

**IS THERE A ROLE FOR GOVERNMENT SPONSORED ENTITIES WITHIN THE
ORIGINATE-TO-DISTRIBUTE MODEL?
EVIDENCE FROM PRIME AND SUBPRIME MORTGAGES**

by

Jeffrey Low
Bachelor of Science in Economics, University of Victoria, 2011

and

Sheng Wang
Bachelor of Arts in Economics, Shanghai University of Finance and Economics, 2005

PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE IN FINANCE

In the Master of Science in Finance Program
of the
Faculty
of
Business Administration

© Jeffrey Low and Sheng Wang, 2014

SIMON FRASER UNIVERSITY

Summer 2014

All rights reserved. However, in accordance with the *Copyright Act of Canada*, this work may be reproduced, without authorization, under the conditions for *Fair Dealing*. Therefore, limited reproduction of this work for the purposes of private study, research, criticism, review and news reporting is likely to be in accordance with the law, particularly if cited appropriately.

Approval

Name: Jeffrey Low
Sheng Wang

Degree: Master of Science in Finance

Title of Project: Is there a role for government sponsored entities within the originate-to-distribute model? Evidence from prime and subprime mortgages.

Supervisory Committee:

Dr. Andrey Pavlov
Senior Supervisor
Professor, Finance

Mr. Steven Adang
Second Reader
Limited Term Lecturer, Finance

Date Approved: _____

Abstract

This paper examines a role for Government Sponsored Entity's (GSE) within the originate-to-distribute model (OTD). The research determines if originated residential prime and subprime mortgages in the OTD market, have a positive correlation with housing foreclosures, by analyzing residential OTD rates in 2007 and comparing it to foreclosure rates in 2008 for all 51 states in the United States. This paper breaks down OTD mortgages into purchaser and loan type in order to determine a relationship between GSE OTD/government mortgage guarantees and foreclosure rates. The paper has limited scope due to data limitations; however, our results indicate that higher levels of residential mortgage OTD rates on a state-wide level, causes foreclosure rates to increase in the US between 2007 and 2008.

Keywords: Government Sponsored Entity (GSE); Originate-to-distribute (OTD); Mortgage; Foreclosure

Acknowledgements

We would like to acknowledge all the professors at SFU who inspired our research topic and dispensed valuable advice and ideas throughout the thesis process. Most importantly, we would like to thank our friends and family for their constant love and support throughout our time in the MSc Finance program.

Table of Contents

| | |
|--|-----------|
| Approval | ii |
| Abstract | iii |
| Acknowledgements | iv |
| Table of Contents | v |
| 1.0 Introduction..... | 1 |
| 1.1 Brief Background | 2 |
| 2.0 Literature Review | 4 |
| 2.1 Previous Research | 4 |
| 2.2 Innovation | 5 |
| 3.0 Data and Methodology | 7 |
| 3.1 Data | 7 |
| 3.1.1 HMDA | 7 |
| 3.1.2 Foreclosure.com | 8 |
| 3.2 Methodology | 9 |
| 3.2.1 OLS Regression Analysis | 9 |
| 3.2.2 Statistic Analysis | 10 |
| 4.0 Limitations of Research | 12 |
| 4.1 OTD Data | 12 |
| 4.2 Foreclosure Data | 13 |
| 5.0 Empirical Results..... | 14 |
| 5.1 Total OTD and Foreclosure Analysis | 14 |
| 5.1.1 Background | 14 |
| 5.1.2 Total OTD | 15 |
| 5.2 OTD by Purchaser Type | 16 |
| 5.2.1 Background | 16 |
| 5.2.2 Government Sponsored Entities (GSE) | 17 |
| 5.2.3 Private Institutions | 17 |
| 5.2.4 Commercial Banks | 18 |
| 5.2.5 Life Insurance and Credit Unions | 19 |
| 5.2.6 Other and Affiliate Institutions | 20 |
| 5.3 OTD by Loan Type | 21 |
| 5.3.1 Background | 21 |
| 5.3.2 Conventional Mortgages | 22 |
| 5.3.3 FHA Insured Mortgages | 22 |
| 5.3.4 VA Guaranteed Mortgages | 23 |
| 5.3.5 FSA/RHS Mortgages | 24 |
| 6.0 Conclusion | 25 |
| 6.1 Is There a Positive Relationship Between OTD Rates and Foreclosures? | 25 |
| 6.2 Is There a Role for GSE's Within the OTD Model? | 26 |

| | |
|---|-----------|
| 6.3 Is There a Role for Gov't Mortgage Guarantees in the OTD Industry?..... | 28 |
| 7.0 Appendix..... | 30 |
| 7.1 Empirical Results..... | 30 |
| 7.1.1 Total OTD VS Foreclosures..... | 30 |
| 7.1.2 GSE OTD VS Foreclosures..... | 30 |
| 7.1.3 Private OTD VS Foreclosures..... | 31 |
| 7.1.4 Commercial Bank OTD VS Foreclosures..... | 31 |
| 7.1.5 Life Insurance/Credit Union OTD VS Foreclosures..... | 32 |
| 7.1.6 Others/Affiliate OTD VS Foreclosures..... | 32 |
| 7.1.7 Conventional OTD VS Foreclosures..... | 33 |
| 7.1.8 FHA OTD VS Foreclosures..... | 33 |
| 7.1.9 VA OTD VS Foreclosures..... | 34 |
| 7.1.10 FSA/RHS OTD VS Foreclosures..... | 34 |
| 7.2 HMDA Raw Data..... | 35 |
| 7.3 Foreclosure.com Raw Data..... | 36 |
| 7.4 HMDA Data Breakdown..... | 37 |
| 8.0 References..... | 38 |
| 8.1 Works Cited..... | 38 |
| 8.2 Works Consulted..... | 39 |

1.0 Introduction

“If it moves, tax it. If it keeps moving, regulate it. And if it stops moving, subsidize it”

– Ronald Reagan (August 15, 1986)

This paper presents three innovations in the field of residential mortgage originations in the originate-to-distribute model (OTD), which have not been studied in detail in academic literature. We go beyond previous research in the field by approaching the OTD industry from its impact on foreclosure rates; using this data to demonstrate that government involvement, through government sponsored entities (GSE), is a positive factor on foreclosures the following year. The paper builds a strong conclusion from three unique angles:

- (I) The impact of prime and subprime mortgage OTD on foreclosure rates in each state, to motivate the need for intervention in the industry. Is there positive relationship between OTD rates and foreclosures in the US?
- (II) The breakdown of OTD data into originated residential mortgage purchaser types, in order to observe the performance of GSE’s and other originators. Is there a continued role for GSE’s in the OTD process?
- (III) The Separation of state OTD rates into loan types, to observe the success of government and conventional mortgages. Is there evidence to support the role of government guarantees and insurances on mortgages within the OTD industry?

The research has been motivated by several factors which were uncovered during the data collection phase of the report. A fascinating pattern exists in the residential housing data from 2000-08: as the prevalence of OTD market increased, reaching \$3.6 trillion USD in 2006, foreclosures increased across the country (Keys et al. 2010). Looking further, into the OTD data provided by the federal government, there is a significant pattern on a statewide level. States that had the highest OTD rate as a percentage of their total mortgages originated in a year, had the highest foreclosure rates the following year. Disregarding the prime/subprime classification, there is large body of research that classified OTD as a safe and positive process that improves liquidity within the market, drives down borrowing costs, and reduces/shifts the credit-risk of financial institutions (Anderson, Capozza and Van Order 2011; Demyanyk and Hemert 2008). However, our data uncovered that the popularity of the OTD model in residential mortgage origination, increases the likelihood of defaults the following year.

Once sufficient evidence had been uncovered about the increased level of foreclosures among OTD mortgages, the particular players in the industry were researched. The five largest players in the residential mortgage OTD market were analyzed by observing their origination volumes in 2007. This revealed that GSE's were a particularly strong performer from a reduced foreclosure point of view, which infers that their presence in the industry helps reduce foreclosure rates the following year. As we continued to look at the OTD market in more detail, a negative correlation was found between government guaranteed loan types (VA, FHA, FSA/RHS) and foreclosure rates. Conventional loans had strong positive correlation between OTD and foreclosures rates, and performed significantly poorer than government extended loans. However this result is not conclusive due to the limitations and biases that are embedded within our data, which will be studied in further detail in section 4. Please refer to *appendix 7.4* for detailed breakdown of the OTD data set from HMDA.

