



NORTH SOUTH UNIVERSITY
SCHOOL OF BUSINESS
AND ECONOMICS

International Financial Institutions and Markets (FIN433)

Final Report

Freddie Mac

Section- (Spring 2023)

Prepared For:

Humaira Haque

Department of Accounting and Finance

North South University

Prepared By: Group 5

Al Zadid Bin Plabon	1912395630
Pial Roy	2011840030
Mohammad Faiaz Tawsif	2012870030
Umme Kulsum Mim	2021026630
Soliman Ahmed Sani	2021950630

Table of Content:

Letter of Transmittal	1
Acknowledgement	2
Executive Summary	3
Introduction	4
Organizational Overview	8
Bailout of freddie Mac	12
Key Lapses	18
Lessons and Recommendation	20
Conclusion	25
References	26

LETTER OF TRANSMITTAL

29th April, 2023.

Ms. Humaira Haque

Lecturer,

Department of Accounting and Finance

School of Business and Economics,

North South University.

Subject: Submission of Report on Freddie Mac.

Dear Ma'am,

We are pleased to submit our research paper on Freddie Mac for the course FIN433. The objective of this paper is to analyze the role of Freddie Mac in the US housing market and the challenges it faced during the 2008 housing market crisis.

The paper provides a detailed overview of Freddie Mac's history, its role in the US housing market, its business model, and its regulatory environment. The paper also discusses the challenges faced by Freddie Mac during the 2008 financial crisis. We have conducted extensive research using both primary and secondary sources. Overall, we believe that the paper provides a comprehensive and insightful analysis of Freddie Mac and its significance in the US housing market.

Thank you for giving us the opportunity to explore this topic in depth. I hope that you find the paper informative and engaging.

Sincerely,

Group 5

ACKNOWLEDGEMENT

We would first want to thank the Almighty Allah. We wouldn't have been able to finish our report by the deadline without his grace. We also like to thank Humaira Haque, a committed lecturer at North South University, for her assistance in helping us finish this report correctly. We appreciate you providing us with all the details we needed to know about this. Last but not least, we would like to express our gratitude to our team member's and friends for supporting us in the whole report.

EXECUTIVE SUMMARY

A public government-sponsored business (GSE) known as Freddie Mac, also known as the Federal Home Loan Mortgage Corporation, was established in 1970 with the goal of bringing liquidity, stability, and affordability to the American housing market. Its main job is to purchase mortgages from lenders and bundle them into securities called mortgage-backed securities (MBS) that are sold to investors.

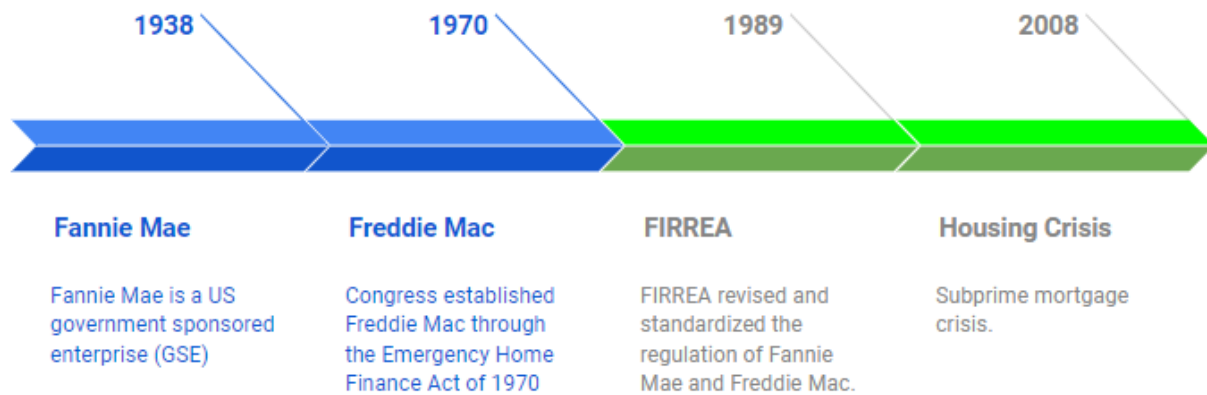
This report discusses the Freddie Mac financial crisis, which began in 2007. This report's first section provides details on Freddie's securitization practices during the crisis. The second section goes through the business analysis and how it affected Freddie's failure. We clearly laid forth the reasons for and against the bailout.

