also has a large capital account surplus. The current-account balance, in theory, should be perfectly offset by the capital-account balance. Since the capital account is similar to the mirror image of the current account, we have used the current account as a proxy when looking at the relationship between capital flows and credit growth. The correlation between these two variables is seen in the table below:

Table 3: Correlation between current account deficit and credit growth in the pre-bubble period (*Based on Quarterly Data*)

	Current account deficit
Credit growth	**0.56**

Table 4: Correlation between current account deficit and credit growth in the bubble periods (*1995-2000, 2006-2008*)

	Current account deficit
Credit growth	**0.87**

While both tables show positive correlation between the current account deficit and credit growth in the U.S. the relationship is much stronger during the housing bubble period. This means that the government kept on borrowing from banks and that resulted in the widening of the current account deficit during the bubble period. It is interesting to note that the correlations are also consistent with capital inflows generating more rapid credit growth, leading to the belief that there was 2-way causation.

3.2 Taylor's Articulation

John B. Taylor, a leading Economist and expert on monetary policy had historically favored the policies of Greenspan to some extent. However, they maintained differences of opinion in some important key aspects, which actually led to a conflict of theories regarding the possible causes behind the most recent financial crisis. Taylor, agrees with Greenspan that the biggest contributor to the increase in housing prices was the decrease in the long-term mortgage rates. However, unlike Greenspan he accentuated the significance of overnight Federal funds rates as well, which be believes eventually drove the long-term interest rates in a similar direction over time. He had proposed the Taylor Rule in 1993 to estimate the value of interest rates that the Fed must ideally follow as a general guideline for monetary policy with respect to the macro-economy. In the aftermath of the financial crisis of 2007-08, Taylor insists that had the Fed complied with this rule, the crisis could have definitely been mitigated. The Taylor Rule positively associates interest rates with inflation and the GDP Gap rate through the following formula:

$$\mathbf{r_t = 0.04 + 1.5\ (\pi_t - \mathit{0}.02) + 0.05\ (y_t - y_t^*)}$$

Where, r = The ideal Federal Funds Target Rate,

π = Rate of inflation in terms of GDP Deflator

y_t = Logarithm of real GDP, thus denoting the change in over the years

y_t^* = Logarithmic transformation of possible output figures as deduced through extrapolation.

The difference between the logarithmic transformations of the actual and possible output predictions is nothing but the GDP Gap rate (Woodford, 2001, p. 1). In reality, y_t^* is seldom found to be lower than y_t; at best they could be at par with one another, meaning the GDP gap rate is rarely a positive figure. Thus, in terms of the Taylor rule, ideally, interest rates determined by the Federal Reserve are driven upwards when there are upward revisions in the domestic rate of inflation and the GDP gap rate. These correlations seem plausible since higher inflation depreciates the value of money in an economy, thus restraining the operations of lending institutions. Hence, the Federal funds rate is automatically pulled up so that borrower institutions are discouraged from demanding a higher volume of loans. On the other hand, the higher the GDP gap rate be (meaning the difference between y_t and y_t^* grows more negative), the greater is the need for investment in the economy so that commercial banks tend to lend out more (and at convenient interest rates). Thus, Federal interest rates are inversely proportional to the GDP gap rate in the U.S.

Furthermore, the excessive savings glut theory that Greenspan, Bernanke, etc have strongly advocated, has been criticized by Taylor, who urged that a disproportionate amount of savings outside the U.S. was nullified by a hike in investment activities within the economy. Hence, the Treasury Bond Yield Rate should not reflect a decline in global interest rates over the long-term. Instead, Taylor insists that the Fed Rate is one of the primary determinants of the rate of mortgage loans over the long-term, which eventually led to housing price fluctuations. To put it more clearly, the overnight interest rates that are determined by the actions of the Fed leads to eventual changes in the values of long-term mortgage rates and thus, housing prices over time. Therefore, the idea will be to assess the degree to which Taylor's theory could be validated as having merit. In order to analyze this notion, it will be important to examine the significance of the following function:

$$\textbf{30-Year Mortgage Rate}_t = f(\textbf{Overnight Federal Rate of Interest}_{t-1}) \quad \ldots (2)$$

In case that the estimated coefficient is found to be highly significant, the next step will be to look at the underlying causation that interest rates have on the housing prices of the nation. This is different from the equation estimated to examine Greenspan's theory (in section 3,1) since it includes much fewer explanatory variables. As the explanatory power of one variable cannot be as high as that of a model consisting of four relevant response variables, the present equation will be much different from the previous one. Thus, the next step will be to assess the following empirical model within context of the U.S.:

$$\textbf{Housing Prices}_t = f(\textbf{30-Year Mortgage Rates}_t) \quad \ldots . (3)$$

This relation (as both Greenspan and Taylor would be in consensus) could be expected to be a relevant one with a good deal of statistical significance. A relevant relation would imply that long-term mortgage rates affected the values of median housing prices in the country. Hence, there is enough evidence on the surface to believe that had the overnight interest rates been decided per the Taylor's Rule, the housing price bubble could have been prevented from ballooning. In order to examine whether this is actually the case or not, the following process could be followed:

- First, estimate the values of interest rates assuming the Fed had followed the Taylor's Rule and then compute the values of 30-Year Mortgage Rates accordingly.
- Second, estimate the values of Housing Prices in line with equation (3).
- In the case that the estimated housing prices are found to be remarkably lower than the actual observations, Taylor's conviction about the ideal way for the Fed to determine the overnight interest rates would seemingly be proven correct as lower housing prices will definitely lower the chances of a bubble in the housing sector.

Investigation of John Taylor's theories will be made on the basis of monthly observations beginning from January, 1980 and ending in April, 2012. Note: 1980 is chosen as the starting point because it is after the Bretton-Woods era (and the years of high inflation that followed). Between 1980 and 2010, there were three 'crashes' in the market; one stock market crash in 1987, the dot.com bubble, and the housing bubble.

3.3. Time Series Properties and Co-Integration Issues

Before proceeding to the estimation, it is important to look at some of the time series properties of the dependent and independent variables. To test for stationarity, the unit roots for each of the series are examined using the Augmented Dickey Fuller (ADF) unit root tests developed by Dickey (1976); Fuller (1976); Dickey and Fuller (1979). The null hypothesis of the Augmented Dickey Fuller Test is that the data needs to be differenced to make it stationary. The more negative the test statistics is, the stronger the rejection of the null hypothesis that there exists a unit root at a significant level of confidence. The optimum number of lags is selected using the Akaike Information Criteria.

Having established that the variables are non-stationary, in order to avoid the problem of spurious regression, the co-integration between all the time variables is examined using the multivariate Johansen and Juselius (1990) co-integration tests. The concept of co-integration, introduced by Granger (1981) and Engle and Granger (1987) is used as a statistical property to describe the long-run equilibrium behaviour of economic time series. The statistical concept of equilibrium centers on that of a *stationary process.* In a regression relationship between two variables, say y_t and x_t if both are stationary, then the results are valid whereas if both are non-stationary, there is possibility of spurious regression unless they are co-integrated. A non-stationary variable is said to be integrated of order 'd' (I (d)) if it requires 'd' times differencing to make it stationary. If both variables y_t and x_t are integrated of order 1, then an important property of these I (1) variables is that some linear combinations of them can be stationary since the trends in y_t and x_t may cancel out to produce stationary (I (0)) variables. If this is the case, the two variables are said to be co-integrated. The regression of these two co-integrated non-

stationary variables will not be spurious as they move together over time, which implies that there is a long-run equilibrium relationship between them. Hence in a regression relationship between two (or more) variables integrated of order 1, the possibility of spurious regression can be avoided if they are co-integrated. Therefore, two or more variables integrated of the same order (if they are co integrated) can be used in their level forms themselves instead of taking their first differences in the regression equation.

If co-integration is established between the variables used in the analysis, then non-stationary variables can be used as such in the estimation procedure since the possibility of spurious regression is avoided (Maddala and Kim, 1998). Moreover, the problem of information loss using differenced variables also can be avoided by using the non-stationary variables in this case (Granger, 1981; Engle and Granger, 1987). Johansen (1988) and Johansen and Juselius (1990) suggest two likelihood ratio tests for examining co-integration relationships when there are more than two variables. One is the trace test, which tests the null hypothesis that there are at most r ($0 \leq r \leq n$, where n is the number of variables) co-integrating vectors. The second is the maximum Eigen value test, which tests the null hypothesis that there are r co-integrating vectors against the alternative of r+1 co-integrating vectors. Reimers (1992) argues that these test statistics be corrected for the number of estimated parameters to obtain satisfactory size properties in small samples. The correction is by replacing T by T-n p in the test statistic, where T is the number of observations, n is the number of variables, and p is the lag length of the VAR. Our interpretation of the results is based on the test statistics with small sample correction.

3.4 Hypothesis Testing

The expected signs of the control variables are the following:

(1) Treasury bond yield rate is expected to affect housing prices negatively

(2) Overnight interest rate is expected to affect housing prices negatively

(3) Mortgage Rates are expected to affect housing prices negatively.

(4) Personal income is expected to affect housing prices positively.

(5) Credit growth is expected to affect housing prices positively.

(6) Consumer price index is expected to affect housing prices (nominal) positively.

(7) Housing inventory is expected to affect housing prices negatively.

A statistical significance in this case examines whether the sample estimation can effectively be forwarded to denote population characteristics or not. In other words, the empirical research methods that are to be followed attempt to evaluate the exact features that could propel real estate trends in the U.S. on the basis of a 10-year sample. In alliance with the model specified above, the null hypothesis is that there exists no significant causal association from an independent variable to the dependent variable. The most suitable critical test to confirm or disprove these hypotheses will be the t-statistic, which would be estimated by default while conducting a regression analysis through STATA. Upon learning which variables are statistically significant, the size, direction (positive or negative), and magnitude of the coefficient is also important.

Another test to be conducted will be aimed at testing the significance of the estimated model, i.e., how well the independent variables could explain deviations in the dependent variable (housing prices). The value to be tested will be Adjusted R-Squared, which corresponds to an estimated F-statistic. Adjusted R-Squared is the chosen statistic to examine the degree of fit of multivariate models which employ more than one explanatory variable. This is because the higher the number of explanatory variables used, the lower the degrees of freedom, which might prove detrimental for the model. R-Squared does not take into account the fall in the degrees of freedom due to a rise in the number of explanatory variables, which is why the soundness of fit figure could turn out to be deceptive in nature (Wooldridge, 2009, p. 201). For each of the two test statistics, the benchmark to accept or reject a particular null hypothesis will be set at the 5% level of significance, so meaning if the estimated statistics are associated with a level of significance lower than 5%, the corresponding null hypotheses will be rejected and vice-versa.

3.5. Model Limitations

The model being specified above features certain limitations. One of the biggest limitations is the existence of multi-collinearity problems. We are looking at more than one interest rate. Interest rates are never completely independent of one another and have a positive correlation.

Another limitation of the model is related to the calculation of the GDP Gap in the economy. This variable is defined as the difference between aggregate supply and aggregate demand in a nation. However, computing either one of these involves a complicated process given that both of them comprise of a large number of variables. Even though the Aggregate Demand level could be figured out after getting hold of data on some macroeconomic variables such as consumption expenditure, investment, etc., the same cannot be said for aggregate supply because

is difficult to come across as it needs information on factor productivities as well as total supply. This problem has been dealt with however, through searching across the archives of the IMF Economic Outlook data. However, the archives only provided annual information rather than quarterly ones (which would reduce the number of observations even further). Thus, in order to maintain compliance with the other variables in the model, an approximation has been made on the values of the GDP gap through matching quarterly inflation rates with the corresponding year's GDP gap values. Such an approximation nevertheless, might not be regarded as entirely misleading since a macroeconomic variable such as GDP cannot undergo a substantial change within a span of 12 months since it is highly subjective to the availability of factor resources.

3.6. Hyman Minsky's Articulation

Hyman Minsky formulated his theory on financial crises with a strong footing based on the economic theories framed by John Maynard Keynes. According to Minsky, financial variables are the prime determinants of the level of investment in an economy, which is the deciding factor behind the economic state of a nation. Hence, the business cycles that hamper the normal functioning of an economy are actually the consequences of disruptive behaviors displayed by some key financial elements. Likewise, if fluctuations have originated in the trends of financial factors, it culminates in the form of a financial crisis. But, an economy that is already characterized by a feeble financial system will probably be affected by even the slightest endogenous disruption. Thus, unlike Greenspan or Taylor, who emphasized mainly exogenous activities, Minsky focused more on the endogenous atmosphere and concluded that a fragile financial environment could be hampered even by interest rate fluctuations.

Paul McCulley is one of the many economists that believes Minsky's Financial Instability Hypothesis is applicable to the recent financial crisis. He compares the three types of borrowing categories Minsky identifies with the mortgage market: a hedge borrower would have a traditional mortgage loan and is paying back both the principal and interest; the speculative borrower would have an interest-only loan, meaning they are paying back only the interest and must refinance later to pay back the principal; and the ponzi borrower would have a negative amortization loan, meaning the payments do not cover the interest amount and the principal is actually increasing. Lenders only provided funds to ponzi borrowers due to a belief that housing values would continue to increase. During the boom cycle, more and more risky mortgage loans where being given by banks.