Based on the strong statistical results of this paper and previous research in field, we support government involvement in the residential mortgage OTD market because all other financial institutions seem incapable at overcoming information asymmetry (adverse selection and moral hazard), leading to increased foreclosures. Research indicates that OTD market has a positive correlation with foreclosures and we advocate for a continued presence of GSE's within the mortgage origination process, as well as increased government monitoring of mortgages. This is necessary to protect investors within the OTD market (through securitizations, etc.), ensure stability of all financial markets, and keep markets highly liquid and efficient.

1.1 Brief Background

The first residential mortgage-backed securities were created by the Department of Housing and Urban Development in 1970; they were sold as securities by GSE's (Apostolik, Donohue, and Went 2009). Since then, the pervasiveness of the OTD market has transformed the mortgage/financial industry from a traditional "buy and hold," to a "buy and sell" approach (Keys, Mukherjee, Seru and Vig 2010). The new approach, also known as the OTD model, has led to explosive growth in the mortgage origination industry (Butler 2009). This poses a unique issue for regulators and government agencies, as the modern OTD process escalates agency risks that arise from the originator not suffering the consequences of a non-performing loan. The specific type of risk, called moral hazard, has been shown to reduce the loan underwriting quality of an institution due to reduced incentives to extend high quality credit (Apostolik et al. 2009). Other risks that arise from the mortgage OTD industry include: inefficiencies between the

originator and investors (fees, tax, and mispricing), weak monitoring incentives of the originator, and renegotiation difficulties after the mortgage is sold (Jiang, Nelson, and Vytlačil 2013). Although the benefits of the OTD process have been heavily researched (Casu, Clare, Sarkisyan and Thomas 2011; Jiang et al. 2013) and is widely known to reduce credit risk and financing costs, the sharp spike in residential foreclosures from 2005-08 indicate that the process is negatively effecting residential housing market.

This research paper follows the structure: *(i)* Section II examines the relevant research literature and earlier empirical evidence on the OTD process and highlights the innovations made in the paper; *(ii)* Section III carefully reviews the data sources and analytical technique used throughout the papers research; *(iii)* Section IV examines the limitations of our data and results; *(iv)* Section V presents the empirical results of our OTD and foreclosure research; and *(v)* Section VI analyzes the results and presents the conclusion of our research.

2.0 Literature Review

The OTD industry is a heavily researched area of study that has established inconclusive results in determining whether the process of buying and selling residential mortgages, negatively influences the economy. The body of research divides into three areas of focus: 1) subprime mortgage crisis analysis; 2) negative impacts of OTD; and, 3) the positive impacts of OTD. There is little research on the originators in the market and the quality of loans originated from these entities; even less literature exists on the effects of government involvement within the OTD industry. The literature review will provide a brief examination of previous research in the field and point out key innovations that were discovered in this research paper.

2.1 Previous Research

The largest body of research exists on the cause and effect of the subprime mortgage crisis and the role of OTD and securitization. The researchers Gaied, Aloui, Salha and Nguyen (2012), study 6775 American banks over five years (2003-2007) to determine whether the role of loan securitization can explain the risk taking behaviour leading up to the subprime crisis. They examine the general securitization of subprime loans by commercial banks (by looking at OTD percentages) and compare them to bank failures. Although it had been commonly perceived that securitization and the OTD model increased short-term bank profits, it has been shown in the long-run to decrease profitability and increase the exposure to default risk. Similar research by Demyanyk and Hemert (2008), as well as Mian and Sufi (2009), examine mortgage and default data extensively to help clarify the body of research and determine the actual cause of the 2007-08 financial crisis. Both papers approach their research from three areas: income based, supply based, and expectations based; and find that the quality of mortgages deteriorated steadily since 2001.

Another main category of research conducts analysis on information asymmetry in the OTD industry and its effects on lending standards and practices. This includes research conducted by Keys et al. (2010), who determined whether the OTD process reduced incentives for financial institutions to screen prospective borrowers, by looking at credit scores. By using the “rule of thumb,” an industry-wide cut-off for credit scores, the author demonstrates how securitized non-agency loans (non-GSE, also referred to as subprime in this paper) are susceptible to moral hazard, due to the OTD model. They discover that the OTD model did affect the screening process of subprime loans, as loans just below the threshold were held to higher

screening standards than loans that were just above the cut-off. This finding is further reinforced by Shi (2012), about whether strict mortgage broker licensing leads to higher lending standards and better mortgages. The results conclude that higher regulation of the mortgage broker industry, leads to higher quality mortgages, as observed through lower default rates of loans. The paper points out value in the broker screening process and a stringent examination process, when mortgages are used for OTD purposes.

Although the main area of research in the OTD model has focused on the negative impacts, there is another group of researchers who have uncovered some positive findings. Jiang et al. (2013) found the opposite conclusion, when examining the relationship between OTD and loan performance using a dataset from major commercial lenders. Their evidence suggested that loans that remain on the balance sheet tend to have a higher delinquency rate than loans that are subsequently sold for securitization purposes. This effect is caused by investors being able to see the loan characteristics after the loan is originated, therefore weeding out the poor performing loans. Furthermore, Casu et al. (2011) investigated the impact of the OTD model on the credit risk taking behaviour of US bank holding companies (affiliate institutions), using data from 2001-2007. The authors found that there was a negative relationship between the securitization of mortgages, home equity loans, and consumer loans and credit risk, because banks become more risk averse as their balance sheet accumulates increased volume of securitization products.

2.2 Innovation

Regardless of previous findings, this paper presents three innovations in the field of residential mortgages and the OTD model by studying the:

- (I)* Impact of prime and subprime mortgage OTD market on foreclosure rates in each state to motivate the need for intervention within the residential mortgage industry.
- (II)* State OTD rates by purchaser types, in order to observe the performance of GSE's and other originators.
- (III)* State OTD rates by loan types, to find which loan types perform the best, government or conventional.

This paper goes beyond previous research in the field by approaching the OTD industry from a perspective of foreclosures and the impact of government involvement; building a conclusion from two unique breakdowns not yet seen in academic literature.

The first innovation made in our paper involved the inclusion of all originated 1-4 family dwelling residential mortgages, prime and subprime, in our data sample. As cited above, many researchers in the field have analyzed the effect of subprime mortgages on different variables with different degrees of success; we set out to build a more robust relationship to determine the net effect on foreclosures. The results reveal a strong positive correlation between all OTD and foreclosure rates, and produces consistent results within academic literature. This innovation was completed in order to build an argument against the prevalence of the OTD model in residential mortgages because of increases in foreclosure rates the following year.

The second innovation made to the general body of knowledge is the detailed breakdown of purchaser types into GSE's, commercial banks, life insurance/credit unions, private institutions, and affiliates, in order to determine whether government originators have a positive impact on foreclosures and have a role within the industry. There have been no published academic papers in our research that analyze the purchaser type of all mortgages in the OTD market on a per state basis. This innovation identifies the main players within the OTD industry, gauges their level of involvement in each U.S. state, and evaluates their mortgages' performance. While other papers have broken down purchaser types (Anderson et al. 2011) in the OTD industry, they have never included prime and subprime mortgages, and never approached it from a pro-government perspective. The innovation is the first of its kind in OTD literature, which finds evidence to support a government role in the OTD market for 2007-08.

The last innovation included within the field of research is the further breakdown of OTD mortgages by loan types: conventional and government guaranteed (VA, FHA, and FSA/RHS). This was included to provide evidence for the positive influence that government loans appears to have on the OTD industry through reduced foreclosures. The breakdown was also conducted to provide sufficient evidence against conventional mortgage loan types and motivate the need for continued support in government guaranteed loans where appropriate. Once again, there are no other published works, which have broken down originated securities into loan types for determining a role for government entities. This is an important innovation to current academic literature because we find evidence that supports the role government guarantees within the mortgage OTD industry for 2007-08. No other papers have analyzed the OTD mortgage types from a government perspective, which is new to the academic literature that was reviewed.