The paper concludes by outlining the losses suffered by the US financial system, the lesson we have learned from them, and the appropriate course of action.

INTRODUCTION

Homeownership has served as a staple of prosperity and upward mobility in the social lives of many Americans since the dawn of the industrial boom. Elsewhere on the planet too, real estate is the hallmark of a life lived well. The houses take the shape, design and utility, given to it by the factors of geography, occupation, social-status, prevailing architectural-norms, etc (MoCrnick, 2017). The traditional European architectural-norms paved the way to more compact and urban modes of housing, signaling the shift from agricultural subsistence to industrial factory work of the people of the United States (Green, 2008). By the early 20th century, the housing market need for the American people was riding the destructive wave of the great depression as the homeownership dream for many was squashed. The American population lacked the financial means to purchase a home during this period as a consequence of high down payment requirements and short-term loans which made it difficult for most people to pay off without a substantial cash payment. Additionally, during the Great Depression, banks had limited funds to lend, which led to high rates of foreclosure, resulting in a widespread housing crisis throughout the country.

The US Housing System:



Lack of accessible long-term mortgages, especially for middle-class and lower-income families, typified the situation of housing in the US prior to the establishment of the housing system in the post-depression period. This posed a challenge for families in terms of making long-term plans due to the fact the majority of mortgages had short terms and frequently required refinancing every few years. In addition, the cost of mortgage interest was frequently high, making it extra harder for families to purchase a home (Hackworth, 2007).

Fannie Mae

The Federal National Mortgage Association (FNMA), also referred to as Fannie Mae, is a government-sponsored business (GSE) that has been publicly traded in the United States since 1968. Established in 1938, at a time of economic depression. The corporation's goal is to increase the number of lenders in the mortgage market by reducing reliance on locally based savings and loan organizations, allowing lenders to reinvest their assets into additional lending, and securitizing mortgage loans into mortgage-backed securities (MBS) (or "thrifts").

Freddie Mac

The Federal Home Loan Mortgage Corporation, which was established in 1970 with the intention of fostering the secondary mortgage market and reducing interest rate risk for banks, is known informally as Freddie Mac. Under the Emergency Home Financing Act, it was established. In 1989, Freddie Mac underwent a reorganization in compliance with the Financial Institutions Reform, Recovery, and Enforcement Act to become a shareholder-owned company (FIRREA).

Fannie Mae and Freddie Mac both expand the secondary market for mortgages and MBSs by buying loans that were generated by banks, savings & loans, and other lending institutions. The following comprehension table outlines the core commonalities of both corporations:

OBJECTIVES	FREDDIE MAC	FANNIE MAE
Increase access to mortgages	Purchase and guarantee mortgage loans from lenders	Purchase and guarantee mortgage loans from lenders
Promote homeownership	Support affordable and sustainable homeownership	Expand affordable homeownership opportunities
Provide liquidity to the housing market	Provide capital to lenders to make more loans	Create a secondary market for mortgage loans
Reduce risk for investors	Guarantee payment of principal and interest on mortgage-backed securities	Guarantee payment of principal and interest on mortgage-backed securities

Support the U.S. housing market	Provide stability and liquidity to the secondary mortgage market	Support the housing market by providing liquidity and access to mortgage financing
--	--	--

