

UNEMPLOYMENT, TARP, AND THE SUBPRIME MORTGAGE CRISIS

by

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ABSTRACT

UNEMPLOYMENT, TARP, AND THE SUBPRIME MORTGAGE CRISIS

Following the fall of the Lehman Brothers in 2008, the U.S. saw the worst recession since the Great Depression in the 1920's. This dissertation presents a summary of two previous major U.S. recessions, the Great Depression and the Savings and Loans Crisis, and an analysis of the root causes and consequences of the 2007-2009 recession is also provided, namely the bursting of the housing bubble, loose monetary policy, lax financial regulation, and misperception of risk. The Troubled Asset Relief Program, a bailout program implemented following the Emergency Economic Stabilization Act in October 2008, is then discussed. Using county-level panel data, the effect of the implementation of TARP on unemployment patterns is then studied. The results show that TARP negatively affected unemployment patterns, so that TARP alleviated the sharp rise in unemployment after its inception.

LIST OF ABBREVIATIONS USED

ABS: Asset-Backed Securities

AGP: Asset Gurantee Program

AIFP: Automotive Industry Financing Program

AIG: American International Group

ARRA: American Recovery and Reinvestment Act

ASSP: Automotive Supplier Support Program

CAMELS: Capital Adequacy, Asset Quality, Management, Earnings, Liquidity, and Sensitivity to market risk

CAP: Capital Assistance Program

CBO: Congressional Budget Office

CBLI: Consumer and Business Lending Initiative

CDCI: Community Development Capital Initiative

CDO: Collateralized Debt Obligations

CDS: Credit Default Swap

CPP: Capital Purchase Program

DIDMCA: Depository Institutions Deregulation and Monetary Control Act

EUC: Emergency Unemployment Compensation

EESA: Emergency Economic Stabilization Act of 2008

FICO: Fair Isaac Corporation

FRB: Federal Reserve Board

FSLIC: Federal Savings and Loan Insurance Corporation

GDP: Gross Domestic Product

GMM: General Method of Moments

GSE: Government Sponsored Enterprise

HHF: Hardest Hit Fund

HIRE: Hiring Incentives to Restore Employment

LIBOR: London Interbank Offered Rate

MBS: Mortgage-Backed Securities

MHA: Making Home Affordable

PIIP: Public-Private Investment Program

S&L: Savings and Loans

SBACLI: Small Business and Community Lending Initiative

SCAP: Supervisory Capital Assessment Program

SIGTARP: Special Inspector General for the Troubled Asset Relief Program

TAF: Term Auction Facility

TALF: Term Asset-Backed Securities Loan Facility

TARP: Troubled Asset Relief Program

TED: Treasury bills/ Eurodollars

TIP: Targeted Investment Program

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Nicole Maliha

Chapter 1 Introduction

The Troubled Asset Relief Program (TARP) is the largest government bailout program in US history, initiated in response to the increasingly severe Subprime Mortgage Crisis of 2007-2009. The program was created by the Emergency Economic Stabilization Act of October 2008, a law signed in by President Bush in an effort to stabilize the economy and alleviate the credit crunch during the systemic financial crisis of 2008, the greatest financial crisis since the Great Depression. Objectives of the program included increasing lending, maintaining home ownership, easing unemployment, and protecting taxpayers' interests (Summers, 2009).

This thesis will examine, on a county level, whether the receipt of TARP funds by banks alleviated the unemployment problem in the areas of banks that did receive TARP funds before the implementation of the Hiring Incentives to Restore Employment Act (the HIRE Act) in March 2010. A brief summary of two important U.S. financial crises, the Great Depression and the Savings and Loans Crisis, will first be reviewed. Similarities between the current U.S. crisis and the aforementioned crises will then be outlined, illustrating how the Subprime Mortgage Crisis is not unprecedented.

An analysis of the 2007-2009 crisis is then presented, including events leading up to the crisis, policy responses, and unemployment during and after the official end of the crisis in 2009. This is followed by a description of the TARP and the Capital Purchase Program.

The study of whether the receipt of TARP funds affected unemployment in those areas in which they were obtained is done through estimating unemployment autoregressive models using county-level, quarterly panel data, as well as through testing for a structural break in unemployment patterns before and after the program's inception.

Chapter 2 Historical Patterns in U.S. Financial Crises

Speculative excess (otherwise known as “manias” or bubbles) have been common historical foundations for post-war crises, including the most recent Subprime Mortgage Crisis. This occurs following certain events causing displacements in the macroeconomy, such as changes in monetary policy resulting in low interest rates. The displacements, if sufficiently large and widespread, increase profit opportunities in at one or more sectors in the economy and close out others, encouraging firms and individuals with savings to invest in the former. These investors will keep withdrawing from the latter until interest in capital gains dominates (the second stage). Investment will increase in the economy if the good opportunities dominate the bad, and a boom occurs. Eventually, supply of the good in question will be unable to meet the quick rise in demand, causing the prices to increase. This, in turn, results in new opportunities for profit, attracting more investors, and drives financial institutions to increase their liabilities, even if it means decreasing their liquidity. It also creates speculation for a price rise of the asset, attracting investors who normally would not undertake such ventures to purchase and resell to make quick profits. The 2007-2008 financial crisis, dubbed “The Great Recession” by many due to its devastating effects on the economy, was fueled by monetary expansion policies. Ultimately, due to income not rising as quickly as the asset price, the bubble caused by speculative mania will eventually burst, which in turn is likely to cause a liquidity rush among investors who no longer want to possess the toxic assets (Kindelberger, 1996). The occurrence of manias was very common in the post World War I period, and this section will analyze the Great Depression and the Savings and Loans crisis to illustrate

similarities between previous post WWI crises and most recent 2007-2009 Subprime Mortgage Crisis.

2.1 The Great Depression

The U.S. Great Depression of the 1929-1933 stands out among economic fluctuations in the world's history as particularly large, painful, and academically significant (Mankiw, 2007). During the early 1930's, output declined by nearly 30%, and civilian unemployment at the 1933 peak was estimated at 25% (Cecchetti, 1997).

The 1920's real estate boom began with a high post-war demand for housing due to the short but sharp decline in construction during the war (White, 2009). Prevalent economic optimism after World War I had also strengthened demand for office space, pushing up national average commercial rents 168 percent from a pre-war base through 1924 (Byrt, 2010). However, similarly to the most recent housing bubble, the 1920's housing bubble that peaked in the mid-1920's was focused on residential housing. Also, the gold standard in the 1920's kept long-term inflation in check and resulted in flat mortgage rates, encouraging mortgage borrowing by households (White, 2009). Demand for construction capital became so high that shares were sold to retail investors, as well as securities backed by these properties. These mortgage securities had a wide range of maturity dates and were issued by large title banks, bond houses and insurance companies. These

securities became one of the largest classes of investment assets in the 1920's¹, mostly driven by public demand, which was nurtured by inaccurate asset valuations by large intermediaries (Byrt, 2010). The speculative bubble was, in addition to easy credit, fueled by the availability of a multitude of mortgage options and Federal Reserve monetary policies that promised to thwart financial crises. However, lending standards did not significantly decrease (White, 2009). The housing price dip in 1926, caused by massive overbuilding and oversupply, drove up the number of foreclosures of residential properties and farms, and the market for real estate-backed securities consequently collapsed. The number of foreclosures rose through the stock market bubble and peaked in 1933 (Harvard Business School [HBS], 2010).

In 1924, the Fed made open market purchases and lowered its discount rate to 3% (Temin, 1994). The low rate created, or at least seriously propagated, the stock market boom (Hetzel, 2008). The rising prices of stocks enticed more and more people to invest in them, further driving up the prices. In 1928 and 1929, the Federal Reserve ultimately initiated a restrictive monetary policy to deal with the stock market problem. Open market sales were undertaken in an effort to force banks into the discount window, therefore allowing the fed to force them to stop issuing loans for the purchase of stocks on margin (i.e. with the stocks used as collateral) (Hetzel, 2008). In addition, the discount rate was raised to 6%. (Friedman & Schwartz, 1963). By the time the Federal Reserve had taken action, however, it was too late. The new contractionary monetary policy and the

¹ Total yearly issuance of real estate securities between 1919 and 1925 grew by nearly 1,106% and corresponded to almost 23% of total public corporate debt issuance at the 1925 market peak. It later dropped to 0.14% in 1934 (Goetzmann, 2010).

consequent credit tightening were the major culprit behind the severe deflation and the fall in prices and industrial production during the depression (Temin, 1994).

The bull stock market then crashed in October 1929, leading to a panic that caused blocks of securities to be dumped into the market, due to general loss of confidence and to investors forced into liquidity because they had purchased stocks on margin, borrowing money from banks with the securities as collateral. In the four year period between 1929 and 1933, money income fell by 53%, real income by 36% (due to the rapid fall in prices), and the money stock by 33%. These four years of contraction temporarily wiped away the gains of the preceding two decades by rendering inactive workers and machines (Friedman & Shwartz, 1963).

The weakness in the economy, chiefly in the agricultural sector², triggered widespread mistrust and set in motion a massive search for liquidity, leading to a series of bank panics from 1930 through 1933, by which time over one-third of commercial banks had failed (Mishkin, 2007). The Fed took a passive stance during the bank panics and did not perform its role as lender of last resort for reasons of ignorance of the negative effect that bank failures can inflict on the economy as well as an internal Federal Reserve power struggle (Friedman & Shwartz, 1963).

² During the war, American agriculture had thrived with the high European demand for food and clothing. However, military demand for these products declined simultaneously with European supplies reappearing in the market. This, in combination with drought, new technologies, and other factors, contributed to the fall in prices and the agricultural distress of the 1920's, where farmers (apart from those with new technologies that allowed them to produce at low cost) had severe debt problems because they had previously borrowed funds to take advantage the high demand and prices environment (Temin, 1994).

