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Due: Dec 8th, 2024

An Empirical Analysis of the 2008 Financial Crisis and Its Aftermath: Mortgage Defaults, Federal Interventions, and Regional Impacts in California and Florida

I. Introduction

The early 2000's witnessed an unprecedented rise in housing prices by 11 percent from 2000 to 2005, fueled largely by the rapid expansion of mortgage credit and the securitization of mortgage-backed securities (MBS) which fundamentally altered the traditional landscape of home lending. MBS Issuances from private financial institutions rose to $1.5 trillion in 2006 from $200 billion in 2000. As mortgage lenders increasingly bundled home loans into securities and sold them to investors, the availability of credit expanded, making homeownership accessible to millions of Americans as subprime mortgage originations rose from $150 billion in 2000 to $600 billion in 2006. However, in this process risky lending practices while primarily targeting subprime borrowers, combined with the growing complexity of MBS products set the stage for a collapse when home prices began to stagnate in 2006 leading to widespread mortgage defaults and cascading into a financial crisis by 2007.

Specifically, it evaluates the impact of the Troubled Asset Relief Program (TARP), authorized by the Emergency Economic Stabilization Act of 2008, which initially allocated $700 billion to purchase toxic assets and provide capital injections to financial institutions. Of the total authorized funds, approximately $475 billion was ultimately disbursed, with $245 billion directed specifically to the banking sector to stabilize major financial institutions. The program included critical interventions such as capital investments in banks like Citigroup ($45 billion), Bank of America ($45 billion), and JPMorgan Chase ($25 billion), which were deemed "too big to fail" and the $85 billion bailout of AIG which was heavily involved in insuring MBS's. Additionally, the research examines the Federal Reserve's monetary policy, including dramatic interest rate cuts from 5.25% in mid-2007 to near-zero levels by December 2008, and multiple rounds of quantitative easing designed to inject liquidity into the financial system. The analysis also includes a geographic focus on California on Florida as the two states were severely affected by the crisis. By examining trends in mortgage debt 90+ days late and delinquency rates of single-family mortgages. By

studying these regional patterns, this paper aims to assess the effectiveness of these interventions in areas most impacted by the subprime mortgage crash.

The motivation for this research is to understand how the 2008 financial crisis happened and why it matters. Between 2000 and 2006, home prices rose by 11%, while subprime mortgage lending exploded from $150 billion to $600 billion. By 2008, the crisis had caused massive economic damage: over 6 million Americans lost their homes to foreclosure, unemployment peaked at 10% in 2009, and the S&P500 dropped by 54% from 2007 to 2009. Despite these dramatic impacts, many questions remain unanswered about how a housing market problem could trigger such a widespread economic collapse. This study focuses on California and Florida that were two states that lost over 40% of their home values from 2006 to 2009 to examine how risky mortgage lending and government interventions like TARP (which injected $245 billion into banks) attempted to stop the economic bleeding. By analyzing mortgage defaults (UPB rate) in California and Florida, interest rates, and delinquency rates of single-family homes, the research aims to identify the key drivers behind mortgage delinquencies during the financial crisis. Specifically, a regression analysis was conducted with single-family delinquency rates as the dependent variable and the combined debt of mortgages that were 90+ days delinquent, along with interest rates, as independent variables from 2003 to 2013. Understanding these mechanisms is crucial because the 2008 crisis didn't just affect homeowners; it cost the U.S. economy an estimated $5 trillion and triggered a global economic recession that took nearly a decade to fully recover from. The findings from this analysis provide insight into the relationships between delinquency rates and mortgage debt, offering valuable lessons for preventing similar crises in the future.