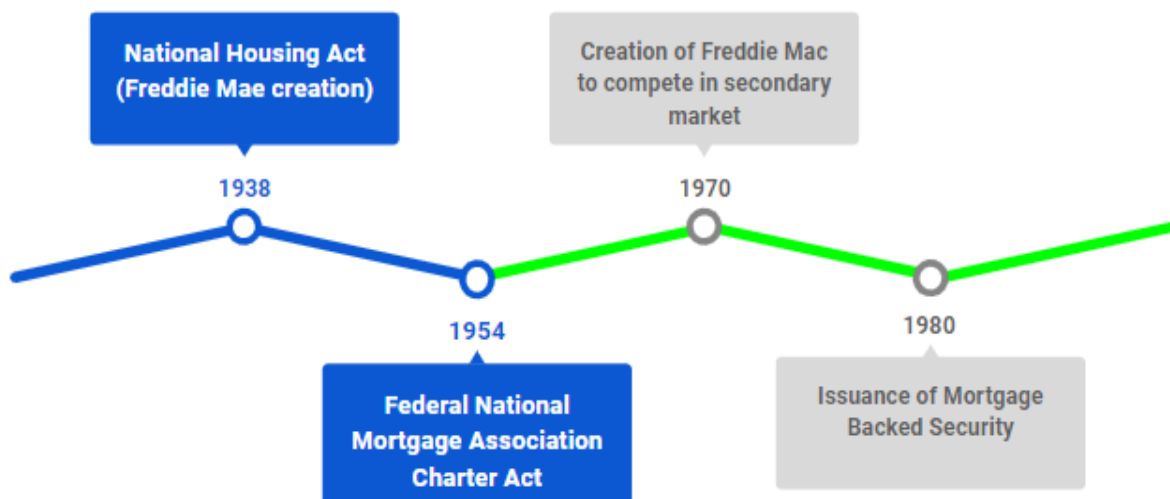
Shares of Fannie Mae and Freddie Mac are now traded over the counter (OTC), therefore you can't buy them on a major stock exchange. The market value of each FNMA and FMCC share as of September 2021 is less than \$1.

However, both companies differ in terms of certain aspects of operation and structure:

DIFFERENTIATION	FREDDIE MAC	FANNIE MAE
Type of institution	Publicly traded company with stockholders	Government-sponsored enterprise (GSE)
Funding source	Securitization of mortgages and issuance of debt securities	Issuance of debt securities and government backing
Organizational structure	Divided into a single-family and multifamily division	Divided into a single-family and multifamily business unit
Historical focus	Historically focused on conventional mortgages	Historically focused on purchasing government-backed mortgages
Government backing	Does not have explicit government backing, but is subject to government regulation	Explicit government backing with implied guarantee on their mortgage-backed securities
CEO compensation	Not disclosed	Publicly disclosed

OVERVIEW OF FREDDIE MAC

The origin of Freddie Mac is intertwined with its predecessor, Fannie Mae. Fannie Mae initially mainly bought traditional mortgages from banks and other lenders. These mortgages had fixed rates and were often obtained to buy or refinance a house. In 1938, Fannie Mae became a part of the federal government as part of an amendment to the National Housing Act. Fannie Mae initially bought mortgages that were FHA-insured; later, loans that had VA guarantees were added to the mix. The following chart outlines the relation between Freddie Mac and Fannie Mae:



Securitization:

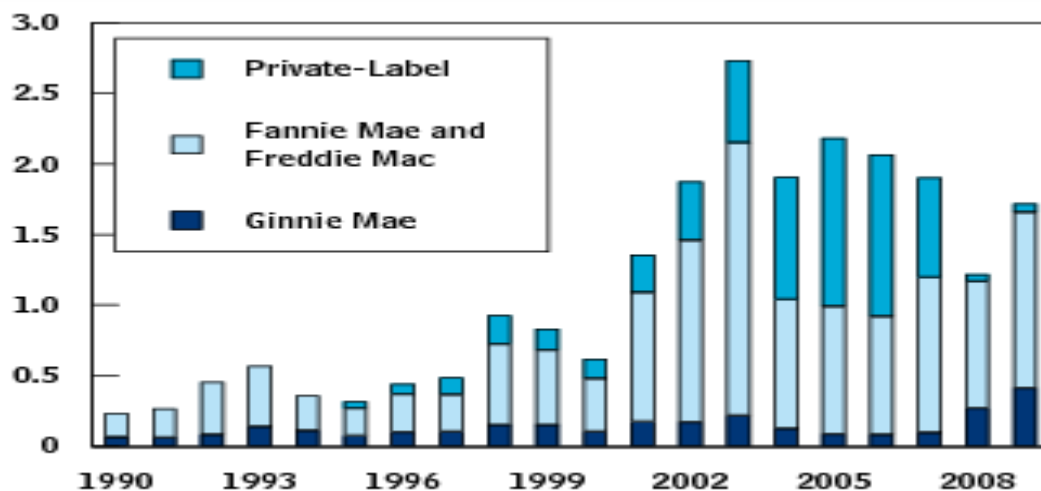
These mortgages would subsequently be assembled by Fannie Mae into mortgage-backed securities (MBS), which were then offered for sale to investors on the secondary market. Fannie