3.0 Data and Methodology

3.1 Data

This research uses two main data sources to build the relationship between OTD rates and foreclosures; the data segment will be broken into two sections: the Home Mortgage Disclosure Act (HMDA) and Foreclosure.com. These sections aim to explain the research data in detail and provide a background into the methodology and analysis process.

3.1.1 HMDA

The Home Mortgage Disclosure Act (HMDA) was enacted in 1975 and implemented through Regulation C, on July 21, 2011 (Gupta, Sharma and Mitchem 2010). The HMDA has two main purposes within the mortgage industry. The first purpose of HMDA is to provide public information on housing data, financial institutions, and lending patterns within geographic regions. This data is collected by the government to ensure that financial institutions are meeting the needs of all US citizens (regardless of where they reside) in order to reduce discriminatory lending (Gupta et al. 2010). The second purpose of the HMDA, is to aid the government in targeting private and public investment to areas of the country requiring government support; this increases the efficiency of the federal governments tax spending. The HMDA resources are collected and maintained on an annual basis by the Federal Financial Institutions Examination Council (FFIEC) and this information is released electronically and can be viewed publically (“HMDA Data” 2014). The HMDA data source is unique and the only information provider to track the total amount of originated mortgages in a specified year, along with a wealth of additional information and features.

Our data targets all originated, 1-4 family dwelling mortgages, in 51 states of the USA (excluding Puerto Rico) for 2007, in an attempt to uncover residential mortgage OTD patterns and to determine if a government presence has a positive impact on foreclosures between 2007-08. Puerto Rico was excluded due to its isolation from the US housing market and status as a tourist destination, which can add a bias to our OTD/foreclosure results. By limiting the search parameters on the HMDA database to only cover originated mortgages of 1-4 family dwelling homes (non-manufactured), the research looks at smaller sized, residential loans, rather than larger commercial property loans which generally require higher documentation levels and collateral (Gregory 2012). Limiting the search to mortgages originated within 2007, only new

mortgages were examined, not recycled loans from previous years outside our field of research. By utilizing data that only covers originated residential mortgages in the United States for one year, we were able to pin point a specific time within the OTD market. This will allow us to build a clear relationship, without adding other economic or environmental factors that inadvertently cause a bias in the results. Refer to *appendix 7.2* for raw data and *appendix 7.4* for detailed breakdown of the data set.

For our analysis, a unique period was examined, which uncovered a strong relationship between our underlying variables. We chose the year 2007 for our OTD data because many researchers and analysts in the field (Keys et al. 2010; Gaied et al. 2012) believe this was a stressed period in the OTD market, particularly in subprime credit. This will also provide insight into a time that experienced some of the most extreme foreclosure rates in US history and arguably, the weakest lending standards (Keys et al. 2010). The 2007 OTD data was broken down into state-level detail in order to uncover a pattern in different OTD procedures in diverse geographic regions across the country. The breakdown provides enough data points, 51 or 49 degrees of freedom (dof), to describe a relationship between two variables, while being efficient from a data application perspective. To build the relationship between OTD and foreclosure rates, the volume of OTD loans (or origination count) were compared to the total number of foreclosures in 2008. The dollar value of mortgages were not utilized because of its relative complexity and its inability to add any additional level of clarity to the thesis.

3.1.2 Foreclosure.com

For our data on foreclosures, we utilized statistics from the research of Lucy and Herlitz (2009), who conducted detailed analysis on foreclosure data for 2008; the data was obtained from Foreclosure.com. Foreclosure.com is the US's largest database of distressed properties and contains detailed information on pre-foreclosures, bankruptcy, and tax liens across the country ("Foreclosure Data" 2014). This data source was selected over a competitor like RealtyTrac because it was readily available through the research of Lucy and Herlitz (2009). Furthermore, RealtyTrac reported more than double the amount of foreclosures in 2008 than Foreclosure.com because their data source recorded more than 860,000 repossessed properties by lender (not foreclosed). Refer to *appendix 7.3* for raw data. Foreclosure.com proved to be more accurate for the purposes of this research.

The total number of foreclosures and pre-foreclosures in the US in 2008 was 1,009,485, which according to the US Department of Housing and Urban Development (2014) was 0.79% of

2007 housing units. Foreclosures in 2008 were highly concentrated in four states: California, Florida, Nevada, and Arizona; constituting 62% of the US foreclosure total and 87% of national housing price declines (Lucy and Herlitz 2009). By using the year 2008 as a proxy for our foreclosure rate, the results will use a highly concentrated data set that has a high level of foreclosures in order to obtain significant results. We also utilized 2008 foreclosure data because during the 2007-08 era, many housing foreclosures occurred very quickly after the loan was extended; however, the period examined in our research is one of the major limitations in our papers research (Lucy and Herlitz 2009).

3.2 Methodology

The research begins with a broad overview of the OTD industry and its relation to the foreclosure rate within a particular state. This motivated our main body of research and topic of this paper: whether there is a role for government-sponsored institutions in the OTD industry, through originations and guarantees. The first government analysis classified the percentage of all OTD mortgages by institution type (five different class types) and compared them to the total foreclosure rate in each state the following year. The quality of each purchaser type was determined by the positive or negative relationship between the percentage of OTD mortgages by that institution and the total foreclosure rates in each state. Our second government-level assessment segregated the total amount of OTD loans by percentage of loan type in order to determine whether government guaranteed mortgages, such a FHA or VA, result in lower foreclosure rates. We conducted our analysis using a linear OLS regression, and analysed two statistics for accuracy: adjusted R-square and t-test.

3.2.1 OLS Regression Analysis

Regression analysis predicted a relationship between a selected variable (OTD rates) and an observed outcome (foreclosure rates); it is essentially a line of best fit between two variables (Hoy, Livernois, McKenna, Rees, and Stengos 2001). Using linear regression in the ordinary least squares (OLS) model, we can create a robust formula that can fit our real-word data.

$$(1) Y = aX + b$$

The linear regression function in equation (1) is a standard pre-set regression formula within a worksheet in Excel. We have decided to present the linear regression form, over the log or exponential format because of its intuitive nature and relative ease to build a strong argument within the research paper. Another important aspect of the linear regression formula is its ability to provide a precise best-fit line with very few data inputs; however, the more data points utilized, the more convincing the research becomes because its dof increases.

3.2.2 Statistic Analysis

The adjusted R-square value is used to measure how well the OLS linear regression formula in equation (1), fit the real-world OTD and foreclosure data. In statistical terms, “the R-square is the square of the correlation between the response values and the predicted response values,” and is called the coefficient of multiple determination (“R-square” 2014).

$$(2) R^2 = 1 - \left[\frac{\sum_{i=1}^n w_i (y_i - f_i)^2}{\sum_{i=1}^n w_i (y_i - y_{ay})^2} \right] = 1 - [SSE/SST]$$

$$(3) \bar{R}^2 = 1 - \left[\left(\frac{SSE}{df} \right) / \left(\frac{SST}{df} \right) \right]$$

The adjusted R-square coefficient (3) was used in this research paper over the simpler R-square term (2) because the data in our research is a small sample of the population of mortgages and foreclosures in the US. Since we did not include the entire universe of data in our data set, there is a high probability that there is some bias in our sample. In fact, one of the disadvantages with R-square analysis is that an increase in the number of data point’s results in a larger value of R-square regardless of how well the extra data explains the relationship (“R-square” 2014). When R-square is used incorrectly, it can over inflate the OLS regression’s ability to explain the variance in the relationship. The adjusted R-square analysis is used because of the small sample size (relative to the population) and its ability to filter out noise/bias that can artificially inflate the relationships strength.