II. Background

The Troubled Asset Relief Program (TARP) and lowering interest rates, enacted in Oct. 2008, aimed to stabilize the financial system during the 2007-2008 crisis by purchasing toxic assets and injecting capital into banks. Preceding TARP, rising mortgage defaults and the collapse of Lehman Brothers strained financial markets. Initially authorized with $700 billion under the Emergency Economic Stabilization Act, TARP eventually disbursed approximately $475 billion, with $245 billion directed to the banking sector to stabilize major financial institutions deemed "too big to fail." Among the recipients were large banks like Citigroup, Bank of America, and JPMorgan Chase, each receiving billions of dollars in capital injections. The program also included the $85 billion bailout of the American International Group (AIG), which had become heavily exposed to mortgage-backed securities (MBS). In

addition to direct capital injections, TARP facilitated the purchase of troubled assets and provided funding for foreclosure prevention programs aimed at assisting homeowners facing financial distress.

In the years leading up to the crisis, the U.S. housing market experienced an unsustainable boom, driven by a rapid expansion of mortgage credit. Subprime mortgages, which were loans offered to borrowers with poor credit histories, grew from $150 billion in 2000 to $600 billion by 2006. Mortgage lenders increasingly securitized home loans, packaging them into MBS and selling them to investors. This process, combined with lax lending standards and a housing bubble, led to rising mortgage defaults, especially as home prices began to stagnate in 2006. By the time the housing market collapsed in 2007, mortgage delinquencies and defaults had already surged, with over 6 million homes eventually lost to foreclosure.

III. Literature Review

Mayer, C., Pence, K., & Sherlund, S. M. (2009) explore the early signs of trouble in the mortgage market in 2005, emphasizing the role of subprime credit and speculative borrowing in the rise of mortgage defaults. They find that the surge in defaults was primarily driven by the rapid increase in subprime mortgages and risky mortgage features such as adjustable-rate loans and interest-only payments, particularly in Alt-A mortgages. These products attracted borrowers with lower credit quality, contributing to the housing bubble and its eventual collapse. Their findings are key to understanding the subprime boom in the early 2000s, as they highlight the destabilizing effect of these non-traditional lending practices. This research informs my analysis of how the rise in subprime lending during the housing boom contributed to mortgage defaults, especially in states like California and Florida.

Mian, A., & Sufi, A. (2008) examine the relationship between housing price changes and consumer borrowing, specifically focusing on the dramatic rise in house prices and its impact on mortgage default rates. They find a positive correlation between rising home prices and increased borrowing, which was primarily fueled by the availability of easy credit and rising home equity. However, when home prices stagnated and began to decline, many homeowners, especially those with subprime loans, faced negative equity and increased likelihood of default. In contrast to their broad panel data analysis, my research focuses specifically on mortgage default rates,

distinguishing between subprime and non-prime borrowers, and considers state-level trends to understand the regional impact of the crisis.

Calomiris, C. W., & Khan, U. (2015) critically assess the Troubled Asset Relief Program (TARP) and its effectiveness in stabilizing financial institutions during the 2007-2008 financial crisis. They argue that the success of TARP was undermined by political connections that influenced the allocation of funds, often benefiting large financial institutions with ties to policymakers. They suggest that the program's perceived fairness, or lack thereof, impacted its overall success in restoring confidence in the financial system. This analysis is closely related to my research, as I examine TARP's role in addressing rising default rates, particularly in states heavily affected by subprime mortgage lending. Understanding the political dynamics of TARP's implementation will help clarify how its effectiveness in stabilizing financial institutions may have influenced the broader housing market and mortgage defaults.

Fligstein, N., & Roehrkasse, A. F. (2016) analyze the rise of fraud in the mortgage securitization industry during the 2007-2009 financial crisis, highlighting how competitive pressures in the mortgage and securitization markets led to increased fraud and predatory lending. Their study reveals that investment banks, driven by short-term profits, were more likely to engage in risky mortgage lending and securitization practices compared to traditional mortgage specialists. This predatory behavior was exacerbated by deregulation in the financial industry and the complexity of mortgage-backed securities (MBS). Their findings are pertinent to my research as they provide context for understanding how financial deregulation and the rise of complex financial products contributed to the crisis. This helps explain why TARP and other interventions were necessary to prevent further financial instability.