A rise in interest rates in such scenarios could lead to loan defaults, depreciation of asset values, and restricted lending activities (Wolfson, 1994, p. 16-18). Hence, in order to check whether the devastating consequences of the recent crisis were triggered by interest rate changes, an empirical model needs to be framed. One of the biggest criticisms of Minsky's theory is that he did not scientifically formulate it. This is the main reason that Misnky's theories are not a part of mainstream economics. Currently, economist Steve Keen is in the process of formulating a mathematical model based on Minsky's theories, but is in still in the early stages. If a solid model were available, it could be a backdrop to analyzing the financial state that prevailed over the economy through a span of 30 years. In other words, an examination of the relationship between changes in interest rates and the three stages stated by Minsky in a financially frail nation could actually assist in figuring out the possible reason behind the financial crises that have surmounted the U.S. over the last 30 years. Formulizing Minsky's financial instability

theory is a challenging task. The following section of this dissertation attempts to take some preliminary steps in statistically testing certain elements of Minsy's theory.

In an attempt to formalize Minsky's theories, it is important to consider potential correlations among four variables, viz., interest rates (whether they are higher than lower than they should be), volume of bad debts, asset prices, and volume of credit advanced. In the case that these variables are found to be statistically significant with each other, it makes the theory developed by Hyman Minsky seemingly viable. More specifically, interest rates should have negative correlations with the other three variables. It has already been assessed in the previous sections that the financial status of the U.S. turned more and more fragile over the last 25 years (which has been characterized by three "super cycles") when the economy underwent high-end modifications in its financial environment. These changes actually resulted in an intensification of the financial fragility of nations. Thus, if Minsky's theory is satisfied, it could be expected that these variables are highly negatively correlated with each other with a strong statistical significance. The reasons for expecting a negative correlation are explained as follows:

- First, the higher the Federal interest rates are, the lower will be the willingness of banks to forward loans, as that might induce them to demand more loans from the central bank of the country. Such a move increases their opportunity cost and hence, is discouraged by banks. The banks take this move through enhancing interest rates at which credit is advanced to people. With a higher cost associated with credit, demand for the same falls as well. This is the reason why the volume of bank credit being advanced is likely to fall with a rise in interest rates and vice-versa.

- Second, if the demand for consumer loans falls, the demand for housing prices will fall as well, given that people no longer can afford to pay house prices, although both these variables are responding in the same direction to other factors rather than having a strong direct relationship with one another.
- Lastly, the higher interest rates become, the lower the volume of loans that banks advance to people will be, and the volume being demanded by the consumers will be even lower. Given an already low volume being demanded, the amount of bad debts incurred will be low as well so that the charge off rate will fall. Hence, it could be expected that the higher interest rates rise, the lower the charge off rate within the economy will be. Another line of logic is that in a risk prone economy, it is highly possible that banks keep on hiking interest rates on lending in order to reduce the cost of loan defaults. This, on the other hand, leads to a rise in adjustable mortgage rates and creates an upward pressure on future trends. Thus, consumers in order to avoid this higher pressure in the future, might be instigated to pay within the stipulated time frame so that ultimately, banks' charge-off rate fall sharply.

If a significant relationship is found between interest rates and the remaining three variables, it can be said that the economy was vulnerable to a financial crisis as vehement as the one that occurred. On the other hand, already knowing the fact that the U.S. indeed had been in a financially frail form, the empirical output could be used to verify the applicability of Minsky's theory.

In order to examine Minsky's theory more closely, the variables used specifically to represent the aforementioned four variables will be:

1- Federal Funds effective rate to represent the short-run interest rates

2- Charge-off rates on all real estate loans forwarded by commercial banks to represent the volume of bad debts banks have to endure
3- Median housing prices to imply asset prices in the present case
4- Volume of aggregate bank credit referring to the volume of credit being advanced.
5- Loan to Value Ratios denoting cheap credit availability

The variables are subjected to Pearson's correlation coefficient computation. The next step will be to test the significance and magnitude of these estimated statistics, which will be accomplished with the help of the t-statistic. The test statistic in this case will be,

$$\mathbf{T = r \sqrt{(n - 2)/ (1 - r^2)}}$$

Where r = Estimated bi-variate correlation coefficient and n = Number of observations

After the statistic is computed, it will be compared with the critical t-statistic, at an assumed level of significance, α, and $(n - 2)$ degrees of freedom. However, it is first necessary to frame a suitable null hypothesis in this context. There are three pairs of variables whose correlations are to be examined, with the main variable being the interest rate. Hence, there will be three null hypotheses to be tested in this case, such that,

H_{0i}: Interest Rates and variable 'i' are not correlated significantly, against the alternative hypothesis,

H_{1i}: Interest Rates and variable 'i' are correlated significantly.

In order to accept or reject the null hypotheses, the following rules will be taken under consideration. It will be useful to note that the assumed level of significance to be considered

will be 0.05 implying that 5% of the total area falling under the distribution curve will be assumed to fall under the rejection region.

- If the estimated statistic is greater than the critical value of the t-statistic at the given degrees of freedom (n-2) and 5% level of significance, the respective null hypothesis will be rejected at the assumed level of significance or with a confidence of $(1 - \alpha) \times 100\%$.
- On the other hand, if the estimated statistic is found to be lower than the critical value of the statistic, the corresponding null hypothesis will not be rejected at the given level of significance.

Hence, Minsky's theory will be accepted or rejected depending upon the fate of the null hypotheses according to the process mentioned above. In case that his theory is accepted, it could potentially be asserted empirically that the financial status of the U.S. indeed had been quite feeble over the last 30 years.

Chapter 4 – Statistical Results

The following sections will discuss the statistical results from the models outlined in Chapter 3. The first part will discuss the empirical results from the Greenspan & Taylor models and the following section will discuss the findings from the Minsky model.

4.1 Empirical Evidences for Greenspan's Theories

The conflict between Greenspan and Taylor is primarily based upon the factors which they believe mainly affected the recent financial crisis. While the former stresses more exogenous factors such as an external savings glut in the Asian region to be the pivotal factor behind the subprime crisis, Taylor emphasizes short-term interest rates and mortgage rates on home loans to be the effective agents behind the crisis. Exogenous factors could be best captured via rates on Treasury Bonds since the yield to maturity calculates the rate of return if the principal amount earns an anticipated sum on maturity. This anticipated amount takes into account a large number of external factors that according to Greenspan, are the ruling factors behind the recent financial crisis. In this model, quarterly yield rates on 20-year Treasury Bonds have been considered as a proxy for long-term interest rates. 30-Year Mortgage rates have also been used as an explanatory variable because the literature (as well as common logic) tells us that mortgage rates influence the demand for home loans, which in turn, influence housing prices.

Overnight interest rates have also been included as a short-term factor in order to examine Alan Greenspan's argument regarding the inapplicability of these rates in deciding housing prices. The other variables considered are credit growth, personal income, loan to value ratios, CPI and

housing inventory. Since all these factors are regarded as response variables to the explanatory variable, a time lag will be added.

Housing prices are, for purposes of this model, an important variable. To measure them, the median values are used for One-Unit, Non-Condominium Properties. These datasets have been collected from the archives of the Federal Housing Finance Agency.

Before estimation, the stationarity properties of the variables are examined using the Augmented Dickey Fuller (ADF) unit root test. The optimum number of lags used is determined using two model selection criteria (1) Akaike Information Criteria (AIC) and (2) Swartz Bayesian criteria. The model that produces the smallest value of these two criteria is considered the best model.

The results of ADF tests are given below.

Table5: ADF Test Results

Variable	Level				First Difference			
	With constant	With constant & trend	Without constant & trend	Inference	With constant	With constant and trend	Without constant and trend	Inference
H	-2.23(0)	-3.52(0)	-1.49(0)	I(1)	-4.7(1)**	-4.64(1)**	-4.61(1)**	I(0)
R	-1.73(6)	-2.72(5)	0.10(6)	I(1)	-5.2(5)**	-5.3(5)**	-5.22(5)**	I(0)
B^T	0.23 (5)	2.12 (3)	1.25 (2)	I(1)	-5.21 (4) **	-5.58 (6)**	-5.31(4)**	I(0)
FRM	-0.246(5)	-2.045(5)	1.247(5)	I(1)	-3.374(4)*	-4.862(0)**	-2.450(4)*	I(0)
Y	0.88(4)	-3.36(1)	0.65(2)	I(1)	-4.64(1)**	-4.23(3)**	-2.99(3)*	I(0)
CG	-2.23(0)	-3.52(0)	-1.49(0)	I(1)	-4.7(1)**	-4.64(1)**	-4.61(1)**	I(0)
CPI	-2.09(2)	-3.23(0)	-0.66(2)	I(1)	-6.02(1)**	-4.32(2)**	-6.18(1)**	I(0)
HI	0.78 (6)	1.35 (4)	1.21 (1)	I(1)	-4.23 (5) **	-5.12 (7)**	-6.13 (6)**	I(0)

Notes: H = Housing prices, R = Overnight Federal funds interest rates, B^T = 20-Year Treasury Bond Yield Rate, FRM = 30-Year Fixed Mortgage Rate, Y=Personal Income, CG=Credit Growth, CPI=Consumer Price Index, HI=Housing Inventory.

*Figures in parentheses denote the optimum number of lags used, * and ** denotes significance at 5 percentage and 1 percentage significance levels respectively*.

Time series data can be of two types: (1) stationary and (2) non-stationary. A series is stationary if its mean, variance and covariance are invariant over time. If the data is stationary, it can be represented by a simple algebraic model, whereas if it is non-stationary, it is not possible to model the process in terms of an equation with fixed coefficients, estimated from past data.

Non-stationarity can be due to the presence of a unit root or a trend component. If a unit root is present, then the process is said to be difference stationary; if there is a trend component, then the process is said to be trend stationary. For the purposes of the model being tested, the results show that all the variables considered are difference stationary of order1.

Upon establishing that the variables of the model are non-stationary of order1, next we move to the co-integration testing between all the variables used in the analysis. The concept of co-integration, introduced by Granger (1981) and Engle and Granger (1987) is used as a statistical property to describe the long-run equilibrium behaviour of economic time series. The statistical concept of equilibrium centers on that of a *stationary process.* In a regression relationship between two variables, say y_t and x_t if both are stationary, then the results are valid. Whereas if both variables are non-stationary, there is possibility of spurious regression unless they are co-integrated. A non-stationary variable is said to be integrated of order 'd' (I (d)) if it requires 'd' times differencing to make it stationary. If both variables y_t and x_t are integrated of order 1, then an important property of these I (1) variables is that some linear combinations of them can be stationary since the trends in y_t and x_t may cancel out to produce stationary (I (0)) variables. If this is the case, then the two variables are said to be co-integrated. The regression of these two co-integrated non-stationary variables will not be spurious as they move together over time, which implies that there is a long-run equilibrium relationship between them. Hence, in a regression relationship between two (or more) variables integrated of order 1, the possibility of spurious regression can be avoided if they are co-integrated. Therefore, two or more variables integrated of the same order, if they are co integrated, can be used in their level forms instead of taking their first differences in the regression equation. For the purposes of this dissertation, the co-integration analysis is based on Johansun Juselius (JJ) tests..

Table6: Co Integration Test Results

null	Maximum Eigen value test			Trace Test		
	Alternative	Statistic	95%Critical Value	Alternative	Statistic	95% Critical Value
r = 0	r = 1	40.2*	33.4	r ≥ 1	102.9*	68.5
r ≤ 1	r = 2	28.0*	27.0	r ≥ 2	62.6*	47.2
r ≤ 2	r = 3	21.2*	20.9	r ≥ 3	35.6*	29.6
r ≤ 3	r = 4	13.0	14.0	r ≥ 4	14.4	15.4
r ≤ 4	r = 5	3..3	3.76	r ≥ 5	3.3	3.76
r ≤ 5	r = 6	**3.2**	**3.53**	r ≥ 6	**3.56**	**3.65**
r ≤ 6	r = 7	**3.1**	**3.43**	r ≥ 7	**3.09**	**3.13**
r ≤ 7	r = 8	**2.32**	**2.53**	r ≥ 8	**2.06**	**2.15**
r ≤ 8	r = 9	**2.09**	**2.12**	r ≥ 9	**2.01**	**2.07**
r ≤ 9	r = 10	**1.35**	**1.45**	r ≥ 10	**1.15**	**1.24**

* Denote statistical significance at 5- percent level.

Table 7 gives the co integration test results between all variables used in the analysis. It shows that there are three co-integrating vectors.

Thus, having established a robust long-run relationship between all the time variables used in the analysis (shown in the above tables), the possibility of spurious regression is avoided by using

non-stationary variables in the analysis. Moreover, information loss is also avoided by using non-stationary variables. Both short-run and long-run coefficients are estimated and explained in the section below.

Based on the number of co-integrating vectors obtained, three co-integrating (long-run) equations are estimated in the table below. This methodology is based on the studies by Johansen and Juselius(1990) and following the procedures of Owoye and Onafowora(2007), Loganathan et al. (2010) and Hussain et al. (2010).