The two-sample t-test with unequal sample size and variance was used, with a 95% confidence level rather of a one-tail test because we wanted to capture the variance on both sides of the coefficient error term (standard deviation) to get a complete picture of the relationships

statistical significance. The t-statistic was utilized over the P-value approach because we can analyse one value instead of providing a range of values.

$$(4) \quad t = \frac{\bar{X}_1 - \bar{X}_2}{s_{\bar{X}_1} - s_{\bar{X}_2}}$$

Formula (4) represents the t-stat calculation for a two-sample t-test. The paper utilizes a two-tail t-test on each coefficients standard error term in order to determine which terms are significant for our research. The t-stat calculated in equation (4) is compared to the critical two-tail t-value of 2.009575 (using 49 dof) to determine the level of significance of the error term with 95% confidence. One drawback of statistical tests like the t-test, is that it relies heavily on unrealistic assumptions and other unknown characteristics of your data set; the test choice is susceptible to human error (Vogelvang 2005). Regardless, the t-test is a useful tool to determine whether our results have sufficient data points to draw a reliable academic conclusion about foreclosures and OTD.

4.0 Limitations of Research

This paper has a solid linear regression relationship and the results are statistically significant; however, two limitations occurred during the data collection phase. Limitations on OTD and foreclosure data caused the research to be less thorough than originally intended because only one year of data was utilized for OTD (2007) and foreclosure (2008) rates. The drawbacks signify a need for further research in the field and help to highlight areas that require further investigation by other researchers, as explained below.

4.1 OTD Data

The first limitation relates to the OTD data that we obtained from the FFIEC's website, which contained HMDA mortgage information. During our research, we uncovered a program available from the federal government that could data mine specific years of HMDA data and export it to an Excel CSV file; parameters were selected using drop down menus to ensure the correct data was applied. However, the program was only available from the year 2007 onwards; without it, we would have to do extremely time consuming manual data entry into an Excel spreadsheet. For the scope of our research, one year was sufficient to build a simple relationship for a specific period of 2007-08, however further data should be used to observe if this pattern continues to persist. More years of data would reduce the time bias in our data and help explain a more powerful and robust relationship over a longer period. Older (up to 2004) and current data (up to 2013) could be mined manually using a programming language, such as VBA or Matlab, or be ordered from the federal government for a fee.

The other limitation regarding OTD data is the actual data source itself. Although we used a reliable government agency for our research, there are errors contained in the data, such as incomplete or missing information in certain entries. For example, under the purchaser type section of our research, we had a group of institutions called "others/affiliates." The 'other' in the title, was generally used by the data collection agency when a data field was left blank or filled in incorrectly; this can skew the results by placing certain mortgages in an incorrect category (Gupta et al. 2010). More research is required to research the details behind this purchaser type and other examples like it and possibly try to eliminate entries that contain errors or incomplete information. By doing so, the mortgage sample size would be reduced but would create a more realistic representation.

4.2 Foreclosure Data

The second limitation lies within the foreclosure data obtained from Foreclosure.com, one of the industry leaders in foreclosure data reporting (“Forelosure Data” 2014). Throughout the research collection process, it was difficult to find foreclosure data on a per state basis due to the cost of obtaining a reliable database. We had originally contacted RealtyTrac, based out of California, about obtaining five years of foreclosure data from 2005-09, but the cost was prohibitively expensive and could not proceed. We did manage to locate one source with a year of free foreclosure data for 2008. The researchers, Lucy and Herlitz (2009), conducted detailed analysis on the foreclosure rates on every US state in 2008, and obtained the data from Foreclosure.com. We had originally expected to analyze the foreclosure rates for a range of years (and compare to OTD rates), but due to financial reasons, were unable to do so. Further research should be conducted using more years of foreclosure data to substantiate the effects of the OTD process. Loans generally default over a period of 1-5 years and the data should reflect this in order to increase the impact of the results (Hull 2012).

Sources such as Foreclosure.com and RealtyTrac are prone to biases and errors imbedded within the data, and information could vary widely from one source to the next. When conducting future research on this topic, it is important to keep in mind that the chosen data source could have drastic impacts on the result. For example, the foreclosure data on RealtyTrac for 2008 included more than double the amount of mortgages that were found on Foreclosure.com’s database (Lucy and Herlitz 2009). RealtyTrac included default mortgages that were repossessed by the lender, which would have been inappropriate for this paper.

5.0 Empirical Results

The results have been obtained through intensive research into residential mortgage OTD and foreclosure in the US, represented by a group of simple relationships between 2007 HMDA mortgage OTD data and foreclosure data on mortgages in 2008 between all 51 US states (excluding Puerto Rico). We begin the empirical results section by building a relationship between total mortgage OTD and total foreclosure rates in order to determine, on a highly robust level, whether OTD has a positive correlation with foreclosure rates. The last two sections of our results build a more specific relationship between the role of the federal government in the OTD process, using GSE's and mortgage guarantees, and total foreclosures at the state level. The relationship found that the OTD model increased foreclosure rates the following year for 2007-08 and substantiates the need for continued a government presence in OTD market and mortgage lending.

5.1 Total OTD and Foreclosure Analysis

5.1.1 Background

The first analysis of OTD and foreclosure rates produces a robust relationship between total OTD mortgages (prime and subprime) and their corresponding foreclosure rates on a state level. Numerous academic literature exists, outlining the subprime OTD process and its cause and effect on the financial crisis of 2007-08 (Anderson et al. 2011; Demyanyk and Hemert 2008), subprime mortgage foreclosures (Keys et al. 2010), and bank defaults (Gaied et al. 2012). However, very little analysis has been undertaken on the OTD model of prime and subprime mortgages and whether it is positively correlated with foreclosures on a state level. We found that the foreclosure rate increases, as the percentage of total OTD increases during the specific period of 2007-08, concluding a positive relationship between the two variables. Our results are similar to finding by Keys et al. (2010), who demonstrated that the high persistence of OTD in subprime mortgages during 2001-2007 caused a 10-25% increase in foreclosure rates due to decreased lending standards, as observed by FICO scores; this provides evidence that our methodology and results are in line with the current body of academic knowledge. Our research takes their result one-step further, by building a more robust relationship between all OTD mortgages and foreclosure rates, in order to shape our argument for continued government involvement.

5.1.2 Total OTD

Utilizing the linear regression function shows a strong positive relationship between the total foreclosure rate in 2008 and the OTD rate in each state, as a percentage of total originated mortgages in 2007. Equation (5) is the linear regression line utilized using the OLS method; the t-stat line below refers to each coefficients t-stat on the standard error term, which is compared to the critical t-stat of 2.009575 (using 49 dof). Refer to *appendix 7.1.1*.

$$(5) \quad Y = 0.0641X - 0.0349$$

t-stat (3.796631) (-3.29643)

The regression formula above, indicates that an increase in the level of OTD mortgages in a particular state (as a function of total originations), corresponds to an increase in the level of foreclosures the following year. This shows that the prevalence of OTD process in the residential mortgage market in 2007 put upward pressure on the foreclosure rate in each respective state. The level of total OTD varies widely per state, ranging from 46 – 73% of total originated mortgages, with a mean of 62.5% and variance of 0.321%. Foreclosure rates per state operate within a tight band between .01 – 4.10%, with a mean of 0.514% and very small variance of $5.803E^{-5}$. Our regression analysis indicates that states with low levels of OTD, have low levels of foreclosures the following year.

The positive regression result is reinforced by the calculated adjusted R-square value of 0.2115 or 21.15%, which produced the second highest value of all other relationships explored within this paper. The value is lower than the R-square value of 0.2273 or 22.73%, indicating the adjusted values superiority in evaluating relationships variance. This indicates that approximately 21% of our relationship’s variation can be explained by our linear regression analysis. Although this figure appears to be low, R-square and adjusted R-square values above 50% in academic disciplines involving the prediction of human behaviour are extremely rare because of the random nature of decisions; our adjusted R-square result sufficiently explains the variation in the given linear relationship’s regression (“R-Square” 2014).