Reinhart, V. (2011) examines the role of government intervention during the 2008 financial crisis, focusing on the Federal Reserve's purchase of illiquid assets, particularly the $30 billion bailout of Bear Stearns. Reinhart argues that this intervention signaled the government's commitment to stabilizing the financial system by safeguarding systemically important institutions. While this measure helped prevent immediate collapse, it also raised concerns about moral hazard, as it suggested that certain firms would be bailed out regardless of their risk management practices. This dynamic set the stage for TARP and other rescue programs, which became central to the broader crisis response. Reinhart's analysis is crucial for understanding the moral hazard concerns associated with TARP and other bailout programs, which I explore in my research as they relate to the regional impacts of mortgage defaults in California and Florida.

IV. Economic Theory

This theory suggests that excessive risk-taking by financial institutions, driven by the availability of subprime mortgages and the securitization of mortgage-backed securities (MBS), leads to asset bubbles and widespread defaults and delinquencies when housing markets decline. Financial institutions issue risky mortgages, such as subprime loans, due to incentives tied to short-term profits. Through the securitization of mortgage-backed securities (MBS), banks can offload the risk of defaults to external investors, while retaining the origination fees. This process, combined with the growing demand for housing fueled by easy credit, created an asset bubble. When the housing market declined while many investors and speculators believed that housing markets would never decline, as home prices had consistently risen for years, fostering a false sense of security, subprime borrowers defaulted, triggering a financial crisis.

In response, government interventions like the Troubled Asset Relief Program (TARP) aimed to restore liquidity to the financial system. TARP helped by injecting capital into troubled institutions and purchasing toxic assets, addressing the immediate liquidity shortfall that prevented banks from lending. The theory behind such interventions is that liquidity is essential during a crisis, without it credit markets freeze, leading to broader economic downturns. However, while TARP stabilized the market, it also introduced moral hazard. Knowing that they might be bailed out in the future, financial institutions may be incentivized to take on more risk, expecting the government will cover their losses. This creates a long-term challenge: balancing the need for short-term market stability with discouraging risky behavior that can lead to future crises.

V. Empirical Strategy/Data

For my empirical strategy, I will utilize data from the Quarterly Report on Household Debt and Credit created by the New York Federal Reserve and Fannie Mae to analyze mortgage origination volumes and Relative Default Rates segmented by credit scores (risk scores), while the segmentations are: Subprime (credit scores of 580-619) Near-prime (credit scores of 620-659) and Prime (credit scores of 660-760+). This will allow me to investigate how the distribution of risk scores at mortgage origination correlates with subsequent mortgage default rates nationally from 2003 to 2013. This would show whether riskier borrowing tends to correlate with higher mortgage default rates.

In the second phase of my analysis, I will examine relative default rates by state, with a focus on California and Florida, using a heat map spanning the years 2003 to 2013. This heat map will visualize default performance segmented by credit score categories, specifically subprime (credit scores of 0-619) and near-prime (credit scores of 620-659). By leveraging this visual representation, I aim to identify patterns and trends in mortgage default rates, particularly in riskier loan categories. The heat map is expected to highlight areas where default rates "heat up," emphasizing the elevated risk associated with subprime and near-prime loans in these states during this period. Building on these findings, I will analyze the effects of the Troubled Asset Relief Program (TARP) and interest rate cuts on default rates in California and Florida on a state level and its impacts. This analysis will assess how these policy interventions influenced the trajectory of mortgage delinquencies in two states that experienced significant housing market turmoil.