2.2 The Savings and Loans Crisis

The U.S. Congress deregulated savings and loans institutions (S&L's) under the Reagan administration (also known as thrifts, institutions that specialize in accepting savings deposits and making loans, notable mortgage loans) in 1980 and 1982, to improve the thrifts' viability³. This was done in response to increased inflation and regulation in the 1970's that limited the interest rates paid to depositors. Thrifts were given many of the capabilities of commercial banks but were devoid of the associated regulations, and that encouraged risk-taking on the part of these institutions while customer deposits were insured⁴ (Shachmurove, 2010). The thrifts borrowed short-term funds and lent them out at fixed rates for long-term mortgages, thus rendering themselves vulnerable to interest-rate risk due to its high volatility during that period (Curry & Shibut, 2000). Sharp increases in interest rates by the Federal Reserve from late 1979 to early 1981, caused for thrifts' interest expenses to exceed their interest income and brought about large losses, rendering them technically insolvent, and that, in addition to deregulation, delays funding the thrift insurance fund, and a multitude of other reasons, led to a large number of thrift failures in the 1980s (Gup, 2010). Additionally, an "intentional" recession in 1981-1982, following a decrease in the money supply intended to suppress inflation, hit various areas in the U.S. very hard and many defaults on S&L loans followed (Mishkin, 2007). The

³With the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) and the Depository Institutions (Garn-St. Germain) Act, respectively (Shachmurove, 2010).

⁴ Thrift institutions, previously almost completely constrained to making home mortgage loans, became allowed to have a portion of their assets in commercial real estate loans of up to 40%, a portion in consumer lending of up to 30%, and a portion in commercial loans and leases up to a 10%. Additionally, the DIDMCA increased the amount of the \$40,000 decreed federal deposit insurance by \$60,000, making it easier for banks and thrifts to obtain loans for risky projects and grow quickly (Mishkin, 2007).

insurer of the thrift industry, the Federal Savings and Loan Insurance Corporation (FSLIC), closed or otherwise resolved 296 institutions with total assets of \$125 billion from 1986 to 1989 (Curry & Shibut, 2000). The recession in 1981-1982, and the accompanying declines in output and employment, set in motion a decrease in inflation, and interest rates were subsequently permitted to fall (Mishkin, 2007).

2.3 Comparisons with the Subprime Mortgage Crisis

To summarize, the Subprime Mortgage Crisis is not unprecedented. The housing bubble that took place prior to the 2008-2009 subprime mortgage crisis is directly comparable to the real estate and boom and bust of the 1920's. Both bubbles were exacerbated by public demand for housing and asset backed securities that were overvalued by rating agencies, as well as by policies implemented to promote homeownership. The housing and asset backed securities markets in both cases failed following vast numbers of foreclosures resulting from housing price dips from their unsustainable bubble levels. However, the housing bubble prior to the Subprime Mortgage Crisis differs from that preceding the Great Depression is that lending standards in the former had significantly decreased. Additionally, the Great Depression was brought about by the failure of the agricultural sector as well as the real estate sector, the failure of the latter being the predominant factor behind the 2007-2009 economic downturn. Furthermore, the bursting of the 1920's housing bubble was not the driving force behind bank failures, unlike the case with the Subprime Mortgage Crisis.

Many important similarities exist between the Savings and Loans Crisis and the recent subprime mortgage crisis as well. The driving force behind both crises was financial deregulation which encouraged financial institutions to undertake excessively risky projects, and defaults on loans made by those institutions in both cases brought about banking crises. Additionally, in both cases, banks relied on short-term funding, making them vulnerable to changes in interest rates and credit crunches. However, an important difference between the Subprime Mortgage Crisis and the S&L crisis is that in the former, financial deregulation, in addition to encouraging financial institutions to take excessive risks, led to the wide expansion of the process of securitization and off-balance sheet entities, and the popularization of the originate to redistribute system (discussed later in detail).

Chapter 3 The Subprime Mortgage Crisis

3.1 The Housing Bubble

The subprime mortgage crisis of 2007 was largely caused by housing price increases that began in 1998 and reached their trough in the second quarter of 2006. The previous rapid increase in house prices that took place could not be attributed to economic fundamentals such as the changes in income, national interest rates, or employment during that period, but rather was powerfully linked to two fairly new factors impacting the housing market: the widespread accessibility to risk-priced mortgages (based on the credit-worthiness of each borrower) and the abnormally strong purchase of homes for investment purposes (Wheaton & Nechayev, 2008).

The subprime mortgage crisis of 2007 was characterized by an abnormally large portion of subprime mortgages originated in 2006 and 2007 becoming delinquent in a mere few months following their origination (Demyanyk, 2007). Several factors were in play to cultivate the housing price bubble. Advances in securitization, as well as sustained past increases in house prices, enabled people who previously could not obtain mortgage loans to take loans with variable interest rates, at low initial “teaser” rates. When time came to reset those loans, bad economic conditions and rising interest rates made it difficult for many to meet their mortgage obligations. These loans were the main reason behind the failure of the housing market (Wright, 2010).

3.1.1 International Policy Factors

In 2007, the U.S. current account deficit stood at U.S. \$730 billion, and China's surplus at U.S. \$372 billion (Bean, 2010). Following the Asian Crisis in the late 1990's, Asian countries worked vigorously on maintaining fixed exchange rates between their currencies and the USD, and invested mostly in dollar denominated securities, notably low-yield Treasury bonds. The consequential increase in credit availability and the rise in U.S. securities prices suppressed medium and long-term interest rates (Bertaut, DeMarco, Kamin, & Tryon, 2011). The low returns on government bonds in turn heartened financial institutions to reallocate funds into other, riskier, assets with higher yields, including, notably, the growing category of asset-backed securities (ABS) given that corporate bond yields were low as well⁵ (Bean, 2010). Many non-ABS purchases involved financial debt and various structured products rather than safer nonfinancial corporate bonds (Bertaut, DeMarco, Kamin, & Tryon, 2011).

3.1.2 National Factors

An easy monetary policy was adopted by several central banks and initiated by the Federal Reserve in dread of a deep recession similar to the Japanese "Lost Decade" after the bursting of the IT bubble in 2000 (Diamond & Rajan, 2009) (Bertaut, DeMarco,

⁵ In the years leading up to the crisis, foreign flows into corporate debt, half of which involved the purchase of ABS, were at least as large as those into Treasuries and Agencies (Bean, 2010).

Kamin, & Tryon, 2011). The policy involved keeping interest rates low for a significant period and then rising it slowly at a calculated rate (which began in 2004, with interest rates rising from 1% to 5% between 2004 and 2006) (Taylor, 2008). The funds rate was maintained at a low level relative to the Taylor rule from 2001 to 2005 to put downwards pressure on long-term interest rates (Bean, 2010). The Federal funds rate (at which banks lent to each other overnight) plummeted from 6.5% in 2000 to 1% in 2003. This ability to borrow cheaply resulted in financial institutions fervently expanding credit through loans and investments in debt and derivative securities (Kaizoji, 2009), and credit expansion grew much faster than the GDP (Saxton, 2008). Interest rates between 2001 and 2006 were lower (by a minimum of around 1% in 2006 and a maximum of around 4% in 2004 (Bean, 2010)) than they would have been had the Fed followed the type of policy that had worked well during the “Great Moderation” that started in the early 1980s (in other words, the interest rate was lower than that dictated by the Taylor rule) (Taylor, 2008). In fact, the real federal funds rate (corrected for inflation) was negative from October 2002 to April 2005 (Verick, 2010).

Furthermore, federal policymakers, especially under the Clinton administration, implemented a number of policies, one of which was to push financial institutions to lower lending standards to endorse home ownership, particularly among financially marginal households (Saxton, 2008).

There were many reasons for the lack of worry about an upcoming financial crisis in spite of the economy being in a condition similar to those it was in before previous crises and the fact that many recent crises had arisen following bubbles. Among other reasons, the U.S was believed to be “special” in that it could sustain massive capital inflows, due to its

having the world's most dependable system of financial regulation, superior innovations in its financial system, a sturdy political system, and the largest and most liquid capital markets worldwide. The U.S. was also perceived to have advanced monetary policy institutions as well as superior monetary policymakers. Moreover, the tremendous international flow of funds into the U.S. due to rapidly emerging developing economies needing a secure place to invest for diversification reasons was believed to be part of deepening financial globalization, expanding global capital markets and permitting countries to go deeper into debt. It was therefore not a source of concern (Reinhart & Rogoff, 2009).

In a 2004 speech, Ben Bernanke, then a member of the Board of Governors of the Federal Reserve System, attributed the low volatility in inflation and output that characterized the Great Moderation to improved monetary policy, structural changes in the economy, and improved macroeconomic policy (Bernanke, 2004). This intensified the underestimation of risk, a major factor in the causing of the crisis.

3.1.3 The Banking System

Two developments in the banking industry had extensively contributed to the lending roar and housing fury that set the fundamentals for the crisis. First, banks shifted to an “originate and distribute” model, meaning that loans were not held on bank balance sheets but instead were repackaged and passed on to various other financial investors, thereby off-loading risk but putting banks in a highly leveraged position. Second, banks

increasingly financed their asset holdings by the use of shorter-term maturity instruments rather than deposits, rendering them particularly vulnerable to a liquidity crunch. They relied on mechanisms such as overnight repurchase agreement ("repo") funding, borrowing capital by selling a collateral asset one day and promising to repurchase it later, which made them sensitive to rollover risks. The percentage of total investment bank assets funded by overnight repos almost doubled from 2000 to 2007 (Brunnermeier, 2009). Long-term mortgage-backed securities were used as collateral with a key requirement that borrowers place collateral that is higher in value than the loan, with the difference in value being dubbed the "haircut" (Mishkin, 2010).