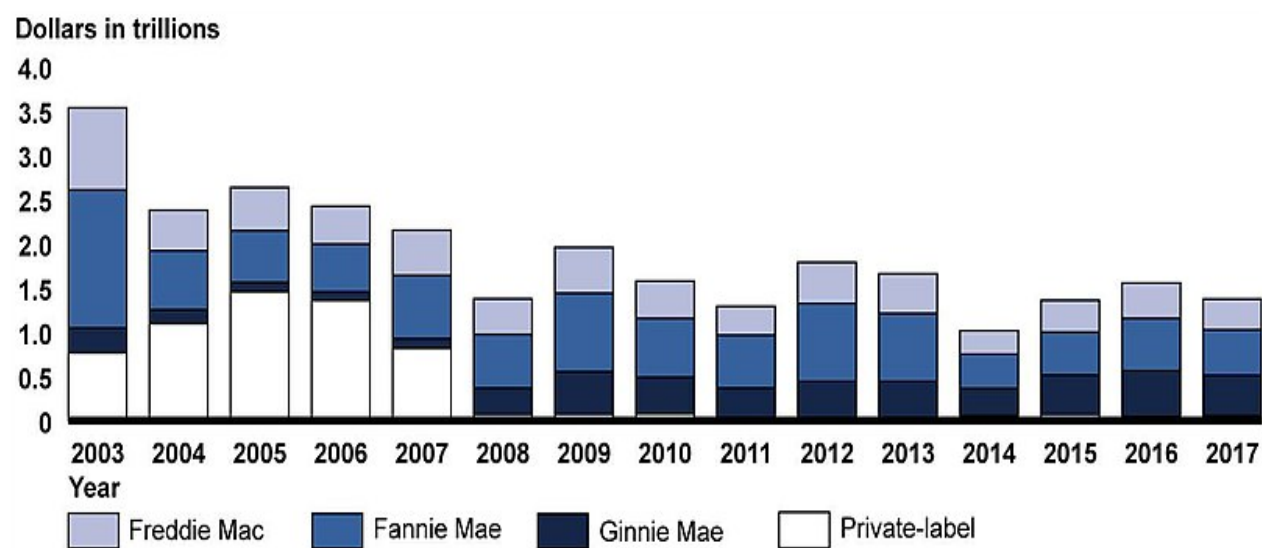
Mae's guarantee of these MBS increased their allure to investors. Fannie Mae contributed to the expansion of mortgage credit availability and the lowering of interest rates for homeowners by acquiring mortgages and producing MBS. Federal Housing Financing Agency, unknown date (Federal Housing Finance Agency, n.d.).

The Government National Mortgage Association, sometimes known as Ginnie Mae, is a government-owned business that was started in 1968 as a division of the Department of Housing and Urban Development. Its main goal is to promote affordable housing by ensuring that investors in mortgage-backed securities (MBS) backed by federally insured or guaranteed loans, such as those insured by the Federal Housing Administration (FHA) and the Department of Veterans Affairs, receive their principal and interest payments on time (VA). Ginnie Mae, in contrast to Fannie Mae and Freddie Mac, does not buy or make loans; instead, it acts as a guarantee for MBS that are backed by loans that have been insured or guaranteed by the government (U.S. Department of Housing and Urban Development, n.d.).

In 1968, Fannie Mae split its ownership between a privately held business and a nonprofit with government support. The private firm, now known as Fannie Mae, was nevertheless allowed by its charter to purchase mortgages from savings and loan organizations and other depository institutions despite the lack of a specific insurance policy that guaranteed the value of the mortgages. The repayment of securities backed by mortgages provided to government employees or veterans was expressly guaranteed by the Government National Mortgage Association (Ginnie Mae), a publicly supported corporation.

In 1989, the Financial Institutions Reform, Recovery and Enforcement Act, also known as FIRREA, implemented standardized regulations for both Fannie Mae and Freddie Mac. As part of this act, the ties between the Federal Home Loan Bank System and Freddie Mac were severed. Additionally, the Federal Home Loan Bank Board (FHLBB) was replaced with a new independent entity. Freddie Mac's 18-member board of directors is overseen by the U.S. Department of Housing and Urban Development (HUD), while the Federal Housing Finance Board (FHFB), another new independent agency, is responsible for regulating the 12 Federal Home Loan Banks, also known as district banks.