RESULTS:

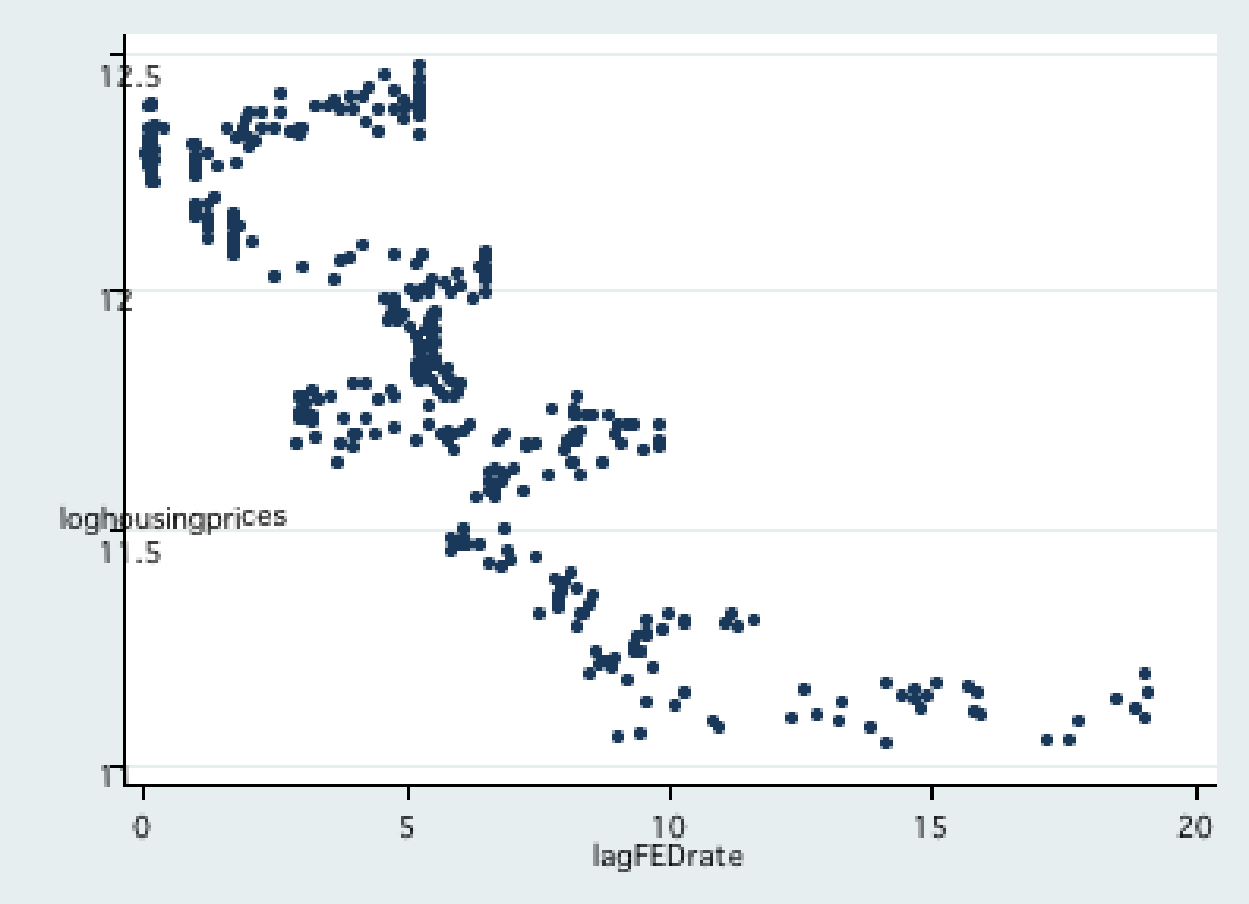
After having performed the respective tests of co-integrating vectors, we are in a position now to assess the model corrected for error of non-stationarity in the series. Apart from providing various test statistics for co-integrating vectors, Johansen's test also generates Error Correction Models (ECM) to represent the short-run dynamics. The number of error correction models depends on the number of co-integrating vectors. The results of the regression are the following:

Independent Variable	Coefficient	Standard Error	t-Statistic	P>|t|	95% Confident Interval	
Federal Funds Rate$_{t-1}$	-314.5287	562.2327	-0.56	0.576	-1421.103	792.0454
20-Year Treasury$_{t-1}$	503.3151	1453.176	0.35	0.729	-2356.794	3363.424
30-Year Mortgage Rate$_{t-1}$	-2191.009	1415.967	-1.55	0.123	-4977.884	595.8668
Personal Income$_{t-1}$	8.514463	0.3975164	21.42	**0.000**	7.73208	9.296846
Bank Credit Growth$_{t-1}$	3390.389	1006.306	3.37	**0.001**	1409.8	5370.979
CPI Growth$_{t-1}$	2653.289	2324.09	1.14	0.255	-1920.934	7227.511
Housing Inventory$_{t-1}$	-2.20126	0.4182679	-5.26	**0.000**	-3.024485	-1.378034
Federal Funds Rate$_{t-1}$ * Dummy	4034.168	649.9342	6.21	**0.000**	2754.982	5313.354
Dummy Variable	-13144.07	3935.702	-3.34	**0.001**	-20890.23	-5397.907
Constant	192706.3	38307.02	5.03	**0.000**	117311.3	268101.3

Looking at the regression results, none of the interest rates used have any statistical significance. Even mortgage rates, which we know through the literature (as well as basic economic theory) is stated as not being relevant. The signs of all the variables, except the 20-year treasury are what we expect. The multi-collinearity that exists between the interest rates can be a reason why the t-statistic is not what we expect.

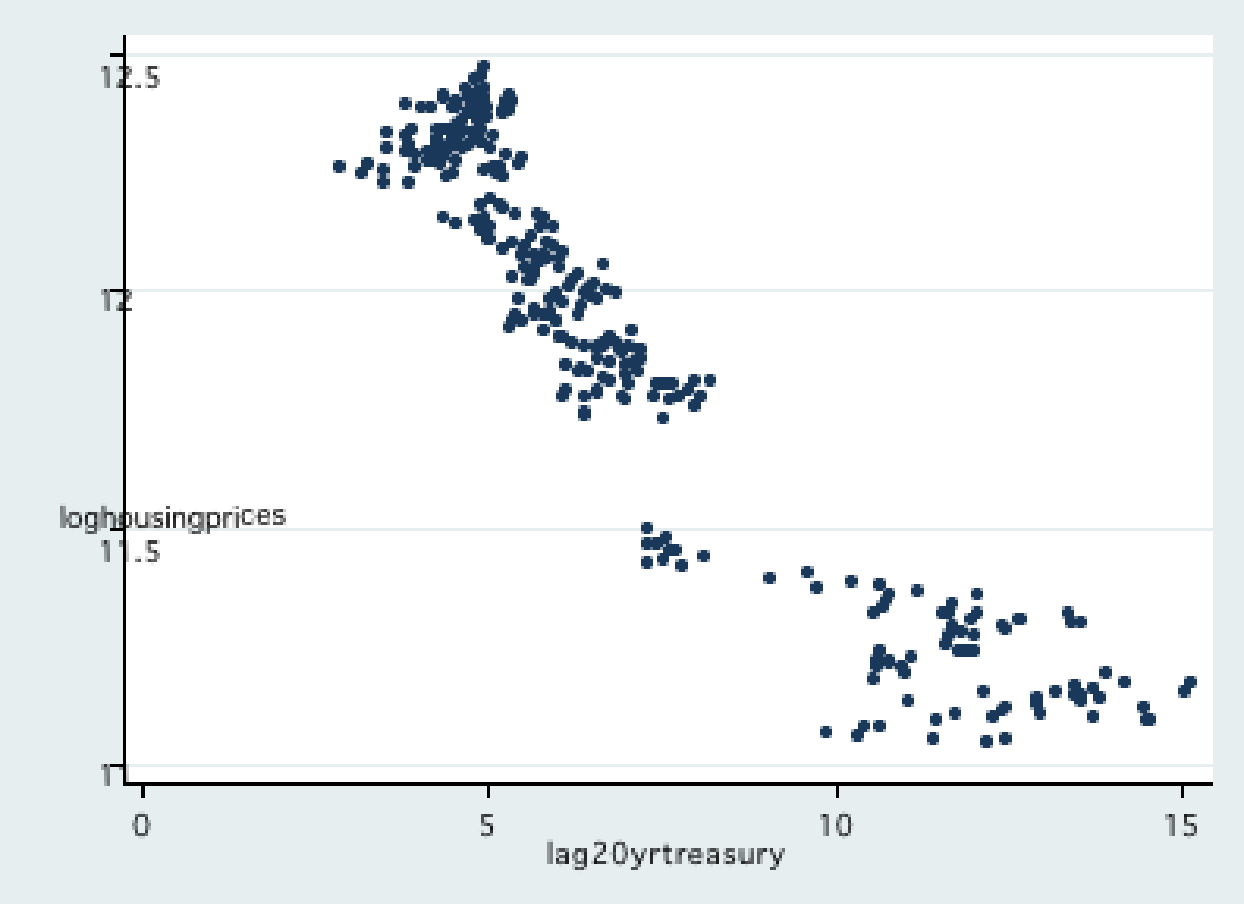
Often, it helps to look at a simple graph in order to visualize what the data is doing. Since the main variables we are analyzing are the interest rates (specifically the federal funds target interest rate) and their effects of housing prices, these are the variables that were graphed.

Figure: Federal Funds Rate$_{t-1}$ and Log of Housing Prices



Looking at the graph, there is a somewhat steep negative slope when the federal funds rate is low. When it is over 10%, the slope flattens tremendously. After running a simple regression with the two variables illustrated above, the t-statistic for the federal funds interest rate is -27.98 and the p-value is significant on the 99th percentile.

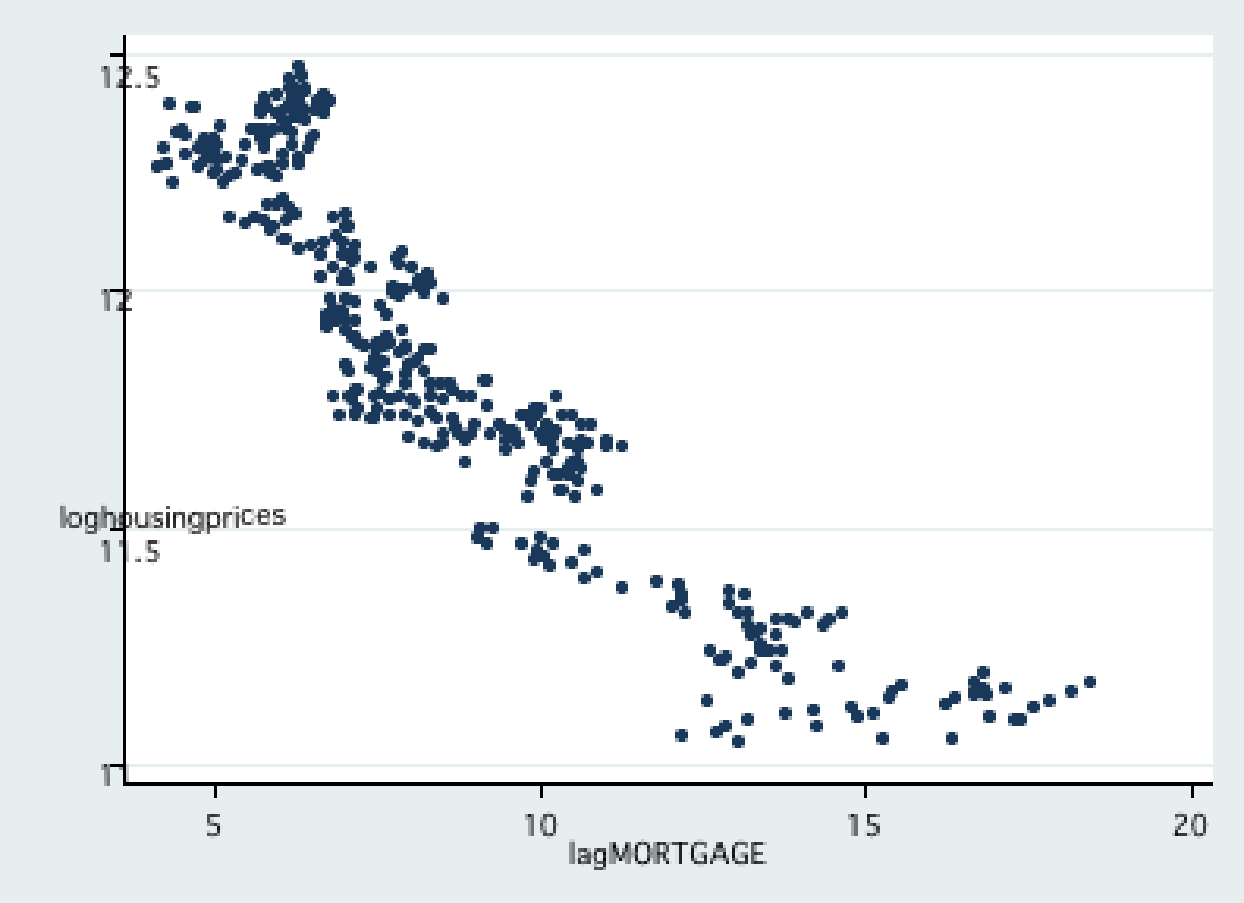
Figure: 20-Year Treasury Rate$_{t-1}$ and Log of Housing Prices



When we graph the long-term interest rates with the logarithmic median house prices, it is clear that there is no positive relationship. Whether or not there is any strong correlation that is statistically significant is difficult to tell, but the relationship is not positive like our model

suggested. Doing a simple regression, we get a t-statistic of 53.50 and a p-value that is significant on the 99th percentile.

Figure: 30-Year Mortgage Rate$_{t-1}$ and Log of Housing Prices



Finally, looking at graph of the 30-year mortgage rates and median housing prices, a clear negatively sloped relationship can be observed. Translating the figure into statistical terms, a simple regression model between the two variables produced a t-statistic of -46.67 and a p-value that was again, significant on the 99th percentile.

Looking at the correlations of the 3 interest rates (seen below), it is evident that there is a strong positive direct relationship between all three interest rates, particularly between the 20-year treasury and the 30-year mortgage rates.