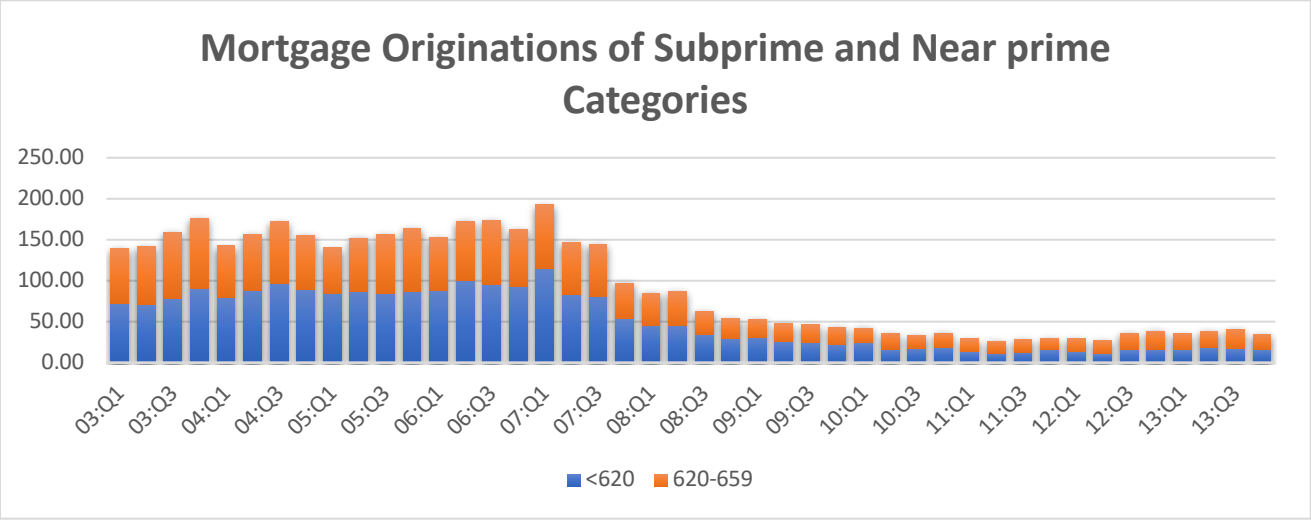
In the third phase of my analysis, I will conduct a regression to investigate the relationship between delinquency rates and key variables, specifically the average total debt from California and Florida, alongside interest rates. The regression model will be specified as:

$$\text{Delinquency\_Rates} = \beta_0 + \beta_1(\text{Total\_Debt}) + \beta_2(\text{Interest\_Rates}) + \varepsilon$$

Here, Total_Debt represents the average total mortgage debt 90+ days late for California and Florida combined, reflecting the debt exposure in two states significantly impacted by the housing crisis. Interest_Rates will capture the cost of borrowing during the period, influenced by Federal Reserve monetary policy. The data used for the regression analysis is from FRED for Delinquency Rate on Single-Family Residential Mortgages and the FED FUNDS rate (interest rate), Total Debt which includes California and Florida debt is from the New York Fed Consumer Credit Panel/Equifax. The time period is quarterly from 2003 to 2013.