To deal with the maturity mismatch between their long-term assets (with the vast majority of investment projects and mortgage loans being long-term) and short-term loans, the mismatch was shifted off the banks' balance sheets into off-balance-sheet investment vehicles. These vehicles sold short-term ABS and commercial paper, which are backed by the mortgage loans as collateral, with average maturities of three months and medium-term ones with average maturities of little over one year, above all to money market funds (Brunnermeier, 2009). The ratio of household and business financial liabilities to GDP climbed from 123% to 179% between 1995 and 2007 (Bean, 2010).

The shifting to the originate and distribute model allowed banks to share risks and therefore brought about the problem of moral hazard, with banks lowering their lending standards and not gathering vital information about the borrowers, such as future income solidity and credit score (Elul, 2011). More and more MBS were being issued because they were convenient for mortgage lenders, especially those that relied on short-term deposits and loans, to reduce interest rate risk (the risk being that if interest rates increase,

these lenders get into trouble because the cost of short-term funds will be higher than their long-term mortgage earnings).

Fannie Mae and Freddy Mac⁶ were both mortgage companies owned and controlled by private investors. However, their debt was inherently guaranteed by the government, and they were allowed to borrow at lower rates than other constituents of the market. This encouraged these firms to take excessive risks and put themselves in highly leveraged positions, further intensifying the problem in the subprime mortgage market (Wright, 2010).

Outside conforming loans (that is, loans to prime borrowers meeting the underwriting standards set by Government Sponsored Enterprises (GSEs), including Fannie Mae and Freddie Mac), there are three classes of non-agency loan classes: Jumbo (are loans made to prime borrowers⁷), Alt-A (loans made to people with good credit but with more “aggressive” underwriting - that is to say, no documentation of income, higher leverage), and Subprime (loans made to borrowers who previously were not able to obtain mortgage loans for reasons of bad credit, insufficient income, or insufficient collateral). These mortgages were mainly collateralized by the value of the underlying real estate (Ashcraft & Schuermann, 2008). Basically, subprime mortgages are planned as a succession of short-term loans. After an initial 2 or 3-year low interest period, the interest rate typically grows quickly, and the borrower will have a strong motivation to refinance. The lender then will make the decision on whether to extend the new loan based on whether house

⁶ The Federal National Mortgage Association (Fannie Mae) was established in 1938 by the federal government to develop the country’s securitized mortgage markets, and was later privatized in 1968. The Federal Home Mortgage Corporation (Freddie Mac) was established in 1970.

⁷ Jumbo loans are loans above the maximum amount established by Fannie Mae and Freddie Mac, and often have a little higher interest rate than conforming loans

prices have increased or not. As a result, MBS's, especially those containing subprime mortgages, have an intricate pay-off arrangement that is related to changes in home prices, and are complicated to price and hard to supervise (Bean, 2010). In 2001, the Alt-A and Subprime subdivisions were comparatively small, communally comprising of \$250 billion of the \$2.1 trillion total origination at the end of 2001. The reduction in long-term interest rates at the end of 2003 caused a sharp increase in mortgage loans and mortgage-backed securities (MBS) across all classes. While the conforming (agency) class loan originations peaked in 2003, the non-agency class continued its sharp expansion. These increases in loan originations were, interestingly, associated with increases in the ratio of issuance to origination. The ratio for the Subprime class increased from 46% in 2001 to 75% in 2006., whereas that for the Alt-A class increased from 19% in 2001 to 91% in 2006, and that for Jumbo loans increased from 33% in 2001 to 49% in 2005, and decreased slightly to 46% in 2006 (significantly lower ratios than those for subprime and Alt-A). The rising issuing to origination ratio in those non-agency classes implied that banks were holding on to very little of those mortgage loans on their balance sheets and securitizing the rest, i.e. transferring them to investors through the process of selling them these loans in the form of debt securities (See Table 1) (Ashcraft & Schuermann, 2008).

Table 1: Origination to Securities Issuance Ratios for Subprime, Alt-A, Jumbo and Agency Loans

YEAR	SUB-PRIME			ALT-A			JUMBO			AGENCY		
	Origination	Issuance	Ratio	Origination	Issuance	Ratio	Origination	Issuance	Ratio	Origination	Issuance	Ratio
2001	\$190.00	\$87.10	46%	\$60.00	\$11.40	19%	\$430.00	\$142.20	33%	\$1,433.00	\$1,087.60	76%
2002	\$231.00	\$122.70	53%	\$68.00	\$53.50	79%	\$576.00	\$171.50	30%	\$1,898.00	\$1,422.60	76%
2003	\$335.00	\$195.00	58%	\$85.00	\$74.10	87%	\$655.00	\$237.50	36%	\$2,690.00	\$2,130.90	79%
2004	\$540	\$362.63	67%	\$200.00	\$158.60	79%	\$515.00	\$233.40	45%	\$1,345.00	\$1,018.69	76%
2005	\$625.00	\$465.00	74%	\$380.00	\$332.30	87%	\$570.00	\$280.70	49%	\$1,180.00	\$964.80	82%
2006	\$600	\$448.60	75%	\$400.00	\$365.70	91%	\$480.00	\$219.00	46%	\$1,040.00	\$904.60	87%

Source: Ashcraft & Schuermann (2008)

*Figures are in billions of USD

Over the last decade, subprime mortgage lending expanded rapidly with the number of these loans originated tripling between 2000 and 2006, bringing the share of subprime lending up from 9% to 20% (Dell'Ariccia, Igan, & Laeven, 2008).

The process of securitization involves putting together diversified portfolios, containing mortgages and other categories of loans, bonds, and other assets such as credit card receivables. These portfolios, known as collateralized debt obligations (CDO's) are then segmented into tranches of different risks, which are sold to investors based on their risk preference. Senior CDO debt tranches were built in a way to qualify for AAA ratings (low risk) by rating agencies such as Standard and Poor's. Their relatively low interest rates were to be paid out first with the CDO's cash flows, then the mezzanine and lower-subordinated notes, respectively, with higher interest rates and higher risk (Brunnermeier, 2009). As previously mentioned, Alt-A and Subprime loans were typically sold to third party market participants (the first two being the borrower of the mortgage and the bank that originated the mortgage loan, respectively) rather than being reserved on bank

balance sheets. Subprime mortgage loans were predominantly used as collateral for CDO's. From 2001 to 2006, it was found in 420 ABS CDO's that 1746 subprime mortgages were used in a total of 4008 mortgages, followed by 1367 Alt-A loans, and substantially lower numbers of other types of mortgages (See table 2) (Deng, Gabriel, & Sanders, 2011).

Table 2: Residential Mortgage Deals in 420 ABS CDO's.

Vintage	Subprime	Alt-A	Seconds	Prime	Total
Year					
2003	215	63	7	144	429
2004	371	252	25	188	836
2005	488	452	62	209	1211
2006	522	487	69	142	1220
2007	150	113	21	28	312
Total	1746	1367	184	711	4008

Source: Deng, Gabriel, & Sanders (2011)

In conjunction with the increased use of securitization, there was also a sudden increase in the demand for Credit Default Swaps (CDS), which entailed the holder of a security to buy insurance in case of default on the part of its issuer (Bean, 2010). Somebody who acquired a AAA-rated tranche of a CDO united with a credit default swap were logically compelled to believe that the investment was low risk for the reason that the likelihood of the CDS counterparty defaulting was deemed to be minimal (Brunnermeier, 2009).

The mortgage-backed securities – bonds whose payments are determined by the payments of a collection of underlying individual mortgages - origination process typically begins when the third party, the MBS issuer, purchases a collection of mortgages from the originators. The third party that mortgage loans were sold to

comprised of Ginnie Mae (the Government National Mortgage Association), which is a government agency; Fannie Mae or Freddie Mac, which are government sponsored entities (GSEs); and private sector financial institutions, such as Lehman Brothers. These third parties would often repackage these loans with others and sell the payment rights to investors through the process of securitization - converting mortgages into mortgage-backed securities. In many cases, these payment rights are used to back investor firms' issued securities, and the eventual buyer of the mortgage (i.e., the people who provide the funding) are frequently several steps away from the initiation of the mortgage process. Investors could invest directly or indirectly (e.g.: through mutual funds) in MBS's, and this broad base of investors is in part responsible for the increasing securitization of home mortgages (Rosen, 2007).

It has been shown that with all else equal, mortgage pools concentrated in areas with higher than average realized rates of house price appreciation received AAA ratings (low risk) on a larger percentage of their residential mortgage-backed securitization deal's principal. This meant that the mortgage-purchasing banks' special investment vehicles could issue bonds at lower coupon rates and higher prices, thus funding the underlying loan collateral at a lower cost. Additionally, these banks desire for the cheapest loan portfolios possible drove up the demand for low credit quality loans (i.e., cheap loans with higher loan-to-value ratios) in areas with higher-than-average housing price growth and lowered lending standards. In short, the banks practiced a "rating arbitrage", seeking the cheapest possible loans that will maximize the potential credit rating of a deal. In a subprime MBS setting, the lowest costing portfolio of mortgage loans that would deliver AAA credit ratings could be loans of poor credit quality in areas with high rates of house

price appreciation (Nadauld & Sherlund, 2009). Therefore, this risk became hidden in the “plumbing” of financial markets and with the tightening yield spread between MBS and Treasury bonds, and those ratings overestimated the safety of those securities.

The TED spread (an acronym formed from T-Bill and Eurodollar futures contract - ED), measures the difference between the LIBOR rate (that is used with short-term, unsecured interbank lending) and the risk-free U.S. Treasury bill rate. The TED spread widened during the time of insecurity, because banks, now skeptical of each other’s liquidity, were charging higher rates for unsecured loans, and Treasury bond rates go down because of increased bank demand for high-rate collateral (Brunnermeier, 2009).