VARIABLES	Federal Funds Rate$_{t-1}$	20-Year Treasury$_{t-1}$	30-Year Mortgage Rate$_{t-1}$
Federal Funds Rate$_{t-1}$	1.0000		
20-Year Treasury$_{t-1}$	0.9075	1.0000	
30-Year Mortgage Rate$_{t-1}$	0.9272	0.9874	1.0000

Such a correlation will inflate the standard errors and lead to unreliable results from the regression. Indeed, looking at the variance inflation factor (VIF), we see the following:

Variable	**VIF**	**1/VIF**
30-Year Mortgage Rate$_{t-1}$	62.63	0.015967
20-Year Treasury$_{t-1}$	48.56	0.020593
Housing Inventory$_{t-1}$	41.16	0.024296
Personal Income$_{t-1}$	27.40	0.036492
Federal Funds Rate$_{t-1}$	14.36	0.069623
Dummy Variable	9.46	0.105703
Federal Funds Rate$_{t-1}$ * Dummy	5.62	0.177788
CPI Growth$_{t-1}$	1.46	0.687775
Bank Credit Growth$_{t-1}$	1.09	0.914479
MEAN VIF	23.53	

The reason why all three interest rates are included in the regression model is as follows:

1. Federal Funds Rates – This is the main independent variable we are interested in testing. Taylor argues that had the Fed not kept these rates too low for too long, the scope of the crisis would not have been as substantial as it was.
2. 20-Year Interest Rates – Part of Greenspan's argument is that it was the long-term interest rates and not the short-term federal funds rate that affected housing prices.

3. 30-Year Mortgage Rates – Based on economic theory, the 30-year mortgage rates are one of the most important factors in affecting housing prices. Therefore, the 30-year mortgage rates need to be included as a key control variable.

To see how the results would vary if one of the interest rates (the 20-year treasury yield) was removed from the model (addressing some of the collinearity), another regression model was ran and had the following results:

TABLE 1:

Independent Variable	Coefficient	Standard Error	t-Statistic	P>|t|	95% Confident Interval	
Federal Funds Rate$_{t-1}$	0.0054695	0.0031150	1.76	**0.080**	-0.0006488	0.0115879
30-Year Mortgage Rate$_{t-1}$	-0.0279452	0.0046721	-5.98	**0.000**	-0.0371324	-0.0187581
Personal Income$_{t-1}$	0.0000259	2.360E-06	10.97	**0.000**	0.0000213	0.0000306
Bank Credit Growth$_{t-1}$	0.0156405	0.0060283	2.59	**0.010**	0.0037866	0.0274943
CPI Growth$_{t-1}$	0.0145531	0.1388900	1.05	0.295	-0.0127577	0.0418638
Housing Inventory$_{t-1}$	0.0000144	2.490E-06	5.78	**0.000**	9.47E-06	0.0000193
Federal Funds Rate$_{t-1}$ * Dummy	0.1597860	0.0037933	4.21	**0.000**	0.0085196	0.0234377
Dummy Variable	-0.1076873	0.0228110	-4.72	**0.000**	-0.1525438	-0.0628307
Constant	10.070480	0.2294077	43.9	**0.000**	9.619385	10.52158

All variables except for CPI growth are significant on the 90th percentile (and all variables outside of the federal funds rate are significant at the 99th percentile). However, the sign of the federal funds rate is again positive.

Finally, as the VIF tables indicated, the 30-year mortgage rate is the highest correlated variable. Although the mortgage rates are perhaps the single most important control variable when testing for housing prices, another regression model was run without the mortgage rates being included. The reason for this is the following: We know that the mortgage rates are a significant facotr in affecting housing prices. The argument we are attempting to test is whether long-term rates such

as the 20-year treasury were affecting housing prices pre-crisis (as Greenspan believes) or the short-term rates (as Taylor believes). Leaving both the 20-year Treasury yield rates and the overnight federal funds target rate in the model and removing the 30-year mortgage rate, we get the following results.

TABLE 2:

Independent Variable	Coefficient	Standard Error	t-Statistic	P>|t|	95% Confident Interval	
Federal Funds Rate$_{t-1}$	-0.0048648	0.03018	-1.61	0.108	-0.108055	0.001076
20-Year Treasury Rate$_{t-1}$	-0.013646	0.0045641	-2.99	**0.003**	-0.0226474	-0.0046818
Personal Income$_{t-1}$	0.0600293	2.05E-06	14.32	**0.000**	0.0000253	0.0000333
Bank Credit Growth$_{t-1}$	0.01216982	0.0057061	3.80	**0.000**	0.0104678	0.0329286
CPI Growth$_{t-1}$	0.0255971	0.012883	1.99	**0.048**	0.0002415	0.0509527
Housing Inventory$_{t-1}$	1.205454	0.1992815	6.04	**0.000**	0.8123243	1.596726
Federal Funds Rate$_{t-1}$ * Dummy	0.0205548	0.0038346	5.36	**0.000**	0.0130077	0.028102
Dummy Variable	-0.0794746	0.0227508	-3.49	**0.001**	-0.1242516	-0.0346976
Constant	-2.562114	2.272171	-1.13	0.260	-7.034087	1.909858

The results for this model show that the signs for both the short-term interest rate and the long-term interest rates are negative like we would expect them to be. However, the short-term interest rate is not statistically significant while the long-term rate is. These results are more in line with Greenspan's argument.

It should also be mentioned that all three variations of the regression model that was performed had highly significant F-statistics and the R^2 was over 95%.

Interaction Term

An interaction term between the federal funds interest rate and the dummy variable (representing pre-bubble and bubble periods) was created and included in the model. The presence of a

significant interaction indicates that the effect of one predictor variable on the response variable is different at different values of the other predictor variable. The presence of a significant interaction indicates that the effect of one predictor variable on the response variable is different at different values of the other predictor variable. Our interaction term was significant at the 99th percentile indicating that the effect of the short-term federal funds rate on median housing prices varies between pre-bubble and post-bubble periods. If we were to believe Taylor's argument that the Fed deviated from the Taylor rule during the bubble period (and followed the Taylor rule during non-bubble periods), then a significant interaction term would be supportive of this theory.

Further Regression Test

In addition to the abovementioned models, the model is estimated with dummy variable that represent boom phases (pre-bubble) to see whether any change occurs in the explanatory model. The revised estimated model is given below.

$$\mathbf{H_t} = \mathbf{36.5\ (0.000)} + \mathbf{0.53\ R_{t-1}(0.003)} - \mathbf{0.12\ B^T_{t-1}(0.25)} - \mathbf{0.73\ FRM_{t-1}}\ (0.07) + 0.009Y_{t-1}\ (0.06) + 0.005CG_{t-1}\ (0.04) + 0.252CPI_{t-1}\ (0.005) - 0.006HI_{t-1}\ (0.043) + 0.005\text{dummy variable}_{t-1}\ (0.002)$$

Adjusted R^2 =0.87, P.>F=0.002; DW Statistic=2.1

The model explains about 87 percent of the total variation in housing prices and is statistically significant.

The results show that the dummy variable is statistically significant and therefore has an effect on housing prices. The sign of the variable was positive, which implies that during boom phases, housing prices are increased. It is important to note that the introduction of this dummy variable significantly changed the model and affected the magnitude and significance of the explanatory variables.

Among the interest rate variables, only the overnight federal interest rate significantly affects housing prices. In this case, the variables personal income and CPI, which were not significant earlier, also significantly affect housing prices. This means that at boom phases, the personal income and CPI are very significant determinants of housing prices. The significances of the other variables remain the same as obtained from the estimated model. CPI is the variable with the highest magnitude that affects housing prices positively when the dummy variable in incorporated into the model. These findings seem to illustrate that monetary policy is a particularly strong tool during times of economic boom. The model suggests that during the boom-phase of the economy, the policies of the Fed did indeed affect housing prices.

The next section discusses the empirical evidence for Taylor's theory.

4.2 Empirical Evidences for Taylor's Theory

After analyzing the 'Greenspan' model for explaining fluctuations in housing prices, the next step will be to look at the 'Taylor' model outlines in Chapter 3. The empirical model to assess Taylor's argument has been presented underneath (as well as their respective equation numbers).

$$\mathbf{FRM_t = 4.430808 + 0.7607656\ R_{t-1}} \quad \text{... (2)}$$

(0.0000000) (0.0000000)

According to the simple regression, overnight interest rates recorded in the previous period are found to have a significant positive influence over the long-term mortgage rates in the current period. The fit of the model (R-Squared = 0.8585) is also worth mentioning, given that it is a two-variable model. However, looking at the size of the coefficients, it seems that the constant term has a far larger explanatory power than the independent variable, although both are statistically significant.

In addition, it is also found that,

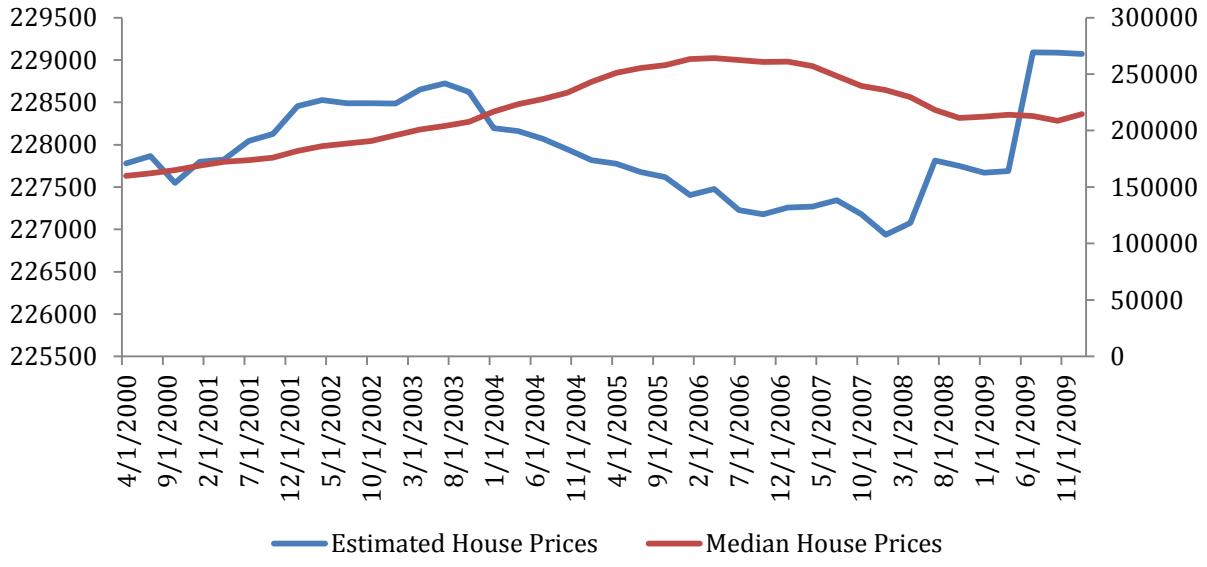
$$\mathbf{H_t = 281652.4 - 15144\ FRM_t} \quad \text{... (3)}$$

(0.000000) (0.00000)

The above regression shows that fixed mortgage rates (FRM) actually help in explaining deviations in the dependent variable, Housing Prices, in the following period. This is evident from the p-value of the estimated coefficient. The value of the R-Squared in this scenario is 0.7481, implying that the framed model can explain approximately 75% of the total variation in

the dependent variable. Although the respective F-statistic is statistically significant, the truth is that deviations in the dependent variable could be explained in a far better way had there been more number of explanatory variables in the model.

The next sets of procedures include examination of the relationship between housing price trends and interest rates framed according to Taylor's Rule. This step attempts to analyze what the hypothetical outcome would have been in the housing market had the Federal Reserve followed the Taylor Rule when deciding the short-term federal funds rate. Thus, R_{t-1} in (2), will now be replaced by R^{T}_{t-1} (Interest Rate according to the Taylor's Rule). The estimated values of FRM_t will be replaced in equation (3) to yield the estimated Housing Prices. The housing prices estimated following the logic underlying equations (2) and (3) are illustrated in the diagram below. Specifically, the diagram is a comparison between what the actual median housing prices had been recorded as and what they potentially would have been had the Taylor's Rule been followed.