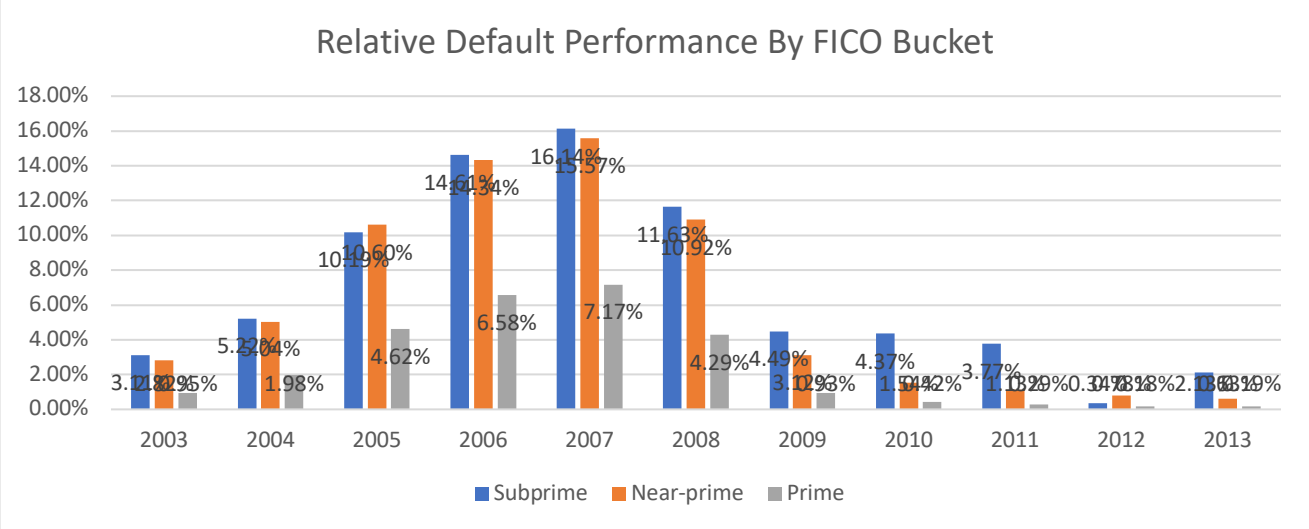
VI. Descriptive Statistics / Graphs

Graph 1: Analyzing Mortgage Originations by Credit Score



Source: New York Fed Consumer Credit Panel/Equifax

Graph 2: Analyzing Relative Default Performance By FICO Bucket

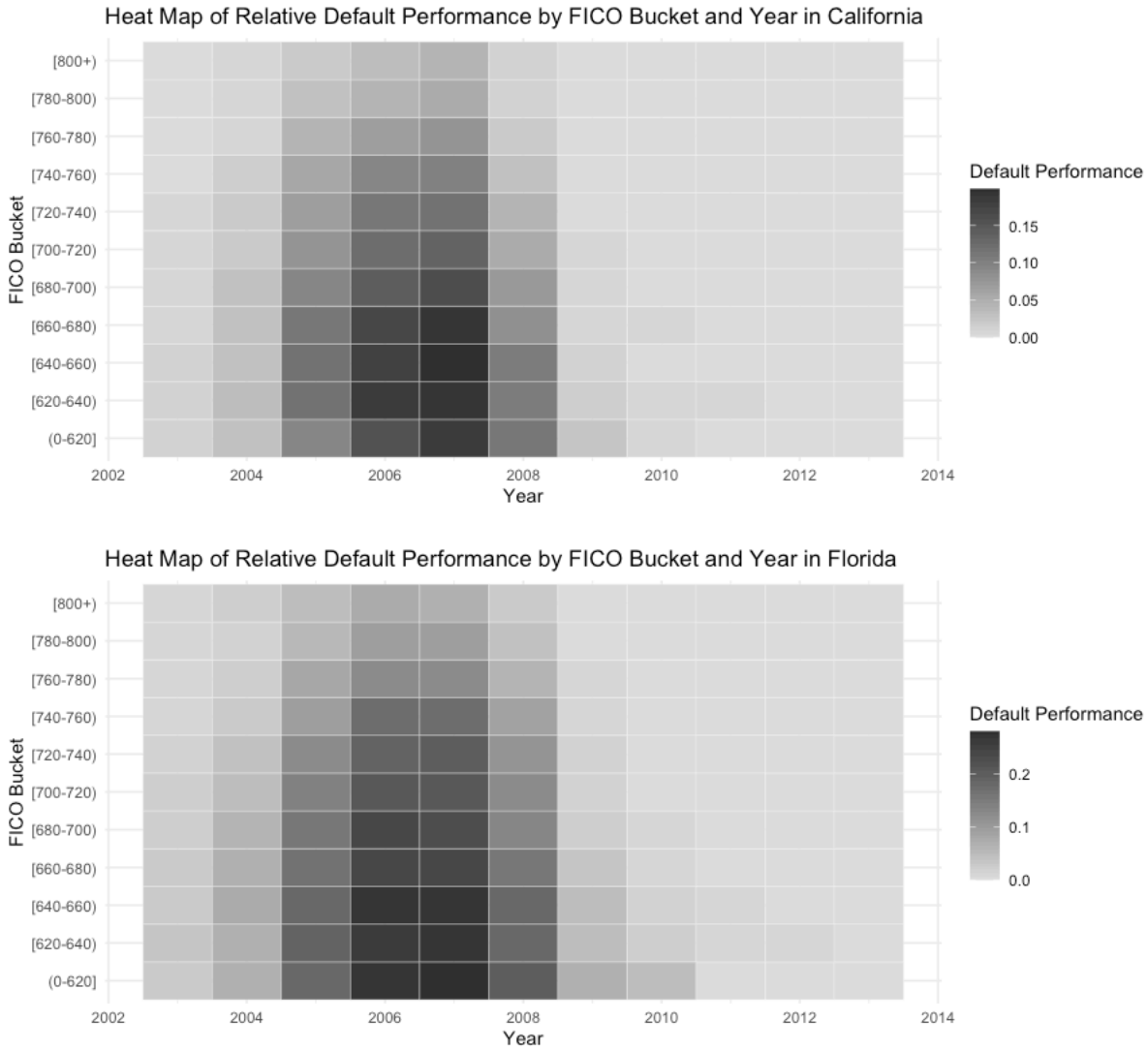


Source: Fannie Mae Single Family Performance Data

Graph 1 of mortgage originations by credit score shows data from 2003 to 2013 quarterly with the y axis showing the total origination value in Billions ($). The graph displays a clear upward trend from 2003 to Q2 in 2007, particularly in the subprime and near prime categories (FICO scores below 620 and FICO scores between 620 - 660), which shows the surge in risky lending during the housing boom. By 2006, subprime loans accounted for nearly 20% of all mortgage originations, and near-prime loans made up an additional large portion, highlighting the increasing reliance on riskier borrowers. This sharp increase in risky mortgage originations was fueled by loose lending standards, which allowed borrowers with poor credit histories to access home loans that they otherwise would not have qualified for. Many lenders offered adjustable-rate mortgages (ARMs) with low introductory rates, which later reset to higher rates, putting subprime borrowers in particularly vulnerable positions. This surge in mortgage lending coincided with rising home prices, further encouraging lending. As housing prices rose, many speculators and investors believed the market would continue to appreciate, creating an unsustainable cycle of borrowing and lending. However, the trend reverses dramatically after Q2 of 2007, when mortgage originations start to plummet across all credit score categories, especially in subprime and near-prime segments. This sharp decline in origination volumes corresponds with the onset of the financial crisis and the bursting of the housing bubble. By the end of 2008, the origination volume for subprime mortgages had dropped by over 80%, reflecting a tightening of lending standards as financial institutions faced mounting losses. The collapse in housing prices, coupled with the bankruptcy of major financial institutions, resulted in a dramatic pullback from risky lending.