As money flowed into the U.S. due to Middle Eastern countries’ oil earnings and the desire of underdeveloped countries like China to diversify their assets as well as emerging economies’ yearning to insure themselves against future crises, U.S financial firms saw their profits rocket. These firms included big investment banks such as Goldman Sachs, Merrill Lynch – later acquired by Bank of America in 2008, and the Lehman Brothers (now obsolete), in addition to large universal banks such as Citibank. The size of the financial sector as a percentage of GDP increased from an average of 4% in the mid 1970’s to nearly 8% by 2007. These high returns were presumed to be due to the financial innovations incurred in the banking sector and made the large quantity of U.S. borrowing sustainable (Reinhart & Rogoff, 2009).

Modernization in the financial sector, notably securitization, permitted consumers in the U.S. to convert their previously illiquid housing assets into sources of cash, thus reducing their precautionary savings (Reinhart & Rogoff, 2009).

3.1.4 The Public

The combination of extended and strong expansions, short and shallow recessions, and low inflation since 1983 (otherwise known as the “Great Moderation” period, which was also characterized by the fast-paced development of emerging economies such as China, India, and Brazil) increased the proclivity for risk-taking all over the U.S. economy. Expectations of rates of return on investments were high following the high-tech stock bubble, and after the bursting in the first quarter of 2000, many households turned to housing as a safer substitute with potential to generate high rates of return. This optimistic speculation exacerbated the housing bubble (Saxton, 2008).

Because many new subprime mortgages enclosed new features, such as low initial interest rates or initial interest-only payment, planned to be reset to higher rates in a few years, many speculators began to get those mortgages as well, hoping to later “flip” the houses they bought for profit. Also, it was easy, in the case of financial trouble, to refinance by taking out new or second mortgages cheaply (Wright, 2010). Additionally, “cash-out” refinancing was common, with households increasing their leverage and reducing their home equity to lower levels. Cash-out refinancing involves home-equity extraction, a procedure in which homeowners exchange a fraction of the equity in the home into cash by retiring the loan on hand and taking out a new, bigger one (Khandani, Lo, & Merton, 2009).

To summarize, the housing boom was created and encouraged by the following factors: The excessive optimism about low risks and low inflation following the Great Moderation, the increase in world savings relative to real investment opportunities, and the worldwide low interest rates which facilitated international capital inflows. It was also exacerbated by the decrease in lending standards. Real housing prices increased by 18.8% from 2001 to 2007, and the percentage of households with zero or negative net worth increased from 17% in 2004 to 18.6% in 2007. Additionally, mean and median household income practically remained idle over the 2000's, whereas mortgage debt on principal residences increased from 9.4 to 11.4% of total assets from 2001 to 2007. Additionally, debt-to-income ratio doubled from 2002 to 2007, reaching 119% (Wolff, 2010).

3.2 The Bursting of the Housing Bubble and the Onset of the Crisis

The recession of 2007-2009 can be divided into two distinct phases. The first, milder phase was from August of 2007 to August of 2008, resulting from losses in the subprime market, while U.S. real GDP continued to rise into the second quarter of 2008. The second, much more intense phase began in mid-September 2008, with the Lehman Brothers filing for bankruptcy on September 15 and American International Group (AIG), a very large insurance firm, failed on September 16, accompanied by a run on Reserve Primary Fund money (Mishkin, 2010).

When the unsustainably high house prices peaked in 2006 and eventually started to decrease (see figure 1), many mortgage delinquencies and foreclosures began to occur. Because the benefits of holding onto a house had decreased due to the halt in the rising of house prices, so did incentives to make mortgage payments (such as by working longer hours, etc.). Speculators had found themselves “underwater”, which their mortgage value being greater than the underlying home value (Taylor, 2008). This drove the speculators to strategically default in some cases even where they could afford to make the payments (Bhutta, Dokko, & Hui, 2010). In addition, poor people faced more difficulties in maintaining mortgage payments with increasing gasoline and commodity prices, and people with adjustable-rate mortgages could not meet adjusted mortgage payments in the face of higher interest rates⁸. Easy financing had also disappeared because of housing no longer being worthy collateral. These issues were main contributors to the soaring in the rate of foreclosures and mortgage delinquencies (Wright, 2010) (Taylor, 2008). Over the period of the boom, although incomes in the U.S. had remained roughly stagnant (see table 3), households were able to increase their wealth and consumption by cash-out refinancing, and that was manifested in the growing, unsustainable U.S. account deficit (Verick, 2010). Income extraction from housing was estimated to have more than doubled from 2001 to 2005, with an excess of \$1.4 trillion extracted in 2005 (Goodman & Mance, 2011).

⁸ The Federal Reserve started raising interest rates in 2004 (from 1% to 2.16% in 2004, peaking at 5.26% in 2007) (Verick, 2010)

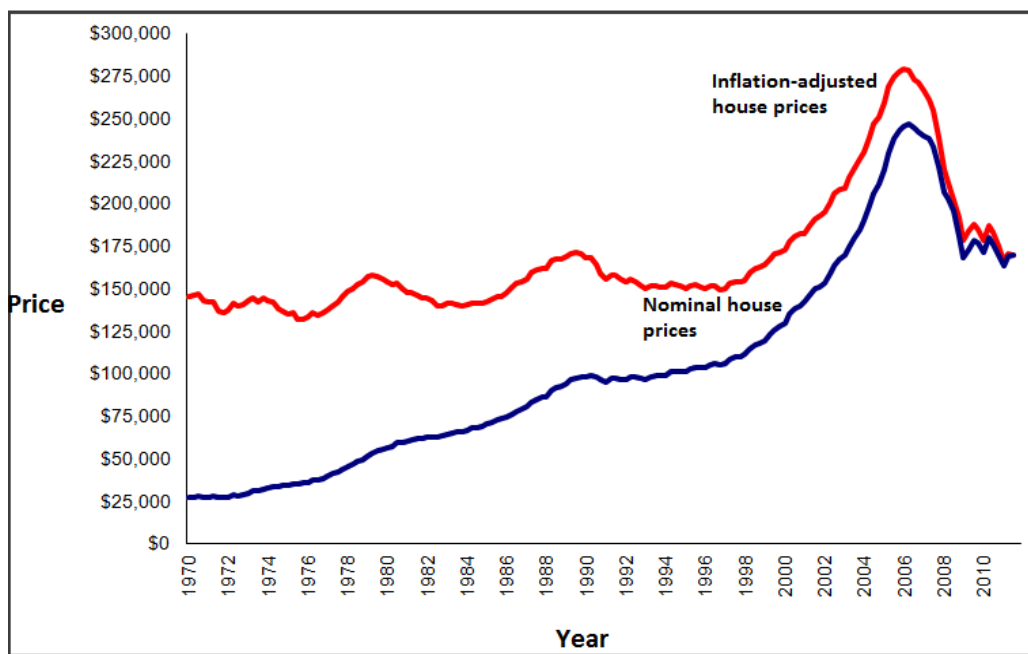
Table 3: U.S. Median Household Income 2000-2010

Year	Number of Households	Nominal Median Income	Inflation-Adjusted Median Income
2000	108,209,000	\$41,362	\$53,164
2001	109,297,000	\$41,656	\$52,005
2002	111,278,000	\$41,787	\$51,398
2003	112,000,000	\$42,726	\$51,353
2004	113,343,000	\$43,703	\$51,174
2005	114,384,000	\$45,686	\$51,739
2006	116,011,000	\$47,485	\$52,124
2007	116,783,000	\$49,495	\$52,823
2008	117,181,000	\$49,564	\$50,939
2009	117,538,000	\$49,081	\$50,599
2010	118,682,000	\$48,753	\$49,445

Source: DaveManuel.com (2012)

Delinquencies began to occur more frequently and increased considerably in 2007, mainly due to the “adjusting” of subprime mortgages after the initial, “teaser” rates. This led to the failure of the subprime mortgage market, which was a hard hit on hedge funds in 2007. Most importantly, because of the complex mechanisms behind CDO’s and credit default swaps, financial institutions did not know the magnitude of their risk exposure or losses. As a result, financial institutions began to accrue liquidity, bringing about complete inactivity in the asset-backed securities market and a severe credit crunch (Verick, 2010).

Figure 1: Real and Nominal House Prices 1970-2010



Source: J. Parson's Real Estate Charts (n.d.)

As mortgage-backed securities decreased in price, their future values were in doubt, and “haircut” levels rose to as high as 50 percent. This meant that the same amount of collateral could support less borrowing, and that banks needed to deleverage themselves by selling assets (Mishkin, 2010). Because capital was immediately demandable from the poor-performing off-balance-sheet vehicles, and they did not have any significant cash holdings, they were faced with no choice but to engage in “fire sales” of their assets (Coval & Stafford, 2007). The collateral (consisting largely of mortgage loans) kept decreasing in value, fueled by the persisting decline in asset prices, which raised future uncertainty and haircuts. There was a vicious cycle in place where financial institutions had to further deleverage by selling assets, etc. (Mishkin, 2010).

In early August 2007, many hedge funds suffered large losses, precipitating margin calls and fire sales. The LIBOR rate shot up on August 9, 2007 because of the resulting mistrust in banks in regard to defaults and liquidity risks. The Fed, in attempt to alleviate the liquidity crunch, injected \$24 billion in overnight credit into the interbank lending market and reduced the discount rate by half a percentage point to 5.75% on August 17, 2007. It broadened the categories of collateral that banks could post, and prolonged the lending scope to 30 days. However, there was a perceived “stigma” associated with banks borrowing from the discount window. When it became clear that the total loss in the mortgage markets was massively underestimated (at about \$200 billion), a large number of banks had to take additional write-downs. The LIBOR peaked in mid-December 2007, prompting the Fed to cut the federal funds rate by 0.25%. At that point, the Fed had realized that its measures to alleviate the liquidity crunch through the federal funds and discount rates were not reaching the banks caught in it. Consequently, the Term Auction Facility (TAF) was announced on December 12, 2007, which comprised of banks being able to anonymously take out 28 day loans from the Fed. The collateral set that banks were allowed to use was broad and included a variety of MBS’s (Brunnermeier, 2009).