Source: GAO analysis of Inside Mortgage Finance and Bureau of Economic Analysis data. | GAO-19-239

BAILOUT OF FREDDIE MAC

In 2008, the US housing market experienced a significant downturn, with home prices falling sharply and defaults on subprime mortgages rising. This led to a crisis in the mortgage industry, as lenders faced a wave of foreclosures, and investors suffered significant losses on mortgage-backed securities.

The housing crisis heavily impacted Freddie Mac, as it held significant investments in mortgage-backed securities and suffered losses as borrowers defaulted on their loans. On September 6, 2008, the US government stepped in to provide a bailout to Freddie Mac. Under the terms of the bailout, the US Treasury Department provided a total of \$71 billion in capital to Freddie Mac in exchange for preferred stock and warrants to purchase common stock.



Why did Freddie Mac require a public bailout?

The main reason is poor business judgment and insufficient resources. Most private investment companies primarily engaged in one line of business, residential mortgage finance, and lacked additional revenue streams to offset a decline in home prices.

During the financial crisis, the US government placed Freddie Mac (Federal Home Loan Mortgage Corporation) into conservatorship in 2008. This was due to a combination of factors, including their exposure to risky loans and mortgage-backed securities, inadequate risk management practices, and the collapse of the US housing market.

Freddie Mac is a government-sponsored enterprise (GSE) that operates in the secondary mortgage market, purchasing mortgages from banks and other lenders and bundling them into securities sold to investors. This helps increase mortgage market liquidity and make home ownership more affordable for Americans.

However, during the housing bubble of the mid-2000s, Freddie Mac purchased large numbers of risky subprime mortgages and other nontraditional loans, which led to significant losses when these loans defaulted during the housing market downturn. In addition, Freddie Mac had taken on considerable leverage, meaning its losses were magnified.

As a result of these factors, Freddie Mac could not meet its financial obligations and was placed under conservatorship by the US government in 2008. The government provided a bailout to prevent the housing market's collapse and stabilize the economy. The bailout terms required Freddie Mac to reduce its risky assets and improve its risk management practices, and the

company has since returned to profitability. However, Freddie Mac remains under government conservatorship, with the ultimate goal of returning it to private ownership.

The argument for the bailout:

There were several arguments in favor of the Freddie Mac bailout in 2008. Here are some of the main ones:

Preventing a collapse of the housing market: Freddie Mac and its sister company Fannie Mae were significant players in the secondary mortgage market, purchasing and securitizing millions of mortgages. If they were to fail, it could have caused a ripple effect throughout the housing market, leading to a collapse in home values and making it much harder for people to obtain mortgages. The government helped stabilize the market and prevent a more severe crisis by providing a bailout. Protecting taxpayers: The Treasury paid \$71 billion for Freddie Mac, according to the Shadow Open Market Committee (SOMC), an independent economic organization. Over time, keeping the two agencies (Fannie & Freddie) afloat cost taxpayers US\$187 billion. The government is granted a warrant to retake control of Freddie Mac by purchasing up to 79.9% of its stock at any moment. While the bailout involved significant government spending, many argued that preventing an even greater cost to taxpayers was necessary. If Freddie Mac had failed, it could have led to a much deeper recession and a significant increase in government spending on social safety net programs.

Maintaining confidence in the financial system: The financial crisis had already caused significant damage to the economy and the stock market, and Freddie Mac's failure could have

further eroded investor confidence. By providing a bailout, the government sent a message that it was willing to step in to prevent a complete collapse of the financial system.



Ensuring access to affordable mortgages: Freddie Mac and Fannie Mae play a critical role in the housing market by providing liquidity and helping to keep mortgage rates low. By giving a bailout, the government ensured that these entities would continue functioning, making it easier for people to obtain affordable mortgages and stimulating the housing market.

Overall, the arguments favoring the Freddie Mac bailout centered around the idea that it was necessary to prevent a more severe crisis and protect the economy's overall health.

The argument against the bailout:

There were also several arguments against the Freddie Mac bailout in 2008. Here are some of the main ones:

On November 20, 2007, Freddie disclosed a \$2 billion loss, which caused its stock price to drop by 29%. The net losses for Freddie reached \$3.1 billion in only one month. Federal regulators

foolishly decided to allow Freddie Mac to take on an additional \$200 billion in subprime mortgage debt on March 19, 2008. By bailing out Freddie Mac, the government provided a safety net for companies engaging in risky behavior. Some argued that this could encourage other financial institutions to take on risky investments in the future, knowing that the government would bail them out if things went wrong.