Graph 2 of Relative Default performance shows data from 2003 to 2013 where the y axis shows the Relative Default Rate. The Relative Default Rate is calculated using this equation: Default Rate = ∑Default Unpaid Principal Balance / ∑Origination Unpaid Principal Balance. The Graph shows an acceleration in defaults for subprime and non-prime up until 2007. The Default rate for subprime increased 13 points and near prime increased 12.8 points while prime loans only increased by 6.2 points from 2003 to 2007. The increase in default rates during this period can be linked to the unsustainable rise in home prices and the widespread use of risky lending practices. By 2007, the default rate for subprime loans had nearly tripled compared to 2003, as housing prices started to fall and many borrowers found themselves "underwater," owing more on their mortgages than their homes were worth. This is consistent with the rising foreclosure rates seen across the country, especially in states with high concentrations of subprime lending.

Graph 3: Default Performance by FICO Score in California and Florida



Graph 3 above show heatmaps illustrating the default performance in two of the states hardest hit by the housing crisis. The default performance in Florida was notably higher than in California, particularly in the years leading up to and during the housing crisis. For instance, Florida's subprime default rate reached a peak of 28.14% in 2007, while California's peak for subprime loans was significantly lower at 18.35%. Similarly, Florida's near-prime default rate peaked at 27.47% in 2007, compared to California's 19.74% during the same year. This stark contrast can be attributed to Florida's highly speculative housing market, where aggressive lending