Due to the turmoil in the housing and credit markets, Fannie Mae and Freddie Mac had lost a combined total of over \$5.46 billion in the first six months of 2008. Soon after, by mid-June 2008, following an ever increasing mortgage delinquency rate, the yield spread between “agency bonds” of the government-sponsored enterprises Fannie Mae and Freddie Mac and Treasury bonds had broadened. By the end of 2008, Fannie Mae stock had lost 72% of its value, while Freddie Mac stock had lost 77% of its value (SIGTARP, 2009). These two institutions held around \$1.5 trillion in mortgage loans and mortgage-

backed securities as of June 2008 (Brunnermeier, 2009). On July 11, IndyMac, a hefty private mortgage broker with \$32 billion in assets, failed and was put in conservatorship by the Federal Deposit Insurance Corporation (Kristof & Chang, 2009). Shortly afterward, stock prices of Fannie and Freddie began to fall, prompting Treasury Secretary Henry Paulson on to announce plans to make the government implicit guarantee of Fannie and Freddie securities explicit on July 13. Stock prices, however, continued to drop, ultimately giving government officials no choice but to put them under conservatorship as well on September 7, 2008, as part of The Housing and Economic Recovery Act of 2008, passed in July 2008. This brought about triggering large payments to those who had bought credit default swaps for these securities (Brunnermeier, 2009).

In September 2008, the investment bank Lehman Brothers was no longer able to borrow. It was also unable to sell its 'toxic' assets to fulfill its creditor obligations, and investors wanted to sell their stock. It was allowed by the Fed and the Treasury to file for bankruptcy on September 15, 2008, after being unsuccessful in finding a merger partner (Temin, 2010). This was the biggest bankruptcy filing in U.S. history, as Lehman was, by asset volume, the fourth largest investment bank. It had an excess of \$600 billion in assets and 25,000 employees. Lehman, unlike Bear Sterns (for which the government brokered and facilitated a merger deal with J.P. Morgan), was allowed to go into bankruptcy for the reason that Lehman was among the most highly leveraged of investment banks, and was making astonishing efforts to hide the magnitude of that fact. Not wishing to propagate moral hazard, the government thought that letting Lehman fail would serve as a lesson to other banks not to engage in excessive risk-taking (Mishkin, 2010). Shortly afterwards, AIG faced a "margin run", where numerous counterparties

demanded supplementary collateral from AIG for its CDS positions. AIG had written over \$400 billion dollars of credit default swaps, and with the failure of Lehman Brothers, it appeared more probable that the AIG may have to make immense payments under these contracts, and short-term financing to AIG became nonexistent. Therefore, these requests would have brought the firm down, had the Fed not infused extra funds in it. The Fed opted to bail out AIG because of its interconnectedness in the credit derivatives arena. This AIG bailout was very large and unexpected⁹.

In the weeks subsequent to the Lehman collapse, the TED spread underwent a tremendous rise, reflecting the deterioration of credit markets (Brunnermeier, 2009). In the direct aftermath of the Lehman bankruptcy, the market appeared to become more selective about bank specific characteristics (e.g.: performance and size) with quantities loaned to borrowers and the cost of funds. Large banks, especially those with a high amount of non-performing loans, were found to have reduced their sums of daily borrowing and the number of counterparties they borrowed from in the wake of the collapse. Opposite effects were observed on smaller banks (Afonso, Kovner, & Schoar, 2010).

The whole stock market plummeted, losing roughly \$8 trillion in the year following its high point in October 2007. This was followed by a credit tightening for firms and local and state governments, and it then became apparent that more actions needed to be taken (Brunnermeier, 2009).

⁹ Initially, the bailout was set at \$85 billion, with the Fed acquiring in exchange an 80% equity stake. It was further extended by \$37 billion in October 2008 and an additional \$40 billion in November 2008 (Brunnermeier, 2009).

Beginning August 2007, the Federal Reserve had freely relaxed monetary policy in the face of the financial crisis, decreasing the federal funds rate target from 5.25% in September 2007 to 0.25% in December 2008. Nevertheless, the cost of credit to households and businesses had by and large risen (Mishkin, 2009).

The doubling in oil prices between June 2007 and June 2008 due to global crude oil production far surpassing global demand had added additional strain on the economy, decreasing personal consumption expenditures, particularly those on durable goods such as automobiles and appliances, goods that tend to be greatly cyclical. Furthermore, as income and wealth both declined during the recession, consumer spending was reduced on discretionary goods and services such as travelling, electronics, and restaurant meals (Goodman & Mance , 2011). Consumption accounts for 70% of U.S. economic activity, so the dramatic decrease of it had a strong impact on employment and GDP during the crisis (Wind, 2009).

3.3 Unemployment

Unemployment skyrocketed during the Great Recession, from 4.5% in 2007 to 9.6% in 2009 to about 10 percent by 2010, even after the economic 'recovery' in 2009, after which it began to fall slowly. The peak unemployment rate was comparable to that of the severe recession in 1981, but the job loss rate in the more recent crisis was much higher than the norm (16% vs. 12.8% in the early 1980's recession). The costs of job losses in

the Great Recession have been unusually harsh, since people who lost their jobs have had far less success at finding others, especially full-time jobs, than the unemployed in the aftermath of earlier recessions (Farber, 2011). The slow fall in unemployment was largely attributed to the short-term extension of Emergency Unemployment Compensation (EUC) that implemented in June 2008. An unemployed person could be eligible for an added 53 weeks of EUC to the regular 26 weeks. Conventional economic theory, consistent with empirical research, advocates that this expansion of the expected extent of unemployment benefits decreased the speed of the fall in unemployment, due to the fact that beneficiaries could afford to be more selective of their job choices (Elsby, Hobijn, & Şahin, 2010).

Unemployment during the 2007–09 recession did not develop consistently. During the first 9 months, nonfarm employment declined by 1.2%. Moreover, during the first half of the 2007–09 recession, slightly over half of job losses took place in manufacturing and construction. When the economic downturn became stronger in September 2008 and the credit crunch started, job losses intensified across a large number of industries. Since its peak in April 2006, employment in construction fell by 28.8% by December 2010. The manufacturing industry, in spite of machinery and aerospace products and parts manufacturing gaining employment for the first nine months of the recession, saw a 14.6 decline in employment between December 2007 and June 2009. Motor vehicles and parts manufacturing saw a severe decline in employment of 35% during the recession. In the finance sector, job losses were initially concentrated in industries closely connected to housing. By September 2008, the whole sector was affected by the crisis, and employment declines continued after the official end of the recession. Education and

healthcare were not as affected by the recession due to the importance of their services, and saw employment growth during the recession, although it occurred at a slower rate than before the recession. Overall government employment increased during the recession. The 2007-2009 recession is the longest and deepest since World War II, and is the first recession on record to have caused the erasing of all job gains during the expansion preceding it, because of the steep employment losses and the fact that growth in employment was modest during the preceding expansion (6.3% from August 2003 to January 2008) (Goodman & Mance, 2011).

The last twenty years had experienced a large of technological change and an increase in offshoring. That led to a “polarization” of the U.S. labor market with significant growth in high-skill professions and in conventionally lower-wage jobs in the in-person service sector accompanied by an especially meager demand for conventional middle class jobs such as manufacturing production and middle management positions, even for those with college training. The housing market boom and bubble of 2002 to 2006 concealed some of these labor market trends in holding up demand for individuals without college educations in construction. This long-term labor market trend was reinforced by colossal declines in construction, manufacturing, and middle management employment. This leads to conclude that there is a need for powerful economic recuperation to augment job creation and employment, and to create a continual job growth. Additionally, policies need to tackle structural labor market issues to ameliorate the matching of job seekers to new job openings, to aid the long-term unemployed in adjusting to the labor market, and to address the long-term job quality issue (Katz, 2010).

In addition to rising unemployment, cuts in workers' hours also took place during the recession. Average weekly hours of all employees dropped by 1 hour to 33.7 hours from June 2007. Aggregate hours¹⁰ plummeted by 9.8% from June 2007 to October 2009, and remained 7.6% lower than their peak before the recession (Goodman & Mance, 2011).

The 2007-2009 financial crises created massive disparities across states in mismatches between skill demand and supply (more severe in states with depressed housing markets), as well as in housing market performance. For example, the states of Nevada, Florida, Arizona, and California were especially hit by the housing bubble, with over half of foreclosures at the national level having occurred in those states. The states of Ohio and Michigan particularly endured the fall in manufacturing, and New York and Delaware were particularly hit in the financial sector. However, these regional mismatches appear to be cyclical. Additionally, structural employment (the "natural" rate of unemployment) was found to have risen by approximately 1.75 percentage points from its approximate 5% precrisis level, caused by bad housing market conditions and skill and job mismatches (Estevão & Tsounta, 2011).

Naturally, this rising unemployment prompted intense disputes and some actions regarding policies to incite job creation. The following two types of policies are likely to have most simple and direct impact on job creation: "Hiring credits", which are subsidies to employers to hire employees, increasing the demand for the resulting cheaper labor, and "worker subsidies", which are subsidies to people to go into the labor market,

¹⁰ The product of employment and average weekly hours

increasing labor supply. An example of an “indirect” policy is the recent recently implemented Hiring Incentives to Restore Employment Act (HIRE) on March 18, 2010, a \$17.5 billion legislation, of which one of the components included paying out a credit comprising of a release from the employer’s share of Social Security taxes outstanding for the March-December 2010 period, in addition to a \$1,000 tax credit per worker. This policy’s objective is to assist those who have been unemployed or who are entering the workforce. It does not explicitly aim for job creation by, for example, gratifying employment only in expanding firms (Neumark, 2011). Another component of the HIRE act, allowed small businesses to write off \$250,000 worth of investment equipment from the previous \$125,000 limit, with this tax incentive intended to increase employment and promote small business growth (hireact.org).