The bailout involved significant government spending, with estimates ranging from \$124 billion to \$187 billion. Some argued that this was too high a cost for taxpayers, especially given that the government already backed Freddie Mac and its sister company Fannie Mae and should have been more closely regulated to prevent the need for a bailout in the first place.

Some argued that the bailout unfairly benefited shareholders and executives of Freddie Mac, who had made poor decisions and taken on excessive risk. Meanwhile, many homeowners struggling to pay their mortgages did not receive similar levels of support.

While the bailout helped stabilize the housing market, some argued it did not go far enough in holding those responsible for the crisis accountable. Many executives and companies involved in the financial crisis faced few consequences, leading some to question whether the bailout was a missed opportunity to address broader systemic issues.

Overall, the arguments against the Freddie Mac bailout centered around concerns about the cost to taxpayers, unequal treatment, and lack of accountability.

Necessaries:

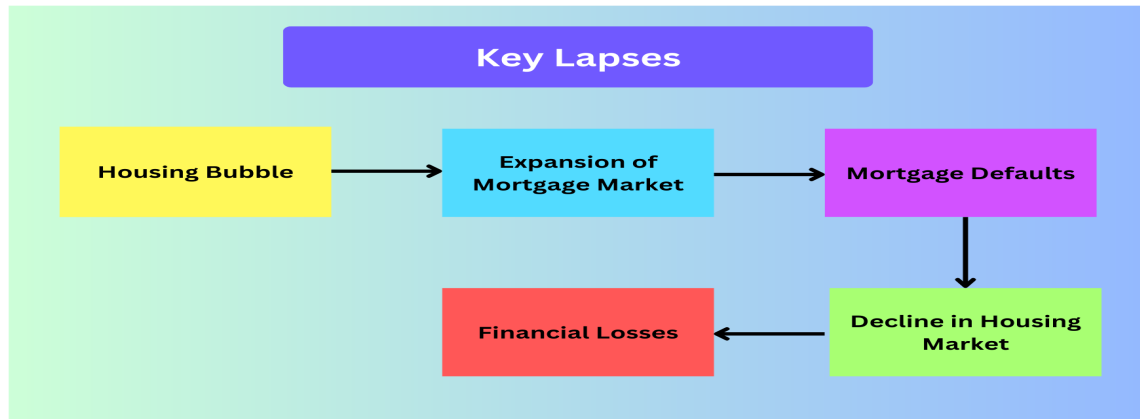
The 2008 financial crisis was complex and multifaceted, and the reasons for Freddie Mac's failure and subsequent bailout were numerous. However, some possible actions could have been taken to prevent or mitigate the need for a bailout.

Freddie Mac's exposure to risky loans and inadequate risk management practices were crucial factors in its downfall. To prevent similar failures in the future, the company could have implemented more vital risk management practices, such as conducting more thorough assessments of the creditworthiness of borrowers and limiting its exposure to risky mortgage products.

Freddie Mac was a government-sponsored enterprise (GSE), which meant it had an implicit government guarantee that gave them a competitive advantage in the market. However, this also made them vulnerable to the risks of moral hazard, where they took on excessive risk knowing that the government would bail them out if things went wrong. To prevent this, the government could have implemented stronger GSE oversight and regulations, including stricter capital requirements and more thorough monitoring of their risk-taking activities.

Policymakers could have taken a more comprehensive approach to address these issues, including reforms to the housing finance system, stricter regulations of financial institutions, and greater transparency in financial markets.

KEY LAPSES



Housing Bubble:

The Huge amounts of financial losses in the USA started with the creation of the Housing bubble. This housing bubble was the result of low interest rates, easy credit, housing market speculation, and government policies. Here, Freddie Mac played a significant role.

- Freddie Mac purchased large amounts of risky mortgages, including subprime and Alt-A mortgages, from banks and other lenders. This increased demand for these mortgages and encouraged lenders to offer more of them.
- Then, they lowered their underwriting standards to allow more people to qualify for mortgages. This included reducing down payment requirements, accepting lower credit scores, and allowing higher debt-to-income ratios.

These things initially influence the creation of the housing bubble.

Expansion of Mortgage market:

Freddie Mac's massive purchases of these mortgages allowed lenders to have a cash surplus. Therefore, they were able to loan out more and include a huge number of middle and lower-middle class people in this market. It made the market a billion-dollar market.