In fact, if research is extended further to check whether the estimated housing prices had actually been dependent upon the computed interest rates defined by Taylor (compared to the situation before), then we get the following set of regression equations –

$\mathbf{H_t = 211323 - 10967\ R_{t-1}}$ and

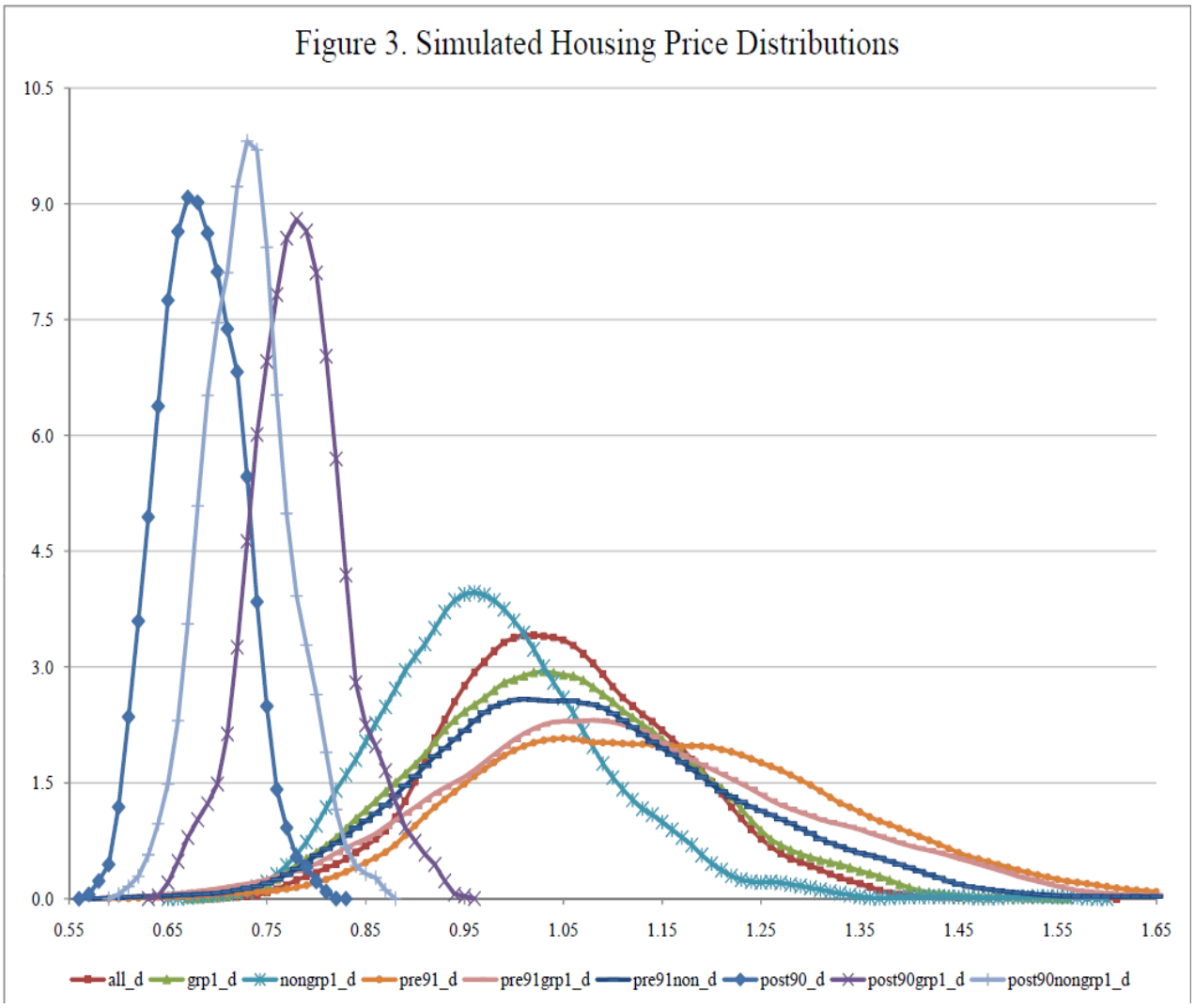
(0.000000) (0.00000)

$\mathbf{H_t^* = 233808.9 - 15972.86\ R^T_{t-1}}$*

(0.000000) (0.00000)

While the first equation represents the amount of fluctuations in housing prices that is being explained by the federal funds overnight rate, the second one depicts the outcome had the Federal Reserve followed the Taylor rule when computing the overnight interest rates. The overnight federal funds rate is found to be significant in both equations. However, the coefficient for equation 2 is much greater than that in coefficient 1 in affecting housing prices. Perhaps this means following the Taylor rule would have been better monetary policy. Perhaps, even if the Taylor rule was followed, the housing crisis would have occurred. It is hard to say either way when the data is through a simple regression model. Nonetheless, it is interesting to note that the coefficient for the overnight federal funds rate is nearly 33% higher when estimated using Taylor's formula.

Price Expectations and Housing



(source: James R. Follain, James R Follain, LLC and Seth H. Giertz, University of Nebraska-Lincoln, "A Microsimulation Approach to Establish a New House Price Stress Test for Economic Capital Related to Residential Mortgages", April 16, 2010)

The above figure gives the results of simulation for housing price distributions based on the survey of price expectations in USA.

The results show evidence for large effects of even minor shocks during times of high inflation and hence adjustments are needed for that.

4.3 Correlations for Hyman Minsky's Theory on Financial Crisis

The data that has been used in this paper has been accumulated from trusted secondary sources such as the archives of the Federal Reserve and the Federal Housing and Finance Association. The data for charge-off rates has been used to represent the volumes of bad debts that commercial banks of the U.S. incurred over a span of 30 years. Data for all variables are taken at quarterly periods over a span of 30 years, so that there are 120 observations in all. However, for charge off rates, the number of data points is 100 because the information is only available for a period of 25 years between the first quarter of 1985 and the fourth quarter of 2010. Hence, the estimation will be made for observations dating between this time span in order to maintain compatibility with charge-off rates. The information that is yielded will be generalized backwards for a period of 5 years between the first quarter of 1980 and the last one of 1984. This has been done via 'Mean Substitution". Mean substitution replaces all missing data in a variable by the mean value for that variable. The main disadvantage of mean substitution is that the variability of the data is artificially decreased, which can lead to underestimates of dispersion, as well as problems with the entire makeup of the model. However, extrapolation for this period seems somewhat safe given that the period from 1981 to 1990 is characterized as a single business cycle with similar features. Furthermore, the data for 25 years could be considered similar to a sample extracted out of a population of 30 years. In the case that the statistical tests are found to yield significant results, they could be easily inferred as representing a span of 30 years, or rather, defining the characteristics of a population of 30 years.

A correlation matrix of all the variables is outlined below. In addition, the corresponding t-statistics have been represented in parentheses underneath the respective statistics.

	Federal Funds Effective rate	*Charge-off rates*	*Bank Credit (in billions of US$)*	*Median Prices of Houses Sold*
Federal Funds Effective rate	1			
Charge-off rates	-0.39985 (-4.4058)	1		
Bank Credit (in billions of US$)	-0.70915 (-10.1581)	0.326722 (3.49133)	1	
Median of actually sold House Prices	-0.0587 (-0.5939)	0.16822 (1.72351)	0.13563 (1.38257)	1

The estimated t-statistics are evaluated in their absolute form, i.e., only their magnitudes are of relevance when making comparisons with critical values. In this case, the number of observations is 104 and the degrees of freedom are 102. Hence, at 102 degrees of freedom and 5% level of significance, the critical value of the t-statistic will be, T = 1.960. It must be stated that the tests of significance are two-tailed in nature so that while forming the distribution table, the level of significance being considered is 0.025.

Looking at the value of the critical t-statistic, the following preliminary conclusions can be drawn.

- Correlation between the effective Federal interest rates and charge-off rates of all commercial banks is significantly negative.
- Correlation between the effective Federal interest rates is found to be significantly negative with the volume of Bank credit advanced.
- On the other hand, the correlation between the Federal Funds rate and median housing prices is found to be insignificant.

The estimated correlation coefficients for the remaining pairs of variables are not being considered in this case as they are of little relevance to Minsky's theory. From the above statistics, it is clear that interest rates determined by the Federal Reserve are significantly and inversely related to the overall charge-off rates and the volume of commercial bank credit being advanced. However, the federal funds rates has no significant relationship with housing prices, even though the sample observations display an inverse relation existing between the two.

Chapter 5 – Data Analysis and Interpretation

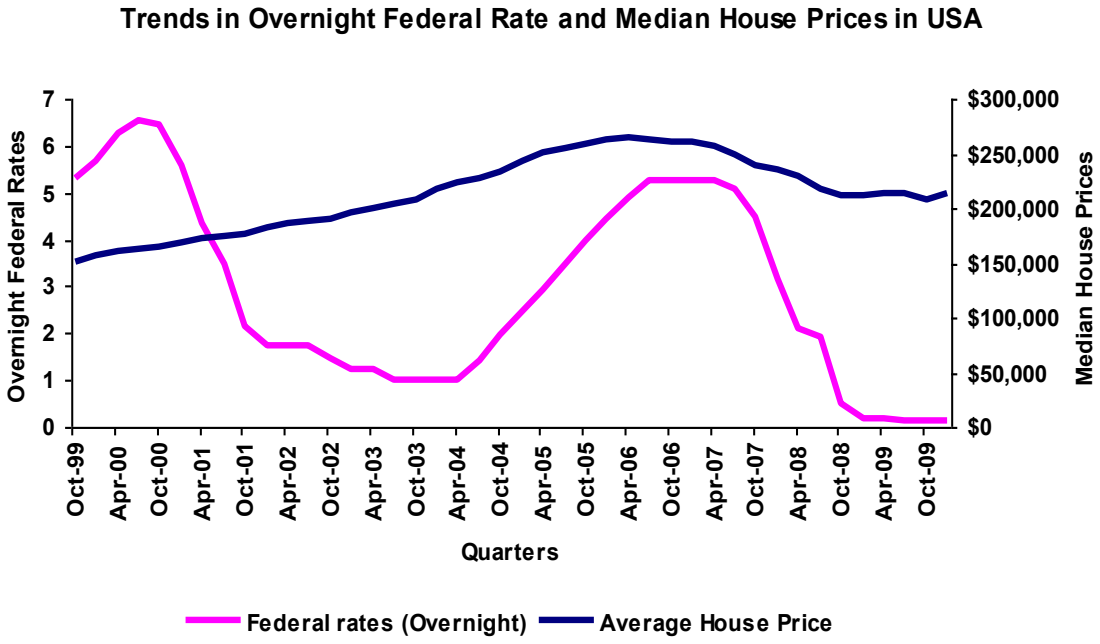
The first portion of this chapter will discuss the results displayed in Chapter 4 regarding the theories of Greenspan and Taylor. The latter portion will expand on the correlations identified in Hyman Minsky's theory of financial crisis.

5.1 Discussion of Greenspan's Theory

In Chapter 4, the empirics behind Alan Greenspan's and John Taylor's theories were outlined. Because the most recent financial crisis was centered around the housing market, the dependent variable used was the housing prices for between January 1980 through April 2012, thus containing 376 observations in all. An objective of this dissertation is to identify the factors that led to a hike in U.S. housing prices. Ideally thus, it is appropriate to consider present housing prices as a function of past values of the dependent variables. If further research is conducted, it will be interested to see how the levels of significance is affected if 6-month, 12-month lags are used instead of 1-month lags.

The results from the models tested in Chapter 4 lead to the following conclusions.

(1) The overnight Federal funds interest rate is found not to be statistically significant at almost a 99.9% level (implicit from the p-value of estimated coefficient), in terms of explaining variations in the dependent variable (i.e., fluctuations in house prices). In terms of the empirical equation, this relation is found to be a negative one when the 20-year treasury yield is included as an independent variable. When the 20-year interest rate is omitted, the sign of the federal funds rate changes from negative from positive. However, it is somewhat problematic that the resulting



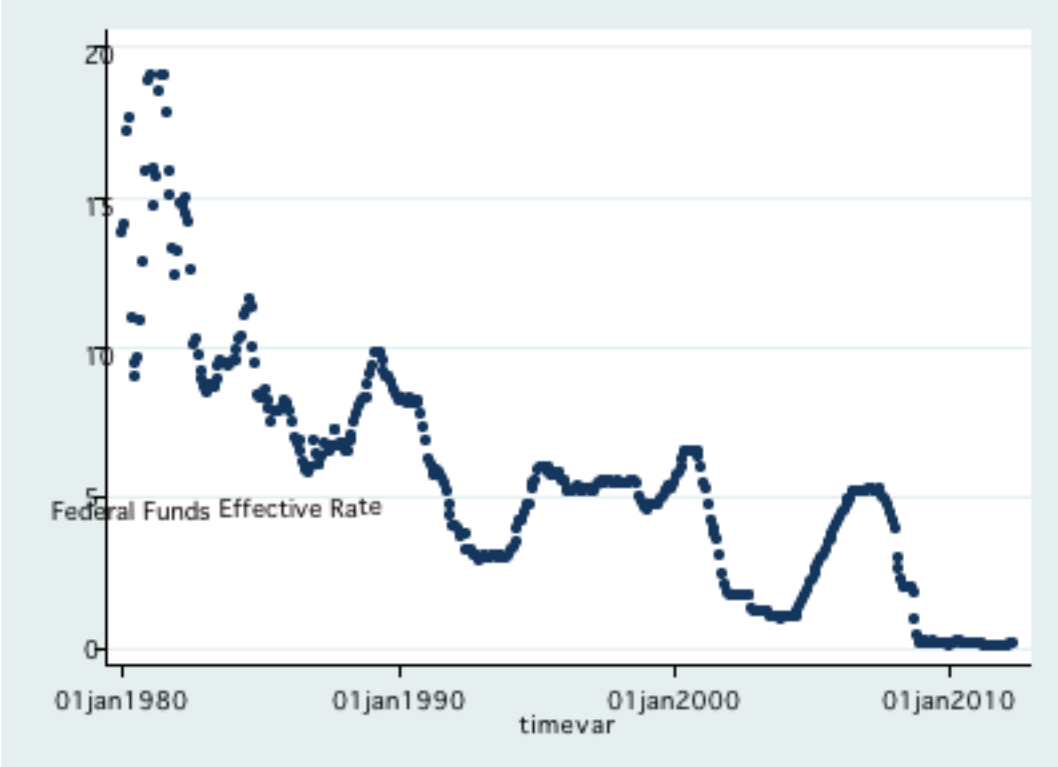
relationship is contradictory to past theories that all claim a negative relation exists between the two. A negative association seems quite in line with logic; a rise in overnight interest rates is reflected through a rise in the market interest rate as well, thus discouraging people from demanding new loans. A natural implication will be that the prices of the commodities concerned, which in this case are housing prices, are most likely to deteriorate. However, the positive correlation that the model revealed is worth some discussion. The graphical depiction above shows that median housing prices went on a rise between October 1999 and April 2006, following which the prices underwent a dramatic downfall. This very time span also saw a fall in overnight federal funds rates, followed by a sudden sharp rise from April 2004 until April 2006, when the interest rate also experienced a peak. This mismatch in trends (in terms of theoretical lines) gives way to the conclusion that overnight interest rates indeed did not play a highly significant role behind the booming housing prices. Therefore,