The strong positive relationship, as demonstrated by the corresponding linear regression equation in formula (5) and adjusted R-square value, is strengthened by the use of two-tail t-test analysis in order to prove that the standard errors are statistically significant. For our paper, we assumed unequal variances and a 95% confidence interval. The total OTD slope and intercept coefficient’s standard error had a calculated t-stat that was sufficiently larger than the two-tail critical t-stat of 2.009575. This indicates that the predicted slope coefficient is statistically

significant and greater than or less than zero respectively. Regardless, there is sufficient evidence to support our belief that the OTD market is negatively impacting mortgage foreclosure rates in 2007-08; further analysis will examine whether there is a negative relationship between GSE's in the OTD market and foreclosure rates.

5.2 OTD by Purchaser Type

5.2.1 Background

The second major analysis section involves the detailed breakdown of all originated OTD loans by purchaser type, by comparing the percentage of OTD of each financial institution to foreclosure rates in each state. The research follows the methodology of Keys et al. (2010), however we differentiate our study by breaking down the purchaser types into five sub-groups: GSE's (Fannie Mae, Ginnie Mae, Freddie Mac, and Farmer Mac), commercial banks, private institutions, life insurance companies/credit unions, and other/affiliates. The OTD rate, as total of each states total OTD mortgages, of each institution is compared to the foreclosure rate in each state, in an attempt to find a difference in the quality of originated OTDs between government and non-government entities.

Our results indicated that GSE's and commercial banks had a relatively strong negative relationship between OTD and foreclosure rates. This demonstrates that the mortgage lending practices at these institutions are stronger, resulting in less mortgage foreclosures the following year. Life insurance and credit unions also had a weak negative relationship between foreclosures and OTD rates at these institutions. Private OTD, also known as subprime, had a strongly positive relationship when compared to foreclosures, which indicated that they are less successful at overcoming moral hazard in the OTD market; other and affiliate institutions, such as bank holding companies, had a weak positive relationship. The results are in-line with previous literature that find private purchaser types lead to asymmetric information in the market caused by the OTD and lax lending standards and controls (Keys et al. 2010; Demiroglu and James 2012). Other research by Sarmiento (2012) and Shi (2012) provided further evidence that GSE's are a positive force in the OTD market by determining that their lending standards are higher and more standardized, resulting in less defaults.

5.2.2 Government Sponsored Entities (GSE)

GSE's, better known as prime mortgages or agency loans, have a strong negative relationship between OTD rate and foreclosure rates the following year, as evidenced by the linear regression analysis, calculated R-square value, and the t-test for statistical significance. GSE originated mortgages had a mean of 37.5%, with a small variance of 0.321%, indicating that government entities are prevalent in most states in the US. Refer to *appendix 7.1.2*.

$$(6) \quad Y = -0.0428X + 0.0225$$

t-stat (-2.3453) (3.0094)

The regression breakdown indicates a negative relationship between the GSE OTD volume of all originated mortgages in 2007 and foreclosure rates the following year. This result means that states exhibiting high levels of GSE OTD rates, gives rise to lower levels of mortgage defaults. The argument for increased involvement of GSE's in the OTD industry is enhanced by the adjusted R-square calculation of 0.0826 or 8.26%, which was the sixth highest value of all regressions completed. This value indicated that our linear regression formula (6) explains approximately 8% of relationships total variation, which is considered a decent result for the type of analysis conducted.

A two-sample t-test was conducted on our GSE OTD sample, assuming unequal variances and a 95% confidence interval, and produced a t-stat of -2.3453 for the GSE coefficient error term, which was much greater than the critical two-tail t-stat of 2.009575 (using 49 dof). The intercept term, foreclosures, produced a t-stat of 3.0094, and was also above to the critical value. This indicates that both regression coefficients are statistically greater or less than zero and are considered significant. The relationship is meaningful in demonstrating the success of GSE's in the OTD industry during 2007-08 due to the relatively strong adjusted R-square value and consistency with previous academic literature on the OTD process.

5.2.3 Private Institutions

Private institutions have historically been the underwriters and originators of subprime mortgages, or non-agency loans, which do not meet the strict guidelines of GSE's: loan size, underwriting quality, and borrower credit worthiness (Butler 2009). The subprime mortgages were bundled and sold as non-agency securities, which had been increasing in importance, especially during 1995-2005 when the total value of outstanding securities increased from \$65 to

\$500 billion USD (Keys, Mukherjee, Seru and Vig 2009). Although the private OTD market consisted of only 3.31% of all OTD loans in the US, the magnitude of the dollar value is a problem because private institutions have a strong positive relationship between OTD rates and foreclosures. Refer to *appendix 7.1.3*.

$$(7) \quad Y = 0.3408X - 0.0061$$

t-stat (4.1842) (-2.1550)

The linear regression utilized in formula (7) indicated that there was an extremely strong positive relationship between the OTD rate of private institutions and foreclosure rates the following year. This means that the level of mortgage foreclosures, on a statewide basis, increases as the level of OTD mortgages by private institutions increases; the private coefficient of 0.3408 in equation (7), is the strongest positive relationship of all institutions analyzed. This supports our view of a stronger government role because private institutions have historically demonstrated poor lending standards and misaligned incentives caused by the OTD market (Keys et al. 2009). The regression analysis is supported by the highest calculated adjusted R-square value of 0.2482 or 24.82%, indicating that our relationship explains 25% of the variance between OTD and foreclosure rates.

A two-sample statistical significance t-test was conducted to confirm that the results were meaningful within a 95% confidence level. This resulted in a t-stat value of 4.1842 for the private coefficient standard error, which is significantly larger than the critical t-stat value of 2.009575 (using 49 dof); a t-stat of -2.1550 was produced for the foreclosure intercept term. The strong positive relationship between the private coefficient and foreclosures is statistically significant, which provides further evidence regarding the negative impacts of private institutions in the residential mortgage market. Previous literature supports our findings and further strengthens the argument for a continued government presence in the OTD market.

5.2.4 Commercial Banks

Commercial banks were found to have the strongest negative relationship of all the purchaser types examined in our research. Commercial banks have demonstrated that they are very strong at containing risk during the OTD process; however, they make up a small proportion of total OTD at 7.18%, the second smallest player in the market.

Previous research is conflicted about the negative relationship we uncovered in our research. Our findings are inconsistent with Gaied et al. (2012), who claim that excessive risk

taking behaviour is prevalent among commercial banks, as witnessed by the correlation between bank defaults and the volume of OTD. However, our results are consistent with discoveries by Jiang et al. (2013) who conducted research on the ex-ante and ex-post relationship between loan performance and loan sale. This trend is clearly visible in formula (8) because the slope of the regression line is steeply downward sloping with a commercial coefficient of -0.0808, which is consistent with sound lending procedures and practices. Refer to *appendix 7.1.4*.

$$(8) \quad Y = -0.0808X + 0.0109$$

$$\begin{array}{ccc} t\text{-stat} & (-1.6772) & (3.0273) \end{array}$$

The linear regression analysis indicated that as commercial banks increase the amount of OTD within a specific state, the level of home foreclosures decreased the following year. However, the impact of our result has been reduced due to the minor adjusted R-square value of 0.0350 or 3.5%, which is considered to be on the lower end of the spectrum. This result indicates that there could be some other variable causing the variation within the linear relationship, other than OTD rates of commercial banks. The data is statistically insignificant for the slope coefficient with a t-stat of -1.6772 and the intercept value is significant with a t-stat of 3.0273. This means that the one of two coefficients in equation (8) are not statistically greater or less than zero, and therefore do not affect the predicted result. Regardless, further analysis will need to be conducted to clarify the ambiguity of our regression fit and to see if the prevalence of commercial OTD mortgages reduces foreclosures the following year.