Mortgage Default:

When the lenders started to offer adjustable rate-mortgages with low initial interest rates, people with these loans were happy paying low interest at the beginning but later on when the interest rates were adjusted higher these people became unable to pay and started to default.

Decline in Housing Market:

With an increased amount of defaults, the foreclosures in the market started to increase, resulting in more and more houses available to be sold. It made the supply of houses greater than its demand. As a result, the housing prices started to decline. Now, people were paying higher than what their houses actually worth to banks. It made more people stop paying off their debts and start to default which resulted in housing prices to fall even lower.

Financial Losses:

After the decline of housing prices, the Mortgage backed securities that were issued by institutes like Freddie Mac started to lose their values. It made buyers of these securities and Freddie Mac face huge financial losses. Because the buyers of the securities were getting interest from the repayment of mortgages. When the borrower started defaulting the buyers stopped getting interest and the assets that were backing up their securities started to lose value. Because of this

only Freddie Mac lost more than 50 billion dollars during 2008 and the whole US financial market faced losses in trillions of dollars.

LESSONS AND RECOMMENDATIONS

Lessons:

Even though it has been more than 10 years since the financial crisis of 2008–2009, there are still a lot of lessons to be learned from it. Unevenly, the economic recovery has been welcomed, particularly for those on the lowest end of the income spectrum with little to no savings or assets. Even though there was easy money to be made because of extraordinarily low loan rates and other stimulants, many hard-working people were unable to take advantage of it because they make up nearly half of the population. The crisis's aftermath resulted in a ton of new legislation and the formation of oversight bodies with names like TARP, FSOC, and CFPB—most of which hardly function today—that amounted to a word salad of acronyms.

lessons that we learned from the crisis:

- The 2008–2009 financial crisis contributed to the Great Recession, which was at the time the worst economic downturn since the Great Depression.
- The government established a number of new legislation in response to the financial crisis of 2008–2009 with the goal of regulating financial activities and bolstering important business sectors.
- At the same time, the U.S. Federal Reserve began implementing aggressive monetary policy measures, such as numerous rounds of quantitative easing.

- While the economy recovered throughout the 2010s, Wall Street and the business world seemed to have put many of the risks that contributed to the crisis behind them, despite the fact that some lessons had been learned.

Failing:

Politicians and the Federal Reserve governors depended on the notion that international banks were too large to fail in order to prevent a catastrophe that would have been several times worse than the crisis itself. The huge 2,300-page Dodd-Frank Act A systemic crisis was avoided by passing the Wall Street Reform and Consumer Protection Act, which was created by two then-Congressmen named Barney Frank and Christopher Dodd. Two regulatory bodies established under the Act, the Financial Stability Monitoring Council (FSOC) and the Consumer Financial Protection Board (CFPB), were established with the goal of serving as watchdogs on Wall Street.

Risk reducing on Wall Street:

Additionally, banks have made poor financial decisions with their own money, sometimes in ways that are obviously at odds with the choices they have made for their clients. The widespread "proprietary trading" that certain institutions participated in caused significant losses for both their books and their clients. As lawsuits multiplied and the tide rose on a sandcastle, trust started to break down.

The so-called Volcker Rule prohibited banks from assuming excessive risk with their own transactions in speculative markets that might also lead to a conflict of interest with their clients in other products. It was a proposed piece of legislation named after former Federal Reserve Chair Paul Volcker. The legislation was eventually passed in April 2014, about five years after

some of the most prominent Wall Street firms, including Lehman Bros. and Bear Stearns, disappeared from the face of the earth for engaging in such operations. Prior to May 2018, only four more years had gone until current Fed Chair Jerome Powell voted to downgrade it because of its complexity and inefficiency.

Despite this, banks now have to maintain higher capital standards and have lower levels of leverage and subprime mortgage exposure. Former TARP monitor and current president of the Minneapolis Federal Reserve Bank Neel Kashkari was present during the crisis and its aftermath. He still holds the opinion that major international banks require more regulation and stronger capital requirements.

Moral Dilemma:

In times of crisis, people frequently look for someone to blame. In 2009, a number of people and organizations could have faced direct repercussions. It is much more difficult to actually prove that someone used illegal means to take advantage of consumers and investors who were gullible and blind. Several of Main Street's and Wall Street's most prestigious companies clearly put the interests of their own executives before those of their clients in bad behavior by banks. However, none of them were put on trial or given any criminal accusations.