Greenspan's argument could be assumed as correct in this regard. Another way (albeit not scientific) of approaching this is by looking at the corollary. A simple regression model run on housing prices in period 't' over average overnight federal interest rates in period 't-1' yields the following result, as already shown previously in Chapter 3 -

$$\mathbf{H_t = 211323.8 - 10967.03\ R_{t-1}}$$

(0.000000) (0.000000)

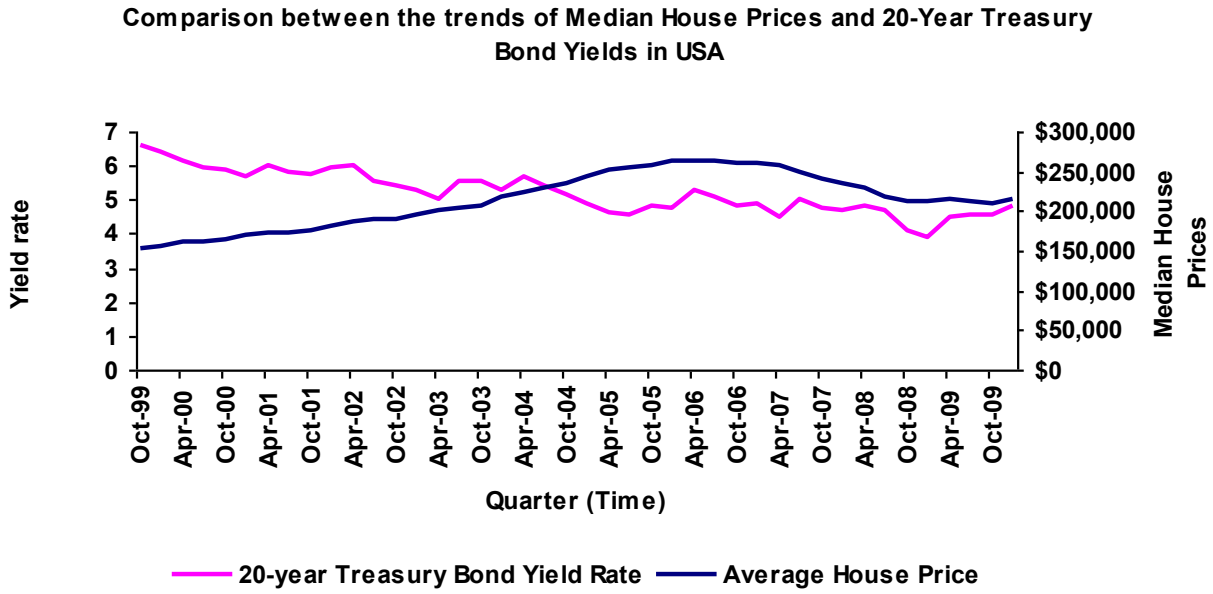
The expressions in parentheses represent the corresponding p-values to the estimated coefficients and they indicate that 'R_{t-1}' influences 'H_t' significantly at the significance level of 5%. However, it is important to note that the sign of the estimated coefficient is found to be negative in this case in contrast to the estimated equation 1 (when the 20-year rate is omitted). This could be the result of the inclusion of factors in the model, which not only pushed the overnight federal rates towards creating a positive impact upon housing prices, but made the estimated coefficient statistically significant as well. In addition, it is also likely that the small number of observations have skewed the results. As Greenspan said in his paper, the high correlation that was found between short-term and long-term interest rates for nearly 40 years (from 1963-2002) was 83% while the recent correlation (from 2002-2005) was a mere 17%. Perhaps there was some sort of anomaly or outlier effect present during these times, which may partially explain some of the results thus far. Another possible explanation can be the volatility of the federal interest rates.



As the graph above illustrates, the federal funds interest rate has been quite volatile during the period immediately preceding the crisis. Such volatility could affect expectations, which in turn effects how consumers react. In addition, the high volatility could mean that a monthly lag is not a good measure to see how the change in the rates affected housing prices. Perhaps a weekly or even daily lag would be a better measure.

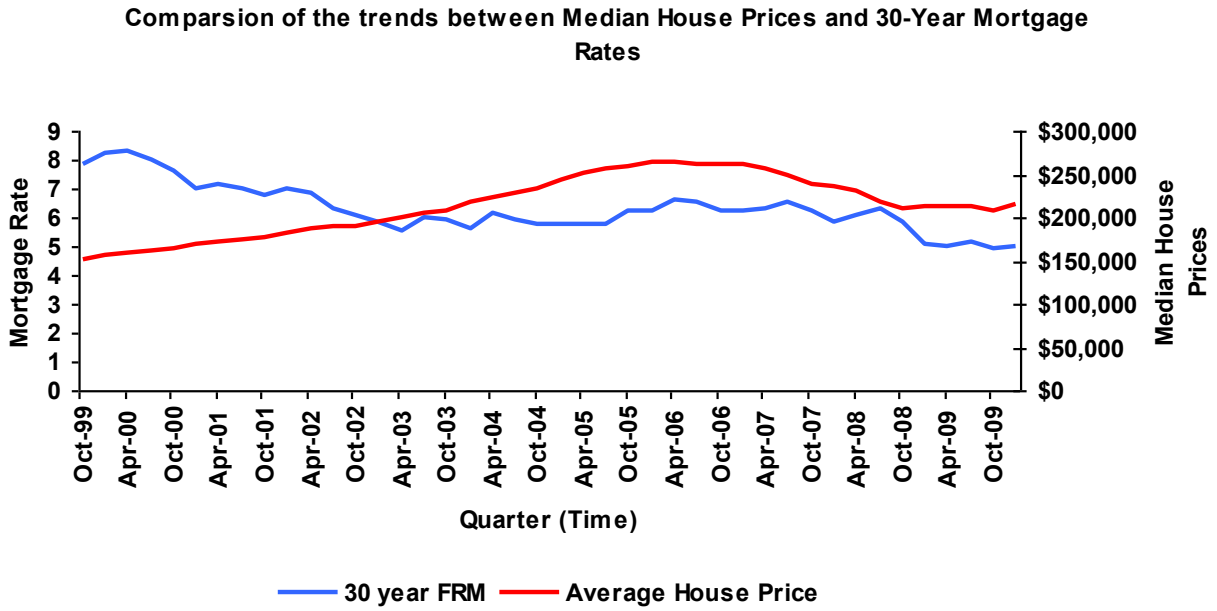
(2) Long-term Treasury Bond Yield Rates help evaluate the impact of exogenous factors upon the financial state of an economy. In order to capture the long-term period, the Yield Rates of the 20-Year Treasury Bonds have been considered. Yield rates are actually functions of bond prices and coupon payments to be made on particular bonds. They suggest how external factors can affect the financial situation in an economy and hence, are often being considered by investors prior to decision-making. Long-term Treasury Bonds are generally regarded as low risk assets, where investors might pour their money into during

periods when investing in short-term securities turns detrimental. For example, when there is a hint of an economic slowdown, investors might withdraw their money from short-term securities and pour them into long-term ones instead, so that long-term rates are lowered to levels below short-term rates. Therefore, a low yield rate on long-term securities such as Treasury Bonds might signal the possibility of a recession. This step raises aggregate demand in the economy and hence, hikes the price of the commodity in question. A similar phenomenon occurred in the housing market where the excessive savings glut reduced the long-term yield rates on Treasury Bonds between 2002 and 2004. Investors, in the many periods to follow, had reduced their investments in short-term securities and shifted to long-term assets such as real estate, thus driving the price to a peak level. This is the rationale behind which it could be said that reduced yield rates on long-term Treasury Bonds in previous periods actually influenced the investment decisions in successive periods. Hence, the reduced yield rate witnessed in the past was coincided by surging housing prices in the following time period.



The empirical model used to test Greenspan's argument showed that the 20-year treasury yield rates were not significant factor in affecting housing prices. In addition to being statistically insignificant, it had a positive sign, which is against economic theory. When the yield rates and housing prices were graphed, and subsequently regressed against one another, a significant negative relationship was shown. The most probable cause of this is that there is strong collinearity between the interest rates tested, specifically the mortgage rates and the treasury yield, both being long-term rates of interest. Greenspan believes that the long-term interest rates, coupled with the global savings glut were the main variables affecting housing prices. The later part of his argument has not been tested in this dissertation and it will be interesting to see how the results change when exogenous variables are added.

(3) Fixed rate mortgages are important determinants of housing price movements according to Greenspan. They are actually long-term interest rates, which according to Greenspan, had been the stimulating factor behind the recent financial crisis. Like the yield rates recorded for 20-year Treasury Bonds, the 30-year Mortgage Rates could also be regarded as possible determinants of housing price trends. These are fixed mortgage rates that are inversely related to the demand for housing (and thus housing prices). The higher the long-run mortgage rate is, the lower the demand for houses will be in the consecutive period and vice versa. This is exactly what had been noted within the context of the U.S. when the rise in housing prices had actually occurred at a time when long-term mortgage rates were experiencing a low. This can be seen in the graph below.



When we tested data for the period immediately preceding and following the housing crisis, the empirical model found a fall in 30-year Mortgage Rates in the U.S. between 2000Q1 and 2010Q2, which resulted in increases in housing prices by $28,125, with the increase being especially prominent between 2004 and 2006. The statistically significant estimated value implies that long-term mortgage rates had indeed had an impact over housing prices in the U.S., consistent with Greenspan's argument.

Looking at the overall results, unfortunately it is difficult to accept or refute either Greenspan's or Taylor's arguments with any confidence. When testing the effects of short-term and long-term interest rates, there is bound to be collinearity problems that alters the standard errors and gives us unreliable results.

According to the model, the dummy variable had the biggest scope. It had by far, the largest coefficient. It should be expected that during the 'bubble' period, housing prices were greater than during the 'pre-bubble' period. The most important information to come out of the model

was the significance of the interaction term and the dummy variable. While the federal funds rate was not by itself significant in affecting housing prices, when interacted with the dummy variable, it became highly significant. This states that the effect of the federal funds rate is different during the pre-bubble period and the bubble period. Again, Taylor's argument is centered around the notion that the Fed stopped setting the federal funds target rate according to the formula set out by the Taylor rule during the pre-bubble period. If this deviation was in part responsible for the increase in housing prices, then we would expect the interactive term to be significant. While the significance of the interaction term in important to note, in and itself is not enough to accept or reject Greenspan's argument.

5.2 Discussion of Taylor's Theory

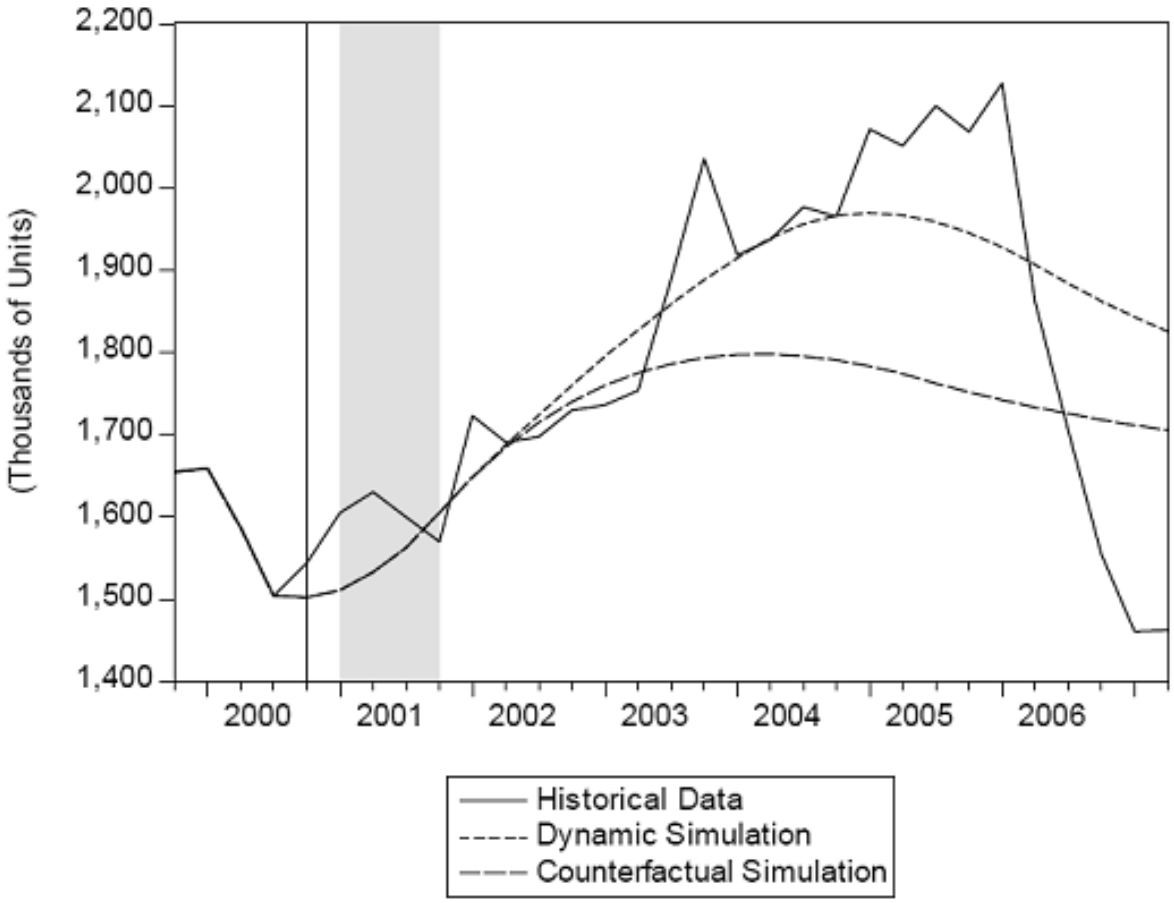
Taylor, in contradiction to Greenspan's view, noted that short-term factors indeed were indirect determinants of housing prices in the U.S. The main point of disagreement between Taylor and Greenspan is the magnitude of short-term interest rates (Taylor believed they were bigger than Greenspan acknowledged). Taylor advocated that changes in short-term interest rates over a long period of time actually resulted to a reduction in long-term rates, which affected housing prices. According to Rudiger Ahrend, Boris Cournede, and Robert Price of the Organization for Economic Cooperation and Development, deviations from the Taylor rule explain a large fraction of the cross-country variation in housing booms in OECD countries. Taylor, in addition, ruled out the idea that a global savings glut had a significant effect on U.S. housing prices because the glut that occurred outside the U.S. was more than counterbalanced with the low savings within the country. Specifically, he states that, "the positive savings gap outside the United States was offset by an equal-sized negative savings gap in the United States. The model

framed to testify Taylor's beliefs indeed found that average overnight interest rates recorded over a quarter successfully predict deviations in the average values of 30-year fixed mortgage rates. An increase in the average overnight Fed Rate results had a positive effect in the 30-Year Mortgage Rates (with a high statistical significance). On the other hand, mortgage rates were found to be influencing housing prices in a negative manner with a high level of significance. Hence, following this line of logic it would seem that short-term interest rates can actually negatively influence housing prices in an economy. Many agree that changes in mortgage values are in reality the result of more factors other than only short-term interest rates. Therefore, even though the relationship between short-term and long-term interest rates is significant, the relationship between short-term interest rates and deviations in housing prices are not as strong.