New claims for unemployment insurance averaged 577,000 a week between October 2008 and October 2009, rising from its previous average of 322,000 between 2005 and 2007. The American Recovery and Reinvestment Act (ARRA), signed into law by President Obama on February 17, 2009, gave chief attention to occupational skill training for workers. It also increased unemployment insurance benefits by \$25 per week through June 30, 2010, as well as extended federally funded unemployment insurance benefits from 26 to 33 weeks.

A summary of federal spending on different training programs is presented in Table 4 below.

Table 4: Federal Spending on Training and Employment Programs 2008-2010

	2008	2009	Recovery Act	2010 Request
Adult Employment And Training Activities	849,101	861,540	500,000	861,540
Dislocated Workers Employment and Training Activities	1,323,373	1,341,891	1,450,000	1,413,000
Youth Activities	924,069	924,069	1,200,000	924,069
Green Jobs Innovation Fund	0	0	0	50,000
Workforce Data Quality Initiative	0	0	0	15,000
Reintegration of Ex-Offenders	73,493	108,493	0	115,000
Career Pathways Innovation Fund	122,816	125,000	0	135,000
Pilots, Demonstrations Research	48,508	48,781	0	57,500
Evaluations	4,835	6,918	0	11,600
Women In Apprenticeship	983	1,000	0	1,000
Denali Commission	6,755	3,378	0	0
Indian and Native American Programs	52,758	52,758	0	52,758
Migrant and Seasonal Farmworkers	79,668	82,620	0	82,620
Youthbuild	58,952	70,000	50,000	114,476
Job Training for Employment in High Growth Industries	0	0	750,000	0
Total Budget Authority	3,545,311	3,626,448	3,950,000	3,833,563

Source: Department of Labor (2010)

3.4 The Troubled Asset Relief Program (TARP)

In addition to combating the rising unemployment, actions needed to be taken against the failure of financial institutions. The Troubled Asset Relief Program (TARP) was proposed by the then U.S. Treasury Secretary, Henry Paulson on September 19, 2008, after the initial steps taken to address the financial crisis had proven insufficient (Mishkin, 2010). The U.S. Congress rapidly passed the Emergency Economic Stabilization Act in October 3, 2008, following the Lehman collapse, which allowed the

Treasury Department to establish the Troubled Asset Relief Program (TARP), with initial appropriated funds of \$700 billion to bail out the financial system, involving the purchase, management, and sale of a maximum of \$700 billion of “toxic” assets, predominantly distressed mortgages and MBS’s. The Act’s goal was to restore liquidity and economic stability. TARP eventually expanded into thirteen sub-programs listed below:

- Capital Purchase Program (CPP)
- Capital Assistance Programs (CAP) (inactive)
- Targeted Investment Program (TIP)
- Asset Guarantee Program (AGP)
- Community Development Capital Initiative (CDCI)
- Term Asset-Backed Securities Loan Facility (TALF)
- Consumer and Business Lending Initiative (CBLI)
- Public-Private Investment Program (PPIP)
- Small Business and Community Lending Initiative (SBACLI)
- Automotive Industry Financing Program (AIFP)
- Automotive Supplier Support Program (ASSP)
- Making Home Affordable (MHA)
- Hardest Hit Fund (HHF) (The Political Guide, 2011)

The TARP was initially created to procure toxic assets directly from banks. However, accurately valuing these assets proved to be problematic because of unending home mortgage foreclosures, defaults, and declining house prices. At a meeting on October 13

with then-Treasury Secretary Henry Paulson, other senior Government leaders, and nine large and systemically vital institutions¹¹, selected for their apparent significance to the whole financial system. These institutions agreed to accept \$125 billion in TARP capital funding (SIGTARP, 2011c).

3.4.1 The Capital Purchase Program (CPP)

The financial mayhem deepened in the weeks subsequent to the Emergency Economic Stabilization Act bill's passage. The Capital Purchase Program (CPP), which became the center of focus of the TARP, was founded by the Treasury on October 14, 2008. The CPP was instituted with the aim of solidifying the capital base of financially sound banks and increasing these banks' ability to lend to businesses and consumers (in other words, to promote bank lending) through the purchase of non-voting senior preferred shares¹². Eligible institutions included bank holding companies, financial holding companies, insured depository institutions, and loan holding companies that are instituted and working in the United States, and are not controlled by a foreign bank or company. The generous terms of the CPP attracted thousands of applicants (the exact number is undisclosed) of which only 707 were given funds. Banks' financial conditions were

¹¹ Bank of America, BNY Mellon, Citigroup, Goldman Sachs, JPMorgan, Merrill Lynch- before its acquisition by Bank of American in January 2009, Morgan Stanley, State Street, and Wells Fargo. These institutions held over \$11 trillion in assets as of June 30, 2008, nearly 75% of all assets held by U.S.-owned banks. (SIGTARP, 2011c).

¹² Dividend payments of 5% were to be made to the treasury for the first 5 years, with 9% payments afterwards (S-corporations, on the other hand, had to pay out 7.7% dividends to the Treasury for the first 5 years and 13.8% afterwards). These shares, purchased on standardized terms, included ten-year warrants for future treasury acquisition of common stock. Qualified institutions could apply for funds amounting to a maximum of 3% of their risk-weighted assets (Li, 2011).

measured by federal banking regulators using the CAMELS rating, acronym for Capital Adequacy, Asset Quality, Management, Earnings, Liquidity, and Sensitivity to market risk. Instigated in October 2008 and shut down in December 2009, the CPP invested a total of \$204.9 billion in government funds, including the \$125 million initially invested in the large nine financial institutions (Li, 2011) (U.S. Department of Treasury, 2011a).

Taliaferro (2009) found that CPP recipients were more likely institutions with falling capital ratios. Lending increases were also found to depend on whether or not banks are undercapitalized, and CPP funding was found to have modestly raised bank lending, with the better part of it being allocated to Tier 1 core capital (Taliaferro, 2009). Li (2011) found that CPP funded institutions used around one third of their CPP capital to support new loans, and the rest to increase holdings of Tier 1 capital. Interestingly, Li (2011) found that, consistent with the findings of Duchin and Sosyura (2011) that banks having connections with the Fed or having their local representative on the Subcommittee of Financial Institutions were much more likely to receive CPP funds. Duchin and Sosyura (2011) further revealed that political connections were not a significant factor in the application process for CPP funds, although they were important in the application acceptance process¹³. Evidence was also uncovered that investments in politically connected firms yield lesser returns (Duchin & Sosyura, 2011).

Banks and other financial institutions also received TARP funds through programs other than the CPP, such as the Asset Guarantee Program (AGP), of which the recipients

¹³ Political connections to both legislators and to agencies tasked with TARP implementation—such as the Treasury and banking regulators, with firms having taken into service a director who had worked at the Treasury or was a banking regulator were 9.3 percentage points more apt to be recipients of government funds, for example (Li, 2011)

included Bank of America and Citigroup, the Targeted Investment Program (TIP), of which the only recipients were Citigroup and Bank of America (SIGTARP, 2011a)¹⁴.

TARP's new investment power was terminated on October 3, 2010. Consequently, after that date, the Treasury could no longer make new purchases or guarantees of troubled assets. However, the Treasury is still able to expand TARP funds if it intends to use the additional funds for pursuing obligations it had already taken on before October 3, 2010. SIGTARP is to stay “on watch” as long as TARP assets remain outstanding (SIGTARP, 2011b).

Despite the valiant efforts made by the Government to boost the capital adequacy of financial institutions, by early 2009, the market still lacked faith in some of the nation’s largest financial institutions, which was detrimental the ability of the whole financial system to lend.

3.4.2 The Financial Stability Plan

The American Recovery and Reinvestment Act of 2009 (ARRA, or Financial Stability Plan) was signed into law by President Obama on February 17, 2009.

Under the Financial Stability Plan, of which the main goals, in addition to providing occupational skill training for displaced workers, were to steady the system and reinstate trust in American markets, to rejuvenate lending and enhance the much-needed credit

¹⁴ A complete list of TARP funds recipients along with purchase details can be found in the Treasury September 2011 monthly report (U.S. Department of Treasury, 2011).

flow to consumers and businesses, and to get financial markets working again (CNBC, 2009), the Capital Assistance Program (CAP) was announced. Its goal was to guarantee that banking institutions were suitably capitalized with high-equity capital, to provide a cushion against unpredictable future losses, and to make sure that these institutions can support economic recovery. Beginning February 25, 2009, the top 19 major U.S. banking institutions' capital needs were "stress tested" under the Supervisory Capital Assessment Program (SCAP)¹⁵. The test estimated future losses, revenues, and needed reserves, under two macroeconomic scenarios— one representing a baseline estimate and another that represented a more harsh recession than the baseline projections (SIGTARP, 2011c). If the tests reveal that additional capital is indeed needed, these institutions with capital shortfalls would be required to raise common equity, with the prospect to first turn to private sources of capital. If not, the needed "temporary capital buffer" could be obtainable from the government in the form of compulsory convertible preferred shares (WSJ Staff, 2009a). The CAP shut down on November 9, 2009, with no funds having been invested (U.S. Department of Treasury, 2011b).