Today's Freddie Mac:

This company has come a long way, but it still has a long way to go. Since the beginning of the crisis, Freddie Mac has reported five quarters of profitability. In August, the U.S. Treasury Department changed the bailout's terms, and as a result, the company's financial situation improved. As per the previous agreement, Freddie may seek money from the Treasury Department when necessary to boost their capital reserves. Businesses donated preferred shares

to the government in exchange for which they were required to pay a ten percent dividend. As per the new rules, Treasury will only collect all of Freddie's quarterly gains and will make cash contributions as necessary in the event of a loss. Even though it appears that the worst of the financial crisis is over, Freddie Mac is still a long way from being able to pay off their debt. The corporations may need 15 years to fully refund the taxpayers, according to Moody's Analytics. Due to the ongoing uncertainty, many crucial employees have left Freddie Mac, and necessary infrastructure and systems have not been adequately funded. The government continues to play a significant role in the day-to-day operations of Freddie Mac.

Recommendation:

In light of the fact that the federal government now backs almost all home loans made in the nation, almost everyone agrees that the current level of support is unsustainable over the long term and that private capital will eventually have to take on greater risk in the mortgage market. That leaves today's policymakers with two crucial things to think about: How can we successfully adopt this new form of financing homes, and what role should the federal government play in the housing market of the future?

Since the start of Freddie Mac's conservatorship, numerous advocacy groups, academics, and industry stakeholders have put forth potential solutions to these worries. The majority of these suggested solutions agree that some form of government support is necessary to ensure a stable housing market and to protect the 30-year fixed-rate mortgage.

In January 2011, the Mortgage Finance Working Group, sponsored by the Center for American Progress, revealed its plan for properly closing down Freddie Mac and restoring private capital to

the American mortgage market. The group is a progressive alliance of leading academics, experts in housing finance, and proponents of affordable housing. In our plan, the viability and affordability of specific mortgage products are explicitly guaranteed by the government, private companies are required to serve the entire market, and a regulator with this authority is established. The roadmap for any reform initiatives also includes the following five guiding principles:

- Mortgage credit is widely available and uniform in every community.
- Stability of mortgage lending in various economic climates
- standardization of transparent items that are easy to grasp.
- There are affordable mortgage options available for both house purchases and tenancy payments.
- Consumer safeguards that ensure mortgage products and processes serve the long-term interests of borrowers.

CONCLUSION

There is no denying that Freddie Mac was a dysfunctional firm that made a number of bad business decisions, and taxpayers shouldn't ever again be compelled to pay for any financial institution's greed. But when decision-makers think about how housing finance will work in the future in the United States, they need to come up with clever solutions that focus on the issues with the current system while keeping the components that have worked well for years. The federal government must keep playing a large role in the housing market, whether it does so through Freddie, a new agency, or wholly private businesses.

REFERENCES

- Federal Housing Finance Agency. (n.d.). Fannie Mae and Freddie Mac: Protecting Americans' biggest investment. Retrieved from <https://www.fhfa.gov/AboutUs/Reports/ReportDocuments/FHFA-OIG-15-002-Protecting-Americans-Biggest-Investment-508.pdf>
- Green, K. (2008). Early American Housing. Oxford Research Encyclopedia of American History.
- Hackworth, J. (2007). The Neoliberal City: Governance, Ideology, and Development in American Urbanism. Cornell University Press.
- McCormick, R. A. (2017). Early American Houses: A Historical Overview. *Journal of Architectural Historians*, 76(2), 119-127.
- U.S. Department of Housing and Urban Development. (n.d.). About Ginnie Mae. Retrieved from <https://www.ginniemae.gov/About/Pages/default.aspx>
- France. (2009, March 12). Freddie Mac's 2008 losses pile up to \$50.1 billion. *France 24*. <https://www.france24.com/en/20090311-freddie-macs-2008-losses-pile-501-billion->
- Marshall, W. C., & Concha, E. (2012). Fannie Mae and Freddie Mac: A Bailout for the People? *Journal of Economic Issues*, 46(2), 557–564. <https://www.jstor.org/stable/23265036>
- Hill, J. A. (2010, July 26). Bailouts and Credit Cycles: Fannie, Freddie, and the Farm Credit System. *Papers.ssrn.com*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1524300