In addition, Taylor also suggested that had the federal interest rates been set according to the Taylor Rule, the crisis could have been avoided or mitigated. This notion has been analyzed by computing the values of Taylor's interest rates, which required getting the values of quarterly inflation and output gap within the U.S. A problem cropped up however, in this context when the GDP gap could not be accessed for the periods beyond 2007Q4. Hence, annual data available for the remaining three years have been used to represent the quarterly values in between. Such an approximation has been made given that the potentials of a nation's capability (of producing output) do not change very significantly within the span of a year. Thus, the quarterly output gap values are not likely to produce immense differences within a particular year. Given this assumption, the interest rates according to the Taylor's Rule have been computed in order to test Taylor's theory. This interest rate, R^T, is the one that Taylor adamantly suggested the Federal Reserve should have used in order to bypass the possibilities of any

financial crisis because it takes into account inflation, as well as the economic condition of the economy.

In his book, Taylor provides the following graph that illustrates how the crisis would have been significantly mitigated had the Taylor rule been followed.

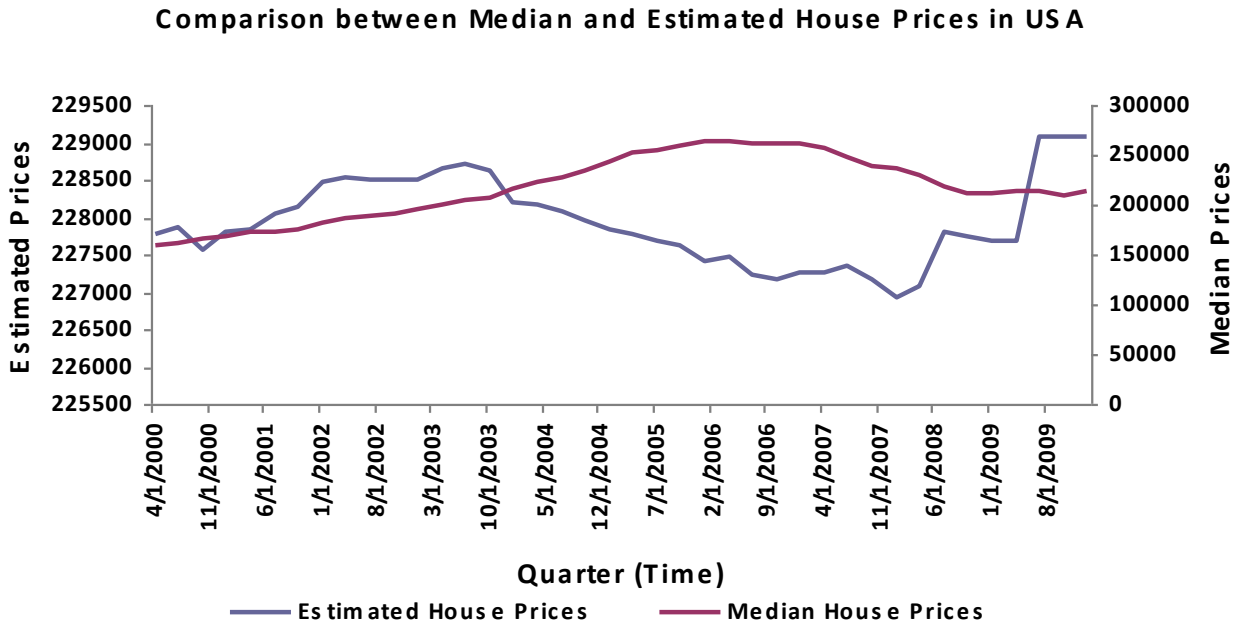


Taylor does not explain in any detail how he calculated these simulations. In an attempt to recreate Taylor's work, simple regressions between short-term interest rates on long-term interest rates and as well as long-term interest rates on housing prices were looked at over several period preceding and following the crisis. The reason was to see if the coefficients that resulted in these

simple regressions could be used for the purpose of simulation. Unfortunately, the outcomes did not make much sense and could not be used.

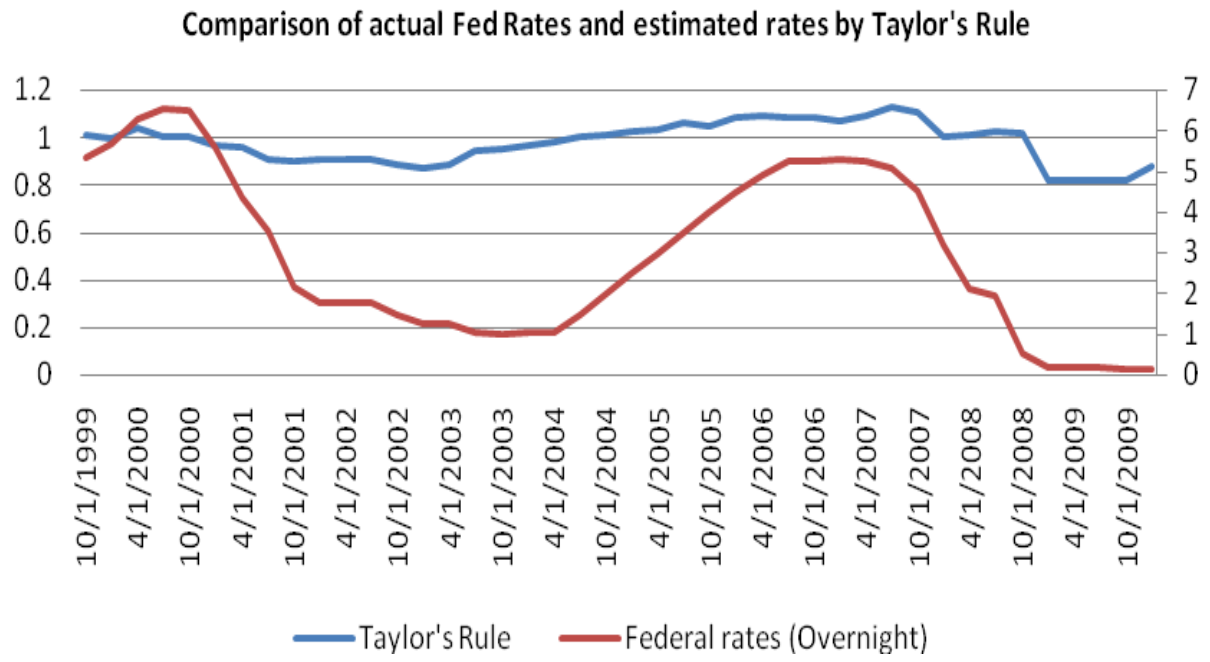
The other (again not ideal) method was attempted to replicate Taylor's simulations. Going back to 2000, the federal funds target rate was calculated following the Taylor rule. To examine whether the Fed would have been better-off taking this difference course of action, 'R' in equation (2) is replaced with R^T (calculated using the Taylor rule) to see how the fixed mortgage rates (FRM) are affected. Then, these estimated FRM values are substituted in equation (3) to yield estimated median housing prices.

The housing prices that were computed through this process are depicted in the graph below. The graph shows a clear indication that median housing prices were indeed much lower when the Taylor rule was followed. In fact, the difference is the largest around the mid-2006, which was when housing prices reached their peak and formed a bubble. To be more specific, the graphs illustrates that the two values had almost moved in accordance with each other until about 2004, after which their paths deviated considerably. This is when Taylor argues the Fed should have raised interest rates. Thus, looking at the graph, one can infer that the financial crisis, which primarily originated in the U.S. housing sector, would not have occurred (at least not on such a large scale) had the Federal Reserve followed the interest rates defined by Taylor's Rule.



In making comparisons between Greenspan's and Taylor's arguments, again neither one of them should be discarded completely because the results are not convincing on either side. Greenspan noted that housing prices indeed are dependent upon long-term interest rates and not on short-term overnight ones. Testing the main independent variables (federal funds rate, 20-year treasury rate, and 30-year mortgage rate) in a multiple regression model vs. a simple regression model provided tremendously different results. A better model needs to be constructed in order to provide more reliable answers.

Where it gets interesting is the hypothetical scenario of what would have happened had the Taylor rule been followed. If the overnight interest rates had been set in such a way, they display an opposite trend, meaning that they have an inverse relation with housing demand. Moreover, it also appears that had the Fed used the 'Taylor' interest rates, the housing price bubble would not have occurred to the degree that it did.



In addition, running a regression using the "Taylor" interest rates upon the estimated housing prices computed according to equations (2) and (3) above yield a significant inverse relation between the two, indicating that the explanatory variable may actually have been an important determinant of housing prices in that scenario. In fact, had the overnight interest rates been set in such a manner, it could have been an effective monetary weapon for the Fed and eventually could even have alleviated the size and scope of the financial crisis. Hence, even though the actual Fed rates did not serve as important determinants of housing prices, it's possible that reason for this was that their monetary policy at the time was not very effective. If our model is legitimate, then monetary policy is an effective tool and could have mitigated the scope of the crisis had the Taylor rule been followed and interest rates were not kept low for so long. The graphs in the above sections have illustrated how the median housing prices would be different had the Taylor rule been followed. Had the interest rates been set in accordance with the Taylor rule, it may be possible that the relationship between short-term interest rates and housing prices

would have been more significant. While the Taylor rule was used to implement interest rates during the era referred to as Great Moderation, the correlation between short-term and long-term rates was strong (which Greenspan does not deny). Greenspan states that this correlation disappeared in the years right before the crisis, coincidently the same period the Fed deviated from the Taylor rule.

Another interesting aspect that is being discussed lately is whether the Fed follows a linear Taylor rule or a non-linear Taylor rule. Kenneth Peterson of the University of Connecticut looked at the Fed's policies from 1960 through 2005 and found that from 1960-1979 the Fed followed a linear Taylor rule and a non-linear Taylor rule from 1980-2005. Rzhevskyy and Papell also look at this issue in their paper "Taylor's Rule versus Taylors Rules". Before making the claim that following the Taylor rule would have ameliorated the scope of the housing crisis, it is important to identify exactly what type of 'rule' the Fed should have followed (the common argument is that the overnight interest rates were 2-3% lower than what they should have been). Even now with the quantitative easing policy the Fed has adopted is some say, in response to the negative interest rates prescribed through the Taylor rule from 2009-2011.

5.3 Discussion of Minsky's Theory

Minsky's theory suggests that financial crises culminate out of disruptions in the behavior of financial variables that determine the amount of aggregate investment in an economy. In fact, a feeble financial structure often leads an economy to successive business cycles. After the termination of a bust period, firms no longer are prepared or willing to invest on high-risk assets and instead, prefer investing on relatively secure hedge funds (though this behavior is only temporary). As the economy enters into another phase of a business cycle that is initiated

through a boom, firms tend to believe that their financial situation will be improved substantially over a short span of time when in reality, it is hollow from within. The expectations of firms about earning more profits increase over time and are gradually inclined towards accepting credit at higher risk, with the hope of making gains through venturing them out. Lenders themselves do not create much upheaval while advancing them money given that they too expect the expanding economy to reap ample profits to investors, thus minimizing their chances of loan defaults. However, an economy that is financially fragile and has poor reserve stock to serve financial needs during periods of crises, is susceptible to a magnified fallout. Everything depends upon the financial measures taken by investors, i.e., unless anyone of the large investors defaults on their loan, the economy runs smoothly. This is because large firms/investors often put large sums of money into their investments, which takes up a significant fraction of lenders' lending potential. Investments often are not always well diversified and can become too dependent on a few actors. That is why the economy crumbles down as soon as an external factor hinders borrowers from repaying their loans. Moneylenders can no longer advance credits primarily because they suffer from a shortage of resources. In addition, they suddenly become very risk averse and are no longer are willing to accept the same levels of risk as they had in the past. Such a situation could arise out of an increase in the interest rates charged by lender institutions such as commercial banks to borrowers. In fact, this is exactly the story that ran behind the scene of the subprime crisis.