practices and rampant investor activity drove an over-saturation of risky loans. Florida had a high concentration of subprime mortgages, especially adjustable-rate mortgages (ARMs), which reset to higher rates, causing many homeowners to default as their monthly payments increased sharply. Additionally, Florida's rapid population growth and the construction of large numbers of homes contributed to an oversupply in the housing market, which led to price declines once the bubble burst. California's housing crisis was largely fueled by an overheated demand for housing, particularly in urban areas like San Francisco and Los Angeles. The demand was driven by limited inventory, high cost of land, and growing population, which further intensified the pressure on single-family homes. The lack of affordable housing in California exacerbated this situation. Despite the state's strong economy, zoning regulations, and environmental restrictions limited housing development, contributing to a severe supply-demand imbalance. Hence in conclusion the exposure for California in terms of default performance was minimized due its strong economy compared to Florida.

Regression Model: Delinquency_Rates = $\beta_0 + \beta_1(\text{Total\_Debt}) + \beta_2(\text{Interest\_Rates}) + \varepsilon$

Source	SS	df	MS	Number of obs	=	44
				F(2, 41)	=	178.73
Model	615.070053	2	307.535027	Prob > F	=	0.0000
Residual	70.5489468	41	1.72070602	R-squared	=	0.8971
				Adj R-squared	=	0.8921
Total	685.619	43	15.9446279	Root MSE	=	1.3118

delinquency~e	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
total_debt	.2707538	.0232543	11.64	0.000	.2237907	.3177169
interest_rate	-.428988	.1449401	-2.96	0.005	-.7217004	-.1362756
_cons	2.838128	.5489014	5.17	0.000	1.729599	3.946657

In this regression I averaged california's mortage debt and florida's mortgage debt into total_debt due to avoid multicollinearity since they were highly correlated. The regression results reveal a significant relationship between total debt and interest rates with delinquency rates. The coefficient for total_debt is 0.2708, with a t-statistic of 11.64 and a p-value of 0.000, indicating a highly significant positive relationship. This suggests that as total debt increases, the delinquency rate also rises. On the

other hand, the coefficient for interest rates is -0.4290, with a t-statistic of -2.96 and a p-value of 0.005, suggesting a significant negative relationship. This implies that as interest rates increase, delinquency rates tend to decrease. The intuition behind this inverse relationship may seem counterintuitive at first, but it indicates that in environments with higher interest rates, borrowers may be more cautious about taking on additional debt or may prioritize debt repayment more to avoid higher costs, However, this relationship can be further explored with the inclusion of unemployment as a variable. Unemployment has a strong influence on a borrower's ability to meet debt obligations, regardless of the interest rate environment. During periods of high unemployment, individuals may struggle to maintain their income levels, which can lead to higher delinquency rates even if interest rates are higher. The regression models shows that both total debt and interest rates play significant roles in explaining delinquency rates. Specifically, the positive relationship between total debt and delinquency rates suggests that higher levels of debt are associated with an increased likelihood of borrowers falling behind on payments. This reinforces the idea that as borrowers take on more debt in California and Florida, they may face greater financial strain, potentially leading to higher delinquency rates. Conversely, the negative relationship between interest rates and delinquency rates suggests that in times of higher interest rates, delinquency rates tend to decrease. This finding might be reflective of a more cautious borrowing environment, where individuals may be less likely to take on excessive debt or prioritize paying off existing debt to avoid the financial burden of higher borrowing costs.

In addition to the broader TARP program, the U.S. Treasury Department established the Hardest Hit Fund (HHF) in 2010 as a targeted initiative to provide financial assistance to homeowners in states most severely impacted by the housing market crisis. This $9.6 billion program was specifically designed to help unemployed and underemployed homeowners avoid foreclosure through mortgage payment assistance, principal reduction, and other foreclosure prevention strategies. California and Florida were among the top recipients of HHF funding, reflecting their significant housing market distress. California received $699 million, while Florida was allocated $418 million. However, these funding amounts become even more interesting when contextualized with population data. As of 2010, California had approximately 37.3 million residents, while Florida had about 18.8 million residents roughly half of California's population. Despite the funding disparity, the data reveals that Florida was disproportionately affected by the housing crisis.