5.2.5 Life Insurance and Credit Unions

Life insurance companies and credit unions consisted of approximately 11.36% of total OTD products in 2007, which was the third largest participant within the industry. Life insurance companies contribute to the OTD market, primarily through the issue of Catastrophe (Cat) bonds, which dominated all other insurance security products with approximately \$31 billion of risk capital (total bond value and payments) issued between 1997 and 2010 (B. Hagendorff, J. Hagendorff, Keasey and Gonzalez 2014). Credit unions make up a small portion of this purchaser type; however, they would conduct business within the OTD market using a procedure similar to a commercial bank (Apostolik et al. 2009).

$$(9) \quad Y = -0.0369X + 0.0093$$

$$\begin{array}{ccc} t\text{-stat} & (-0.7652) & (1.6706) \end{array}$$

The results indicate that there was a weak negative relationship between life insurance/credit union's OTD and foreclosure rates in each US state. This means that as the volume of OTD increases by this purchaser type, there is a weak positive impact on the overall home foreclosure rate, as observed in equation (9). The relationship is negatively impacted by a calculated adjusted R-square value of -0.0084 or -0.84%, the lowest of all values; indicates that none of the variation in our relationship is explained by the regression analysis. This means that the results regression analysis must be researched further to determine a more concrete relationship using a better predictor variable. The two sample t-test indicated that both coefficients standard error terms were statistically insignificant, producing a t-stat of -0.07652 and 1.6706 respectively, that is well below the critical t-stat of 2.009575 (using 49 dof). This means that our data was insufficient to conduct proper academic analysis, and could not explain a relationship between OTD and foreclosures that are associated with life insurance companies and credit unions. Refer to *appendix 7.1.5*.

5.2.6 Other and Affiliate Institutions

The last category of loan purchaser type was other and affiliate institutions, which generally consist of bank holding companies and other off-balance sheet shell companies of large commercial banks; these act as agents in the securitization process ("HMDA Data" 2014). This is the largest group of OTD users throughout the US, with 37.5% of all OTD mortgages belonging to these institutions. Refer to *appendix 7.1.6*.

$$(10) \quad Y = 0.0507X - 0.0139$$

$$t\text{-stat} \quad (2.7129) \quad (-1.9591)$$

Despite the large size of this purchasers market, there was a positive relationship between OTD rates and foreclosures, with the third smallest linear regression coefficient of 0.0507. This means that there is a small positive increase in foreclosure rates, as the magnitude of OTDs by affiliate institutions increases. The regression analysis is strengthened by a calculated adjusted R-square value of 0.1128 or 11.28%, which points to 11% of the variation being explained by the regression. The data's error terms for the slope coefficient was statistically significant, within a 95% confidence interval, generating a t-stat value of 2.7129, which is above the critical t-stat of 2.009575 (using 49 dof); the intercept term was not statistically significant. Regardless of the statistical significance test, the strong R-square value and consistency with previous findings

provide significant evidence for a positive relationship between foreclosure and other/affiliate OTD in 2007-08.

Our results are similar to findings by Casu et al. (2011) that indicated that there was an ambiguous relationship between the OTD volume of affiliate institutions and soundness of the banking system; however, the outcome depended on structure of the OTD product. The positive relationship demonstrated with our papers linear regression analysis concludes the same result.

5.3 OTD by Loan Type

5.3.1 Background

The third and final analysis section involves the breakdown of originated OTD loans into four different types: conventional, FHA insured, VA guaranteed, and FSA/RHS. The first loan type, conventional, consists of typical mortgages that are not eligible for government insurance or guarantees. The last three loan types consist of three different government sponsored programs that aid underprivileged or provide veteran assistance to those in need. FHA insured mortgages, or Federal Housing Administration mortgages, allow lower income American families to buy a house that they would otherwise not be able to afford without federal assistance. VA guaranteed mortgages, or Veteran Affairs mortgages, are designed to provide long-term financing to war veterans and their surviving spouses in order for them to afford a house. Lastly, FSA/RHS mortgages, or Rural Housing Service mortgages, is government assistance provided for farm housing purposes to aid small communities in the rural US (Anderson et al. 2011)

We conduct our research in order to determine, with more clarity, whether more government involvement in the mortgage OTD industry has a positive influence on foreclosure rates the following year. Our research methodology closely follows Anderson et al. (2011), who also broke OTD loans into loan types and compared the breakdown to decreasing loan underwriting standards. However, the researchers did not study the impact of government-sponsored mortgages in the OTD market with respect to foreclosure rates on a statewide level. One prevalent detail of the author's data was the major decrease in government-insured mortgages, from 7.4% in 2001 to 2.7% in 2005, and the corresponding increase in mortgage default rates after 2005. The author's results are similar to our findings, which provided additional support for continued government involvement in the OTD industry.

5.3.2 Conventional Mortgages

Conventional mortgages, as classified by the HMDA, are all mortgages that are not eligible for government sponsorship or support and may include prime, subprime, or Alt-A loans (Gupta 2010). This class of loans are not involved with the government in any formal way, except through GSE's as outlined in the previous analysis section. Refer to *appendix 7.1.7*.

$$(11) \quad Y = 0.0625X - 0.0517$$

t-stat (2.6524) (-2.41)

We have determined through our linear regression formula (11), that there was a positive relationship between conventional mortgage OTD and foreclosure rates in the following year. This means that the more prevalent conventional mortgages are in a specific state, the higher the foreclosure rates will be during 2007-08. This result is supported by an adjusted R-square calculation of 0.1077 or 10.77%, which means that only a small portion of the variation in the error terms are explained by the linear regression. However, due to the minor adjusted R-square values that have been found in previous sections, we consider this to be a strong result. A two-tail t-test was conducted on the each coefficient's error term and was determined statistically significant, with a t-stat of 2.6524 for the conventional error term and -2.41 for the foreclosure error term. These were both above the critical t-stat of 2.009575 (using 49 dof) and indicate that both coefficient terms are statistically greater than or less than zero respectively. The fourth highest adjusted R-square in our research and consistency with previous findings by Anderson et al. (2011), provide sufficient evidence of the positive relationship with conventional loans and foreclosures.

5.3.3 FHA Insured Mortgages

FHA mortgages are the most common form of government support within the mortgage OTD realm, with a market share of 6.3% in 2007. The results indicated that there was a negative correlation between the OTD volume of FHA mortgages and foreclosure rates the following year. Federal Housing Administration loans should continue to be utilized in the OTD market because it appears to have a positive effect on the foreclosure rates in each state. Refer to *appendix 7.1.8*.

$$(12) \quad Y = -0.0831X + 0.0104$$

t-stat (-2.2774) (4.1222)

As observed in formula (12), the FHA coefficient of -0.0831 was the fifth highest magnitude of all regressions completed in this research. The adjusted R-square calculation, at 0.0773 or 7.73%, was a high value when compared to all other regressions, demonstrating that this relationship holds meaning; the variation in the data is described well by the FHA OTD rate. The two-sample t-test was also conducted and returned a t-stat of -2.2774 and 4.1222; the foreclosure intercept term and slope terms were both statistically significant. The statistical significance indicates that the intercept and slope coefficient term is significantly less than or greater than zero and is sufficient within a 95% confidence interval.

5.3.4 VA Guaranteed Mortgages

VA guaranteed loans are loans that are extended to war veterans and their families – the loans are highly documented and well tracked by numerous government agencies (Anderson et al. 2011). The breakdown of loan types uncovers that this type of guarantee is very rare and only accounted for 2.14% of the total originated OTDs in the market in 2007. Refer to *appendix 7.1.9*.

$$(13) \quad Y = -0.1216X + 0.0077$$

$t\text{-stat} \quad (-1.8432) \quad (4.4086)$

The regression analysis specifies that there is a negative relationship between VA guaranteed loans and foreclosure rates in the following year. Formula (13) shows that the VA coefficient value of -0.1216, is a very strong negative result and indicates that VA loans result in less foreclosures the following year, than conventional mortgages. The generated adjusted R-square value of 0.0458 or 4.58% demonstrates that the results are poor at describing the variation in the linear regression analysis. The t-test provided further evidence that our intercept error term was statistically significant, producing a value of 4.4086, however the VA coefficient error term was not, with a t-stat of -1.8432. Regardless of the statistical significance test, the negative relationship and consistency with previous academic findings indicate that OTD VA guaranteed mortgages have a negative relationship with foreclosures. The result is consistent with findings by Anderson et al. (2011) who found that high levels of moral hazard persist within non-agency loan types, causing underwriting risks to be mispriced. Our findings provide further evidence for an increase in government guaranteed loans, as a way of improving OTD and reducing subsequent foreclosures.