Following the dot-com bubble, the Federal Government had initially reduced the effective Federal overnight rate in response to a depressing economic condition. As the economy started expanding, investors were prompted to invest in assets endowed with a higher risk. Many financial houses for example, invested a huge sum of money on mortgage-backed securities

issued by commercial banks to finance credit advanced to subprime borrowers. These securities were characterized by high potentials of returns but were also endowed with a large amount of risk. The risk content arose from the fact that the subprime borrowers were advanced funds at adjustable rates of interest, which required them to pay back at the rate being modified by the Federal Government. A good deal of these borrowers had no other options, given that they were not in a position to accept loans in lieu of equivalent mortgage payments. They had agreed to the condition that in the case they failed to make interest payments over time or decided to walk out on their loans, banks would seize their property. Commercial banks figured their position to be advantageous as, at worst, they anticipated possessing the properties of these borrowers in case they were not able to honor their payments. House prices were already on a rise and hence, banks figured their possibilities of yielding a hefty profit to be quite high if such a situation arose. Many regarded the housing market as a 'safe' investment. Housing prices historically had always gone up (although not at the pre-crisis level). Nassim Nicholas Taleb popularized a term he called the Black Swan effect. This refers to seemingly impossible events that, when occur, completely disrupt the investment landscape. Taleb in an interview with the New York Times states, "What we call here a Black Swan is an event with the following three attributes. First, it is an outlier, as it lies outside the realm of regular expectations, because nothing in the past can convincingly point to its possibility. Second, it carries an extreme impact. Third, in spite of its outlier status, human nature makes us concoct explanations for its occurrence after the fact, making it explainable and predictable." There are a few who believe the housing crisis was a Black Swan. Many people never envisioned housing prices dropping to the extent they did and thus, engaged in extremely risky behavior.

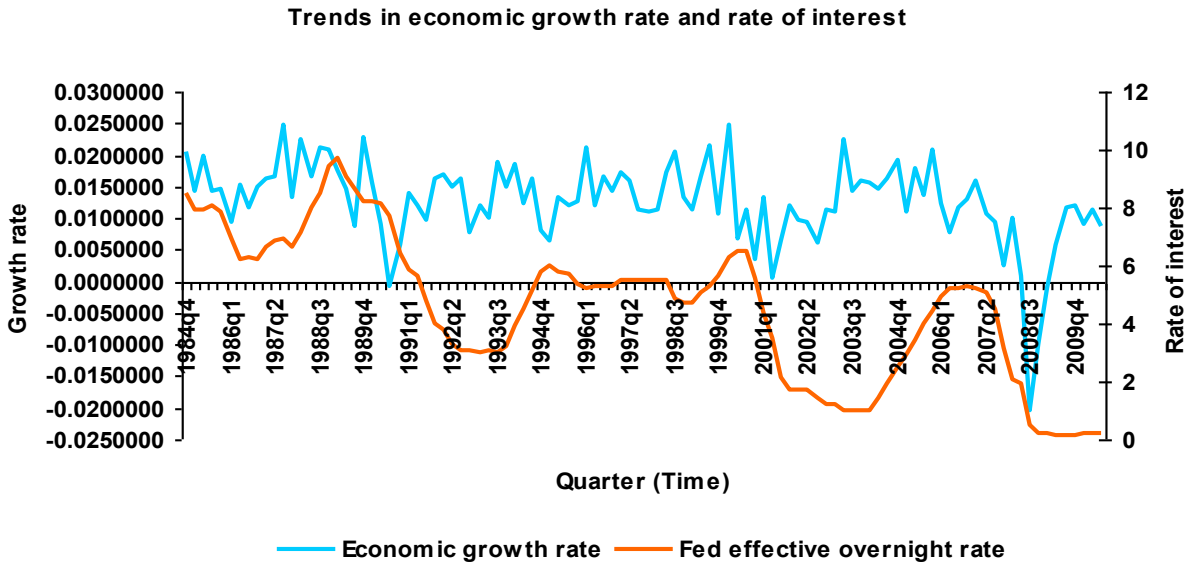
The Federal Reserve had kept interest rates low in order to minimize the chances of a recession in the economy. Thus, when the central bank decided to hike interest rates suddenly, commercial banks did not anticipate this move. In fact, central banks believed that interest rates would remain at the status quo, if not go even lower. The Fed's decision to pull them up suddenly shattered the hopes of commercial banks of reaping huge profit margins (same applies to the financial houses that were the financiers of these banks at the other end). Had commercial banks initiated their lending spree with a robust monetary reserve (liquidity) intact , the crisis would not have magnified to the extent it did. Following the Fed's decision, the subprime borrowers voluntarily walked out of their loans, leaving commercial banks with scores of houses. Initially, banks had the option to use these housing assets towards their benefit, but a rising interest rate had reduced the demand for housing and lowered asset prices as well and banks could no longer reimburse their stocks. Hence, they gave way and voiced out their inability to financial houses, many of whom, in turn, declared themselves bankrupt.

A similar situation had cropped up in the economy back during the 1990s when the savings and loans crisis had hit the U.S. This was largely blamed to be a result of quick and unwise government decisions to regulate the soaring inflation within the economy. The U.S. was undergoing a phase of high inflation since the 1970s and savings and loans institutions had been lending while incurring a high opportunity cost, with regards to fixed interest mortgage loans. In fact, if deeper analysis is made, it could be discovered that lenders were actually paying the borrowers to accept credit. Under such a scenario, the Federal Reserve loosened lending restrictions from these institutions and allowed them the liberty to advance credit for financing riskier investments. This very step resulted in a crisis at a latter phase and it is often alleged to have happened due to an unsound domestic financial system. Institutions, on the other hand,

went out on a lending spree and when the Fed could no longer maintain a lid over the level of interest rates, the S & L institutions faced a crisis similar to that of banks and financial houses during the subprime crisis of 2007-2008. The crisis of the 1990s was also followed by a reduced market price for assets such as real estate (although not to the same extent), etc.

Hyman Minsky in his theory suggested that an economy that is characterized by a frail financial structure is prone to falling victim to even slight disruptions in financial factors or monetary instruments. Interest rates are one of the most influential of all variables in this case. An economy featured by a dicey financial condition is highly vulnerable to interest rate fluctuations. To be precise, the trends adopted by short-term interest rates are often found to reflect the economic growth rates of a country, which in turn are representative of the surmounting business cycles. For example, when interest rates were freed during the 1980s, the period following was characterized by low economic growth because the expansion process came to a halt. A similar situation took place in the U.S. after the financial crisis of 2008. After the housing price bubble exploded, the country was submerged in a low economic growth phase. In fact, the economic growth rate came down to negative figures coupled with poor unemployment figures and a full-fledged recession was underway. As proposed by Minsky, a financially tumultuous situation tends to crumble down at the slightest disturbance in interest rates ruling over the market. It is highly possible that a rise in interest rates is likely to reduce banks' willingness to lend, as well as reduce the demand for new loans. This move is directly reflected in the price of assets, which tumble down, pulling the country down to a phase of poor economic growth. The correlation coefficients that were discussed in Chapter 4 corroborate this. The figure below compares the economic growth rate and the trends in interest rates. A closer look at the graph reveals that the

economic growth rate moved in an opposite direction to the overnight Fed rate that was recorded in the immediately preceding quarter.



The correlation coefficients that were computed indicate that interest rates recorded in the U.S. over the last 25 years have been inversely related to housing prices, volume of bank credit being advanced by all commercial banks, and the charge-off rates recorded by them. Rationale behind the selection of each variable has already been discussed in previous chapters. An inverse relationship between interest rates and each one of these variables is plausible given that a hike in interest rates is usually decreases consumption and allows people to hold on to non-perishable good (such as housing) longer. Hence, with a sudden rise in interest rates, there will be a fall in the economic growth rate which will also be corresponded by a fall in asset prices, bank credit, etc. The opposite scenario is true for a sudden fall in interest rates.

The correlations performed in the previous sections support the view that movements in interest rates led to inverse movements in asset prices, bank credit being advanced, and the amount of

bad debts in the economy. In fact, the correlation between interest rates was found to be statistically significant with the latter two variables, but not significant with asset prices. However, this might be on account of the fact that only a single type of asset i.e., housing, have been considered. Had the categories of assets been expanded, the correlation coefficient might have yielded a significant negative association with interest rates. In addition, the degree of association is found to be much higher with the volume of credit being advanced by commercial banks than it is for the amount of loans turning up as bad debts. Hence, it is quite obvious that interest rates affect the volume of bank credit being advanced more than they affect the charge-off rates of commercial banks. These results could easily be extended to the U.S.'s financial history over the last 30 years given the high statistical significance. No bold statements can be made when using only correlations as a means of justification. However, due to the difficulty in formalizing Minsky's Financial Instability Hypothesis (and the fact that no sound model exists), correlations are a helpful first step to looking at an unorthodox theory that has recently been receiving a significant amount of attention.

Chapter 6- Conclusion

This dissertation summarizes the ensuing debate among economists regarding the factors instigating the credit crisis. The suggested causes of the crisis range from factors like low federal funds rates, distorted incentive structure in the financial system, failure of the supervisory and regulatory authorities, information problems, excessive risk-taking, global imbalances, securitization etc.

As previously stated, the strong correlations between the interest rates that were tested yielded unreliable results. The results from the multiple regression and simple regression differed in significance and in some cases, the sign of the variable. The dummy variable was the most significant when considering not only the p-values, but also the coefficient. The dummy variable, when interacted with the overnight federal funds rate (the main variable that was being tested), resulted in a highly significant outcome. This alone is not enough to reject or accept any theory. The dummy variable was so strong that, if interacted with any variable, may have feasibly resulted in a significant interaction term. In addition, the federal funds rate was changing so dramatically between the time-period immediately preceding the crisis. As stated earlier, starting on June 30, 2004, the Fed reversed its policy of low (close to 0%) interest rates in 17 equal increments and gradually raised the target rate to 5.25% by June 29, 2006. On September 18, 2007, the Fed yet again reversed its decision and in a series of 10 moves, reduced the target rate to practically 0 (0%-0.25%). Such dramatic and volatile movements could have altered the way we expect economics to work 'normally'. For instance, we expect interest rates and housing prices to have an inverse relationship. Usually, housing prices react to interest rates. However, when the housing bubble burst and prices started dropping tremendously, the Fed dramatically lowered its interest rates. This was a case of interest rates reacting to housing prices

and not vice versa. A significant drop in housing prices, coupled with a significant drop in federal rate target rates took place. Such an occurrence would explain why it would be feasible for the regression model to show interest rates and housing prices to have a positive relationship.

Finally, although the subprime mortgage crisis has recently popularized Minsky's financial instability theory, it must be coupled with a thorough scientific model before it can be considered a part of mainstream economics. This dissertation only looked at some correlations when looking at Minsky's Financial Instability Hypothesis. Much more complex models are required before any sound conclusions can be reached.

The Federal Reserve is responsible for promoting financial stability in the county. However, during the crisis, it did not meet this expectation. It was not able to identify the threats exposed by low or negative real interest rates and credit booms to financial system stability. It assumed financial market risk to be minimal, thereby ignoring the need to manage financial risks and contain the effects of the credit and housing bubble by using tools other than interest rates.

There was a global imbalance in the demand for safe and liquid assets that contributed to the falling real interest rates, fuelling the housing and credit bubble. Enticed by high profits, financial markets designed instruments with underlying sub-standard assets which was extremely susceptible in times of systemic distress. The regulatory failures and the global imbalances led to a collapse of financial systems of several advanced economies.

The study shows a strong correlation between the current account deficit and credit growth in the U.S.

For further research, it will be interesting to see how Greenspan's and Taylor's theories regarding the housing crisis can be applied to previous crises in the U.S. Taylor, himself admitted in his book that the Fed had followed the Taylor rule during times of what he refers to as "The Great Moderation". In addition, with the continuous emergence of China as a superpower and that country's strong historical tendencies to save, one cannot help but wonder how the Fed's monetary policy will be affected in the future. Just recently, the Fed announced that it plans to buy 61% of the government debt issued by the Treasury Department. Lawrence Goodman, a former Treasury official and current president of the Center for Financial Stability, states that, "This not only creates the false appearance of limitless demand for U.S. debt but also blunts any sense of urgency to reduce supersized budget deficits." The aftermath of the crisis shows the U.S. government as one that is increasingly becoming more dependent on borrowing to finance itself. Net issuance of Treasury securities is currently hitting 8.6 percent of gross domestic product (GDP) on average per annum, which is more than double levels before the crisis. Such a move continues to keep long-term interest rates artificially low.

"The Fed is in effect subsidizing U.S. government spending and borrowing via expansion of its balance sheet and massive purchases of Treasury bonds. This keeps Treasury interest rates abnormally low, camouflaging the true size of the budget deficit," Goodman writes. Thus, even post-crisis, the monetary policy of the United Stated Federal Reserve seems to be keeping interest rates historically low. Goodman mentions that this trend is not one that is sustainable. One wonders if in a few years, we are back at the same argument that the Federal Reserve kept the interest rates too low for too long after the housing crisis as it did after the dot.com crisis.

To sum up, the words of Reinhart and Rogoff say it best. “Even as institutions and policy makers improve, there will always be a temptation to stretch the limits. Just as an individual can go bankrupt no matter how rich she starts out, a financial system can collapse under the pressure of greed, politics, and profits no matter how well regulated it seems to be”. The threat of a financial crisis is always present regardless of how sound an economy may seem. As Hyman Minsky stated in 1986, "In a world of businessmen and financial intermediaries who aggressively seek profit, innovators will always outpace regulators; the authorities cannot prevent changes in the structure of portfolios from occurring.” It is crucial to expand on the existing models of crisis, and learn from history to better recognize the early signs of trouble. As the world becomes more globalized, a financial crisis in a dominant country like the United States will often have a huge contagion effect, making it even more crucial to not repeat the same mistakes of the past by recognizing the red flags immediately and avoiding the “this time is different” mentality that has been associated with nearly all crises in the past.

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