¹⁵ The nineteen banks to be stress tested were: J.P. Morgan Chase & Co., Citigroup Inc., Bank of America Corp., Wells Fargo & Co., Goldman Sachs Group, Morgan Stanley, MetLife, PNC Financial Services Group, US Bancorp, Bank of NY Mellon Corp., SunTrust Banks Inc., State Street Corp., Capital One Financial Corp., BB&T Corp., Regions Financial Corp., American Express Co., Fifth Third Bancorp, KeyCorp, and GMAC LLC (WSJ Staff, 2009b). On November 9, 2009, the Fed announced that 18 of the 19 banks (the exception being GMAC) that partook the SCAP tests were revealed to have no further capital need or to have satisfied their requirements in the private market. GMAC (now Ally Financial) ended up using the TARP Automotive Industry Financing Program to satisfy its capital needs, and MetLife did not participate in TARP altogether. The other 17 SCAP institutions were part of the CPP, absorbing roughly 80% of all CPP funds (\$163.5 billion) (U.S. Department of Treasury, 2011b).

Chapter 4 Empirical Study

This empirical analysis exclusively aims at examining whether the receipt of TARP funds by banks affected unemployment at a county level. There are many limitations involved in this analysis, namely the issue of endogeneity, as well as the matter of unavailable influential variables, both discussed in greater detail in the subsequent subsections.

4.1 Data

The dataset used for this study is retrieved from SNL financial, and contains a combination of data from both SNL and the U.S. Census Bureau. Data is available from the first quarter of 2004 to the first quarter of 2010. Unemployment before and after the implementation of TARP will be examined, to test for possible changes brought about by the implementation of TARP. The data is quarterly, county-level panel data, available for all counties with the exception of those in the states of Connecticut, Kansas, Massachusetts, New Hampshire, and North Carolina and the District of Columbia. Additionally, data for the states of Oklahoma, Louisiana, and Florida as well as for the county of Skagway in Alaska is not available for the first quarter of 2010.

The dataset contains data on of 2,879 counties, with a total of 37,218 observations. The number of counties available for each state in the dataset can be seen in table 5.

Table 5: Number of Counties, Counties That Received TARP Funds, and those that Did Not by State

States Included in Study	Number of Counties (and Equivalent Entities) Used in Study	Number of Counties that did not Receive TARP Funds	Number of Counties that Received TARP Funds	Percentage of Counties that Received TARP Funds
Alabama	67	13	54	80.60
Alaska	22	2	20	90.91
Arizona	15	0	15	100.00
Arkansas	75	21	54	72.00
California	57	1	56	98.25
Colorado	63	22	41	65.08
Delaware	3	0	3	100.00
Florida	67	4	63	94.03
Georgia	158	37	121	76.58
Hawaii	4	0	4	100.00
Idaho	42	0	42	100.00
Illinois	102	16	86	84.31
Indiana	92	4	88	95.65
Iowa	99	39	60	60.61
Kentucky	120	36	84	70.00
Louisiana	64	15	49	76.56
Maine	16	0	16	100.00
Maryland	24	0	24	100.00
Michigan	83	5	78	93.98
Minnesota	87	29	58	66.67
Mississippi	82	10	72	87.80
Missouri	115	20	95	82.61
Montana	55	23	32	58.18
Nabraska	93	51	42	45.16
Nevada	16	0	16	100.00
New Jersey	21	0	21	100.00
New Mexico	33	8	25	75.76
New York	62	6	56	90.32

States Included in Study	Number of Counties (and Equivalent Entities) Used in Study	Number of Counties that did not Receive TARP Funds	Number of Counties that Received TARP Funds	Percentage of Counties that Received TARP Funds
North Dakota	51	24	27	52.94
Ohio	88	0	88	100.00
Oklahoma	77	45	32	41.56
Oregon	36	3	33	91.67
Pennsylvania	67	4	63	94.03
Rhode Island	5	0	5	100.00
South Carolina	46	3	43	93.48
South Dakota	63	33	30	47.62
Tennessee	95	16	79	83.16
Texas	250	104	146	58.40
Utah	28	3	25	89.29
Vermont	14	6	8	57.14
Virginia	134	6	128	95.52
Washington	39	1	38	97.44
West Virginia	55	12	43	78.18
Wisconsin	71	6	65	91.55
Wyoming	23	8	15	65.22
Total	2879	636	2243	82.27

For the 2879 counties studied, 2243 were found to have banks that received TARP funds, and the remaining 636 counties did not have banks that received TARP funds.

The variables used in this study comprise of the following: The unemployment rate, denoted by U; end-of quarter employees monthly average earnings. The percent of county branches in banks that have received TARP funding, denoted by PBTARP; and the percent of county branch deposits in banks that have received TARP funding, denoted

by TARPDEP. The last variable has several missing values for the time period after the fourth quarter of 2008.

4.2 Methodology

The simplest test for whether the receipt of TARP funds by banks affected unemployment in the areas in which they were received is to estimate the following two fourth-order autoregressive models:

$$(1) \quad u_t^i = \alpha_0 + \alpha_1 u_{t-1}^i + \alpha_2 u_{t-2}^i + \alpha_3 u_{t-3}^i + \alpha_4 u_{t-4}^i + \beta_1 \text{PBTARP}_t^i + \beta_2 D_i^{\text{TARP}} + \text{EARN}_t^i + \varepsilon_t$$

$$(2) \quad u_t^i = \theta_0 + \theta_1 u_{t-1}^i + \theta_2 u_{t-2}^i + \theta_3 u_{t-3}^i + \theta_4 u_{t-4}^i + \gamma_1 \text{TARPDEP}_t^i + \gamma_2 D_i^{\text{TARP}} + \text{EARN}_t^i + \rho_t$$

$$(3) \quad u_t^i = \delta_0 + \delta_1 u_{t-1}^i + \delta_2 u_{t-2}^i + \delta_3 u_{t-3}^i + \delta_4 u_{t-4}^i + \beta_1 \text{PBTARP}_t^i + \partial_1 \text{TARPDEP}_t^i + \partial_3 D_i^{\text{TARP}} + \text{EARN}_t^i + \epsilon_t$$

with u_t^i representing unemployment, lagged over four quarters, and PBTARP_t^i and TARPDEP_t^i representing, by county, the percent of county branches in TARP banks and the percent of branch deposits in TARP banks, respectively. To deal with time varying

effects associated with TARP, the variable D_i^{TARP} , representing a time dummy variable with a value of zero for the period before the execution of TARP (2007q1 to 2008q3) and with a value of one for the period after (2008q4 to 2010q1)¹⁶, is included. Additionally, economic theory states that wages affect the demand and supply of labor, so the variable end-of quarter employees average monthly earnings is included, and is denoted by EARN.

A main challenge to the empirical analysis in this section is the likely presence of endogeneity, which should be corrected for by using exogenous instrumental variables. However, since this analysis is intended to be preliminary, the endogeneity issue will be ignored. Additionally, data for variables that are likely to affect unemployment, such as county-level GDP, are not available. County-specific demographic characteristics, which have been documented to influence unemployment (for example, Engemann (2010)) are either unavailable (such as ethnicities and age groups), or scarce (such as education data, only available for 2010q1). Also, quarterly, county-level data on unemployment benefits, such as dollar amounts of benefits, dollar amounts of extended benefits and duration of benefits, which likely affect unemployment, are not available for this study.

Furthermore, the types of sectors available in counties will affect unemployment within those entities since some sectors, such as the real estate sector, were hit harder by the recession than others. The model will attempt to deal with this problem by using fixed and random effects estimation. Two asymptotically equivalent tests to the Hausman test

¹⁶ Since TARP was implemented in the beginning of the fourth quarter of 2008 (beginning October), this seems reasonable.

(the Hausman test having produced a non-positive-definite differenced covariance matrix), reveal that fixed effects estimation, which captures time invariant, county-specific effects, is more appropriate than random effects in this study. The first asymptotically equivalent test bases the covariance matrices on the estimated disturbance variance from the efficient estimator. The second one bases the covariance matrix on the estimated disturbance variance from the consistent estimator.

Heteroskedasticity in idiosyncratic residuals was revealed in the fixed effects model after performing a modified Wald test, which tests the hypothesis that the residual correlation matrix, calculated over common observations to all cross-sectional units, is an identity matrix, the order of which is the number of cross-sectional units. This modified Wald test is feasible when the assumption of normality of residuals is violated and when panel data is unbalanced (the latter of which is the case for the data used in this study) (Baum, 2001). First-order autocorrelation was also found in idiosyncratic errors after using the Wooldridge test¹⁷ that uses heteroskedasticity-robust standard errors (Drukker, 2003).

Tests for cross-sectional autocorrelation (the Pesaran, Friedman, and Frees tests, as well as the Breush-Pagan LM test) could not be performed due to the highly unbalanced nature of the panel data used in this study, due to the fact that TARP data is obviously not available before the implementation of the program in the fourth quarter of 2008, and

¹⁷ The test uses residuals from a regression in first-differences (thus removing individual-level effects). Wooldridge states that if these residuals (ϵ) are not serially correlated, then $\text{Corr}(\Delta\epsilon_{it} - \Delta\epsilon_{it-1}) = -0.5$, where Δ is the first-difference operator. The Wooldridge test regresses the residuals obtained from the first-difference regression on their lags and tests if the coefficient on the lags is equal to -0.5 (Drukker, 2003).

also to the fact that the variable TARPDEP has several missing values for the period following 2008q4.

Some, such as de Hoyos (2006), argue that panel data models are likely to contain significant cross-sectional dependence in the errors, possibly due to the ever-increasing financial integration of financial entities, which would bring about interdependencies between cross-sectional units.

To account for the revealed serial correlation, heteroskedasticity, and for possible cross-sectional correlation between counties, a model with Driscoll-Kraay standard errors¹⁸ (i.e. with robust errors and consistent parameters in the presence of cross-county correlations, as well as temporal dependence) are estimated (Hoechle, 2007).

Unfortunately, this model (fixed effects with Driscoll Kraay robust errors) does not account for possible endogeneity of explanatory variables. A two-step difference Arellano-Bond estimation¹⁹ is attempted. However, the Sargan test revealed that the chosen instruments were not exogenous. Therefore, endogeneity in explanatory variables cannot be corrected for.