5.3.5 FSA/RHS Mortgages

FSA and RHS loans are the smallest loan type of all OTD loans, consisting of 0.66% of the total OTD industry in 2007. We found that there was a strong negative relationship between FSA/RHS OTD volumes and foreclosure rates. The results of this loan type are also in line Anderson et al. (2011) who conducted similar research in order to conclude a different finding.

$$(14) \quad Y = -0.2137X + 0.0065$$

t-stat (-1.9032) (5.1278)

The linear regression analysis indicated a strong negative relationship, as in formula (14), where the FSA/RHS coefficient value of -0.2137 proves this government loan type resulted in less foreclosures in 2008. The adjusted R-square value of 0.0498 or 4.98% demonstrates that 5% of the variation in the data analysis is explained by the regression fit; this is the fourth lowest adjusted R-square value calculated in the research. Refer to *appendix 7.1.10*.

One drawback from utilizing the data on FSA/RHS loan types (and all other government loan types) is the small sample size of the mortgages that utilized. This resulted in our two-sample t-test not being statistically significant within a 95% confidence level for the slope coefficient. The intercept term was strongly significant and produced a value that was above the two-tail critical t-stat with a t-value well over the critical, at 5.1278. Once again, the strong negative relationship and consistency with previous literature indicates that this type of mortgage performs well in the OTD market.

6.0 Conclusion

At the beginning of the paper, we set out to expand the knowledge base of the OTD industry and to answer three questions:

- (I)* Is there positive relationship between OTD rates and foreclosures in the US?
- (II)* Is there a continued role for GSE's in the OTD process?
- (III)* Is there evidence to support the role of government guarantees and insurances on mortgages within the OTD industry?

Through our detailed research and analysis, we have concluded that OTD of 1-4 family dwelling, originated mortgages on a statewide level increased foreclosure rates in 2007-08. There is a role for the government in the OTD industry through GSE's, and the federal government should continue to be involved with mortgage guarantees and insurances.

6.1 Is There a Positive Relationship Between OTD Rates and Foreclosures?

Yes. The research has indicated that the increased prevalence of the OTD market on a statewide level in 2007 increases the likelihood of foreclosures the following year. Having obtained the second highest level of certainty with our results, we are able to infer with a high level of confidence that the volume of OTD that exists in a particular state negatively affects the foreclosure rate the following year. Our research was conducted on a highly robust level where all 1-4 family dwelling mortgages were analyzed and compared to the total foreclosure rate the following year; therefore, these results indicate that the OTD model should be used cautiously. Anderson et al. (2011), found evidence since 2002 which suggests that favourable economic conditions during the 1990s covered up poor underwriting quality and allowed foreclosure rates to only increase by 25% from 1993-2004, rather than double the rate if poor economic conditions had existed. This research further supplements our findings, indicating that OTD has negatively influenced the US economy since the early 1990's, peaking in 2007-08 when the economic conditions finally collapsed. This means that the OTD model, a major tool used by banks to hedge credit risk and finance banking activities, has been a house of cards waiting to tumble for the last 25 years (Anderson et al. 2011).

Since it is the government's responsibility to regulate and protect users of the OTD market, it is very important for them to address these issues in order to prevent future financial

crises and too ensure stability for the global economy. Foreclosures put stress on financial markets by increasing the volatility in the market and the likelihood of a liquidity crisis (Hull 2012). This led us to investigate the breakdown of the OTD industry, in order to determine the main cause of the defaults in the OTD industry and the positive relationship between OTD rates and foreclosures.

6.2 Is There a Role for GSE's Within the OTD Model?

Yes. Our research indicated that there is a need for a government presence within the OTD industry as indicated by the negative relationship between GSE OTD and foreclosure rates; commercial banks also had a very strong negative relationship. Although both institutions have an ability to create high quality loans and adhere to solid lending standards, the results indicate varied conclusions. Commercial banks have a negative relationship by carefully selecting good quality loans to originate (using strong screening standards), while simultaneously funding the previously rejected applicants using an affiliate or subsidiary institution (Jiang et al. 2013). This process is a negative hindrance on the economy. Conversely, we believe that GSE's have the ability to screen potential mortgage applicants effectively and extend loans to people who will not foreclose. Unlike commercial banks, GSE's do not try to profit from selling mortgage products to previously rejected applicants at inflated profit margins through their subsidiary institutions (Sarmiento 2012). This is seen as a positive force for in the OTD industry and we advocate for a continued GSE role in the US, especially in high foreclosure states like California and Nevada, where the government's role in OTD is well below the national average of 37.5% of OTD mortgages.

Commercial banks, credit unions, and life insurance companies have traditionally been strong lenders in residential and commercial loans due to their ability to screen lenders efficiently and extend mortgages to borrowers who have a good history of repayment (Apostolik et al. 2009). However, these entities negative regression results have been influenced by two main factors, producing a relationship between institutions and foreclosures that may be misleading.

Firstly, any anomaly in the potential mortgage applicants credit score, the Fair Isaac Corporation score or FICO, can cause an otherwise sensible loan to be denied, especially when it falls below the "rule of thumb" credit score of 620 (Keys et al. 2010). The conservative level of screening used by banks tends disqualify any applicants with poor credit histories and low-levels of documentation, producing above quality mortgages that are sold to the OTD market at a premium. Meanwhile, the applicants that failed the commercial bank/life insurance/credit

union's strenuous credit screening procedure are passed along to one of the many bank holding companies/affiliated institutions who then extend credit to these risky borrowers at a high level of profit; quickly selling them to the OTD market (Gaied et al. 2012). This usually occurs off-balance sheet to avoid scrutiny from investors.

Secondly, previous research by Jiang et al. (2013) has indicated that commercial banks and credit unions tend to hold the poor quality mortgage originations on their balance sheet at cost to avoid taking a loss on their banking book, while selling the high quality loans to the OTD market at a profit. The research shows that investors obtain further information ex post of the origination and will not buy OTDs that have characteristics that appear to be risky. This means that banks inflate the negative relationship we found between OTD and foreclosures, by not securitizing poor quality loans because there is no investor demand, and instead holding them on or off the balance sheet.

On the other hand, GSE's have a strong history of mortgage screening and lending practices, since the inception of the Farm Credit System in 1916; it now holds approximately \$5 trillion USD worth of mortgages in 2014 ("HMDA Data" 2014). We believe that the results obtained from our research are indicative of continued government involvement in the industry, because states with the highest level of OTD mortgages from GSE's had the lowest foreclosure rates the following year in 2007-08.

GSE's do not use their strict lending requirements to deny undesirable applicants from regular credit, while simultaneously extending expensive credit from an affiliated institution at a large profit; GSE's interact in the OTD market for different purposes and are meant to promote ease of access to the housing market (Shi 2012). Secondly, GSE's do not suffer from the same risks caused by moral hazard in the OTD market and are not profit driven like commercial banks (Sarmiento 2012). Research has shown that GSE's uphold underwriting standards within the OTD industry by segmenting loans into two strict categories: conforming and non-conforming. Any loan that is unwritten and approved according to agency standards can be purchased by a GSE for a small fee to the originating institution and sold as a securitization product. This encourages other institutions to conform to strict lending guidelines in order sell the mortgage to the GSE immediately after origination, removing credit risk from the balance sheet and providing immediate profit to the originator. We believe that GSE's prominence in the mortgage industry should continue to persist.

6.3 Is There a Role for Gov't Mortgage Guarantees in the OTD Industry?

Yes. The research and analysis supported a further need for a government presence in the issuance and guarantee of mortgages in the OTD industry. The negative linear regression relationships between three types of government insured OTD mortgages and foreclosure rates indicate that states with higher government participation, results in less foreclosures the following year for 2007-08 . Furthermore, the strong positive relationship between conventional loan types and foreclosures within the OTD industry promotes continued government support. Without government support, many at-risk residential mortgage applicants would only be able to obtain capital by entering into a subprime or non-agency loan contract that would charge extremely high interest rates (Shi 2012). Since all citizens require some form of housing, many applicants enter into a subprime agreement, only to find out they are unable to afford the monthly payments and subsequently foreclose. Foreclosures are costly to all members of society and are a burden to the economy, and government sponsored mortgage insurance programs are therefore highly essential to the OTD industry (Apostolik et al. 2009).