VII. Conclusion

The 2008 financial crisis was largely triggered by the rapid growth of subprime and near-prime mortgage lending, a trend that our analysis clearly supports with strong evidence. Graph 1 shows that by 2006, subprime (FICO scores 580-619) and near-prime (FICO scores 620-659) loans made up nearly 40% of all mortgage originations, a significant shift from previous lending patterns. This increase from about $150 billion in subprime loans in 2003 to $600 billion in 2007 highlights a widespread practice of lending to borrowers with lower credit scores. Many of these loans were adjustable-rate mortgages (ARMs) with low initial interest rates, which would eventually reset to higher rates, setting the stage for defaults.

Graph 2 further shows the sharp rise in default rates between 2003 and 2007. Default rates for subprime loans rose by 13 percentage points, while near-prime loans saw a 12.8-point increase. In comparison, defaults for prime loans increased by only 6.2 points. This clear difference in default rates directly links risky lending practices to higher levels of mortgage defaults. The geographic heat map (Graph 3) shows that states like Florida, which had a high concentration of subprime ARMs, saw default rates as high as 28.14%, while California's rate was 18.35%. My regression analysis also supports these findings, showing a significant positive relationship between total mortgage debt and delinquency rates, with a coefficient of 0.2708. This evidence demonstrates that subprime and near-prime lending were not minor factors but central causes of the housing market collapse. The crisis was not a random event but a predictable result of relaxed lending standards, where financial institutions prioritized short-term gains over long-term stability, ultimately creating a bubble that was bound to burst and hence the programs like TARP and subsequent interest rate cuts were used to cool down the market as well as provide relief to subprime and near prime borrowers while also bailing out some of the “big banks.”

VIII. References

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Data Table used for for Regression:

interest_rate	california_debt	nevada_debt	florida_debt	delinquency_rate
1.25	0.59	1.30	1.31	1.97
1.25	0.36	2.12	1.51	1.83
1.02	0.43	1.86	0.99	1.73
1.00	0.38	2.31	1.00	1.76
1.00	0.32	1.83	0.94	1.65
1.01	0.23	1.05	0.80	1.60
1.43	0.39	0.71	0.70	1.56
1.95	0.31	0.18	0.63	1.41
2.47	0.34	0.51	0.64	1.42
2.94	0.28	0.34	0.68	1.55
3.46	0.51	0.04	0.58	1.59

3.98	0.48	0.20	0.55	1.64
4.46	0.56	0.03	0.61	1.61
4.91	0.41	2.16	0.46	1.62
5.25	0.66	1.59	0.64	1.74
5.25	0.90	1.93	1.37	1.92
5.26	1.28	1.81	1.82	2.08
5.25	1.85	1.89	2.09	2.29
5.07	2.88	0.87	2.83	2.71
4.50	4.21	2.16	4.17	3.10
3.18	5.84	6.02	7.75	3.68
2.09	6.14	7.05	8.50	4.36
1.94	7.01	10.32	9.91	5.28
0.51	8.26	13.04	13.46	6.58
0.18	10.72	13.82	16.23	8.01
0.18	12.86	15.29	18.11	8.57
0.16	12.18	17.81	18.25	9.48
0.12	13.17	15.37	19.05	10.40
0.13	12.94	16.65	20.63	11.48
0.19	11.55	20.97	19.36	11.08
0.19	10.90	19.20	18.42	10.66
0.19	10.50	15.76	18.36	10.33
0.16	9.22	24.09	17.76	10.36
0.09	8.60	19.95	17.23	10.55
0.08	8.46	18.60	16.79	10.50
0.07	8.11	18.63	16.69	10.25
0.10	7.18	18.50	16.15	10.33
0.15	6.67	19.21	15.26	10.45
0.14	5.88	14.91	14.46	10.48
0.16	5.28	16.86	13.10	10.02
0.14	5.09	13.89	13.41	9.73
0.12	4.29	13.18	12.15	9.32
0.08	3.03	11.91	10.14	8.66
0.09	2.77	7.15	9.31	8.30