The results of the above pair of regressions are presented in Table 6 below.

¹⁸ Basically, the Driscoll Kraay methodology applies a Newey-West style adjustment to the cross-sectional averages of moment conditions sequence, therefore ensuring that the covariance matrix estimator is consistent independently of cross-sectional correlation (Hoechle, 2007).

¹⁹ A general method of moments (GMM) estimation, using "GMM style" instruments - in brief, two lags of the differences of endogenous variables were used as instruments in levels. The Arellano-Bond estimation begins by transforming all regressors, typically by differencing to eliminate individual effects, and then uses the general method of moments to estimate the transformed equation. The error terms in this step are assumed to be independent and homoskedastic across units and time. In the second step, the residuals obtained in the previous step are used to compute a consistent estimate of the variance-covariance matrix, therefore relaxing the previous assumptions.

Table 6: Results of Autoregressive Models: Equations (1), (2), and (3)

VARIABLES	(1)	(2)	(3)
Constant	0 (0)	2.266*** (0.511)	0 (0)
(t-1)Unemployment	0.209* (0.0766)	0.418*** (0.0269)	0.209** (0.0652)
(t-2)Unemployment	-0.271*** (0.0160)	-0.297*** (0.0646)	-0.297*** (0.0221)
(t-3)Unemployment	-0.0347 (0.0245)	0.0691 (0.0472)	-0.00817 (0.0384)
(t-4)Unemployment	0.576*** (0.0572)	0.542*** (0.0524)	0.555*** (0.0688)
EARN	-1.01e-05** (2.33e-06)	-9.90e-06* (4.97e-06)	-2.10e-05** (3.68e-06)
PBTARP	-1.087*** (0.167)	-	-1.357** (0.270)
TARPDEP	-	0.129 (0.0706)	0.138* (0.0558)
Time Dummy	6.904*** (0.558)	2.214*** (0.136)	7.380*** (0.415)
Observations	11,183	9,173	5,117
Within R-squared	0.4994	0.7903	0.5125

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results reveal that for equations (1), (2), and (3), the first and fourth lags in unemployment have a significant, positive relationship with the unemployment variable, whereas the second lag's relationship with unemployment is negative and significant. The third lag has a negative, insignificant relationship with unemployment in equations (1) and (3), and a positive insignificant relationship with U in equation (3). As for the fourth lag, a positive significant relationship with U is seen in all three equations. Additionally, in all three equations, the time dummy variable has a positive and significant effect on the dependant variable.

The results for equation (1), the percent of county branches in banks that have received TARP funding is found to have significantly and negatively affected the unemployment rate pattern at a 95% confidence level, whereas the results for equation (2) reveal the percent of county deposits in banks having received TARP funds seemed to have an insignificant positive effect on the unemployment rate. The results for equation (3) show that the percentage of county branches in banks that have obtained TARP funds significantly and negatively affected unemployment at a 95% confidence level. Additionally, the percent of county deposits in banks having obtained TARP funding significantly (at a 90% confidence level), and positively affected unemployment.

The study will additionally test for whether the carrying out of TARP brought about a structural break in unemployment, by running the following fourth-order autoregressive model twice , once for the period before TARP (2007q1 to 2008q3) and one for the period after TARP (2008q4 to 2010q1), also with fixed effects and Driscoll Kraay robust errors.

$$(4) \quad u_t^i = \alpha_0 + \alpha_1 u_{t-1}^i + \alpha_2 u_{t-2}^i + \alpha_3 u_{t-3}^i + \alpha_4 u_{t-4}^i + \text{EARN}_t^i + \varepsilon_t^i$$

when quarter < 2008q4

$$(5) \quad u_t^i = \theta_0 + \theta_1 u_{t-1}^i + \theta_2 u_{t-2}^i + \theta_3 u_{t-3}^i + \theta_4 u_{t-4}^i + \text{EARN}_t^i + \sigma_t^i$$

when quarter >= 2008q4

The Chow test for structural change is then used to test for a significant difference in estimated coefficients between the two above regressions. The results are summarized in Table 7 below.

Table 7: Results of the Chow Test: Equations (4) and (5)

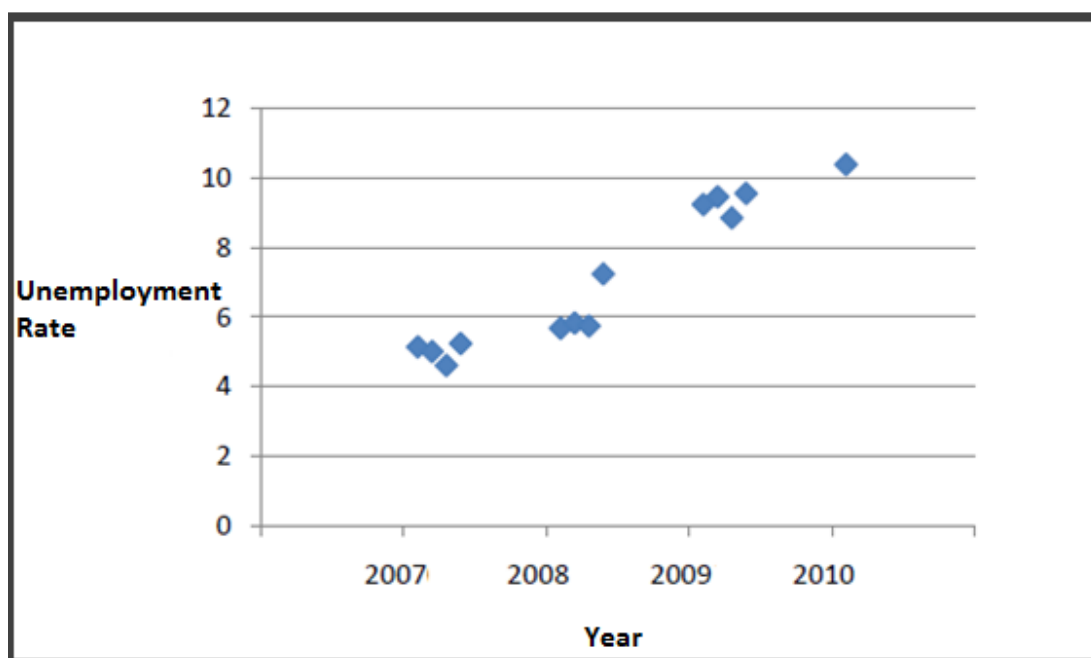
VARIABLES	(4)	(5)
	Pre- TARP	Post-TARP
	Unemployment	
Constant	0.00904 (0.00711)	0.187 (0.171)
(t-1) Unemployment	0.501** (0.142)	0.780*** (0.116)
(t-2) Unemployment	-0.0762* (0.0392)	-0.438** (0.133)
(t-3) Unemployment	0.117 (0.0711)	0.203* (0.100)
(t-4) Unemployment	0.560*** (0.148)	0.714*** (0.106)
EARN	3.85e-07*** (5.89e-08)	7.30e-07* (3.41e-07)
Observations	19,945	19,945
Within R-squared	0.9799	0.9597
Chow Test	F (7.7) = 827.61 Prob > F = 0.0000	

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

The Chow test F-statistic is significant, equaling 827.61, with 7 and 7 degrees of freedom. This means that there is a structural break in the series in the fourth quarter of

2008, when TARP was implemented, implying that the implementation of TARP caused a change in unemployment.

Figure 2: Average Quarterly Unemployment 2007-2010



4.3 Results

Estimating equations (1), (2), and (3) with fixed effects and Driscoll Kraay robust standard errors revealed a significant negative relationship between the percent of county branches in TARP banks and unemployment. The percent of branch deposits in TARP banks was found to be insignificant in equation (2), but significant at a 90% confidence

level and with a positive effect on unemployment in equation (3). The likely culprit behind unexpected result is the probable presence of endogeneity in the model, which likely arises from an omitted variable problem. As discussed in section 3, banks that were deemed too-big-to-fail received the lion's share of CPP funds. A reasonable implication would be that counties holding more branches of those big banks received more TARP funds and experienced less of a credit crunch than others, meaning that they likely suffered less from unemployment after the program took place. Additionally, CPP funds were given exclusively to financially sound banks, of which the percentage to the total number of banks is likely to vary greatly from one county to another.

The Chow test, used to test for equality of coefficients between equations (4) and (5) (run with fixed effects and Driscoll-Kraay standard errors) detected a structural break in unemployment after the implementation of TARP.

Therefore, the estimation of both models revealed that the receipt of TARP funds did indeed alleviate the rise in unemployment in the counties in which they were acquired. Additionally, it was revealed that the higher the percentage of county banks that received TARP funds, the more the unemployment problem was improved in those counties.

Chapter 5 Conclusion

The goal of this thesis was to investigate the effect of TARP on the unemployment rate by county. The results suggest that the receipt of TARP funds by banks (i.e. CPP funds) did in fact help mitigate the rising in unemployment rates before unemployment-specific initiatives were undertaken, such as the HIRE act and the Small Business Jobs Act (enacted in March and September 2010, respectively).

Extreme caution must be exercised while interpreting the above estimation results. Data availability constraints did not allow for the inclusion of local economy variables likely to affect unemployment, such as county-level GDP . Additionally, it is possible that fixed effects (which assumes time -invariant characteristics for each county) do not accurately capture county-specific effects. For example, demographics may be time-variant due to factors such as inter-county migration. An additional problem is that of likely endogeneity of the explanatory variables in the model, which tends to bias estimates in an unknown direction.

At the same time, TARP banks were generally found to have used the better part of their TARP funding to strengthen their capital base, with the rest having been employed to support new loans (Li, 2011). The next logical step to this study for future research would be to isolate the effects of the increased capital base of TARP banks and the increased amount of new loans issued by TARP banks (by loan type) on unemployment.

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