Conventional loans (non-government insured or guaranteed) tend to exhibit higher foreclosure rates when the volume of OTD of this loan is high in a particular state. This indicates that conventional loans are at a higher risk of default than the more conservative government guaranteed loans, such as FHA, VA, and FSA/RHS. Our results and conclusion are further supported by Shi (2012), who conducted analysis on whether stricter mortgage lending standards, led to improved mortgage performance. Since government guaranteed loans follow stringent guidelines in order for an applicant to receive funds, there are less defaults within the OTD market; this has been evidenced in the research through negative/neutral relationships between government guaranteed loans and foreclosures.

Another aspect of government guaranteed mortgages is that loans classified under this category are less likely to foreclose because the government will be more lenient with delinquent payments and other financial hurdles in times of economic hardship. In other words, the government guarantees the timely payment of mortgage coupons to the corresponding OTD product, regardless of the applicant's payment status (Demiroglu and James 2012). This can be viewed as both a positive and negative factor because fewer foreclosures are a benefit to the economy; however, government bailouts are also a hindrance to economic stability and can promote information asymmetry within the financial industry (Hull 2012). We believe that the opportunities outweigh the risks because the cost of government payments for mortgage support

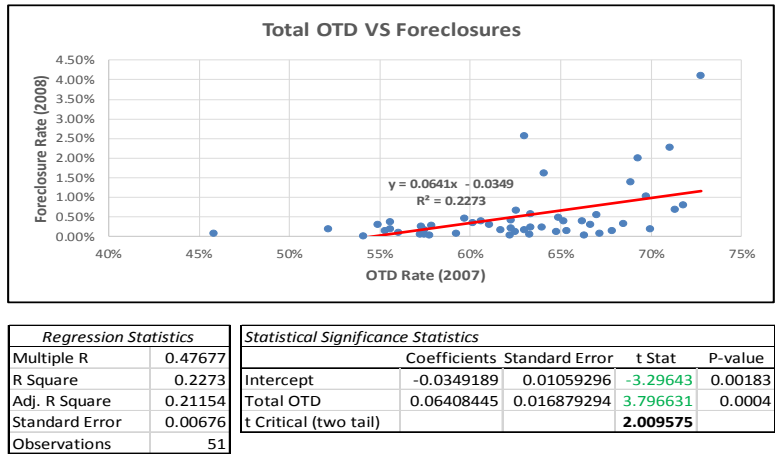
is much smaller, in dollar value, than the cost of foreclosures. Moreover, the additional cost of supporting a citizen who just lost their house to foreclosure is incredibly high due welfare payments, housing costs, and other financial support. We therefore advocate for continued government involvement in the OTD industry through three government guaranteed loan types, FHA, VA, and FSA/RHS.

Overall, the paper's thorough analysis into OTD and foreclosure rates in the US in 2007-08 has determined that OTD rates of all originated residential mortgages have a positive relationship with foreclosures. Our results determined that GSE's are a very strong player within the OTD industry and have a negative relationship with foreclosure rates; commercial and life insurance/credit unions also had a negative relationship, however these results are not deemed appropriate due to the low adjusted R-square value and previous academic literature. Furthermore, government sponsored mortgages had negative relationships with foreclosure rates, while conventional type loans had a strongly positive relationship. These results indicate that there is a role for GSE's within the OTD industry, as evidenced through prime and subprime originated residential mortgages in the US. Regardless of our papers data limitations, we advocate for GSE's continued support in the OTD process and in the mortgage origination cycle.

7.0 Appendix

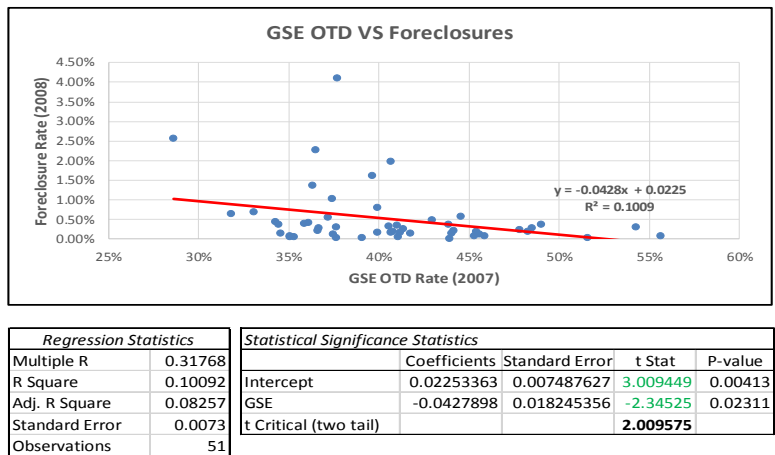
7.1 Empirical Results

7.1.1 Total OTD VS Foreclosures



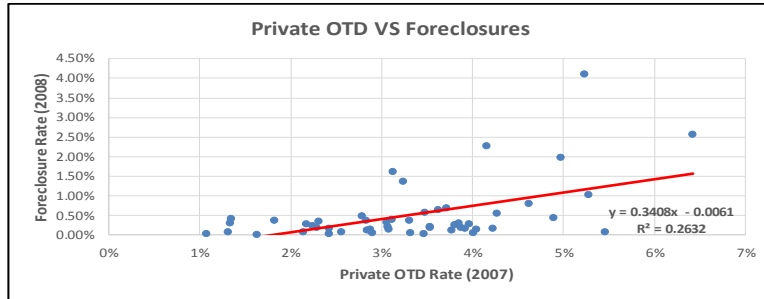
Description: Relationship between total OTD (prime and subprime) and the corresponding foreclosure rates on a state level. We found that the foreclosure rate increases, as the percentage of total OTD increases, concluding a positive relationship between the two variables. The t-stat analysis indicates that both standard error coefficient terms are significant with a 95% confidence (green); concluding that this relationship is significant. Each point represents one of 51 states in the US.

7.1.2 GSE OTD VS Foreclosures



Description: Detailed breakdown of all originated OTD loans by purchaser type, by comparing the percentage of OTD of each financial institution to foreclosure rates in each state. GSE's, better known as prime mortgages or agency loans, were found to have a strong negative relationship between OTD rate and foreclosure rates the following year. Both coefficients are statistically significant (green). Each point represents one of 51 states in the US.

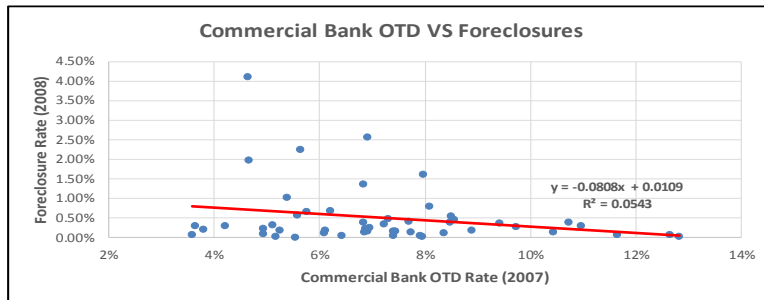
7.1.3 Private OTD VS Foreclosures



| Regression Statistics | | Statistical Significance Statistics | | | | |
|-----------------------|---------|-------------------------------------|----------------|-------------|----------|---------|
| Multiple R | 0.51307 | Coefficients | Standard Error | t Stat | P-value | |
| R Square | 0.26324 | Intercept | -0.0061415 | 0.002849896 | -2.15498 | 0.0361 |
| Adj. R Square | 0.2482 | Private | 0.3408155 | 0.081453922 | 4.184151 | 0.00012 |
| Standard Error | 0.0066 | t Critical (two tail) | | | 2.009575 | |
| Observations | 51 | | | | | |

Description: Private institutions have historically been the underwriters and originators of subprime mortgages, or non-agency loans, which do not meet the strict guidelines of GSE's. Analysis indicated that there was an extremely strong positive relationship between the OTD rate of private institutions and foreclosure rates the following year; reinforced by the significant t-stat for both coefficients (green). Each point represents one of 51 states in the US.

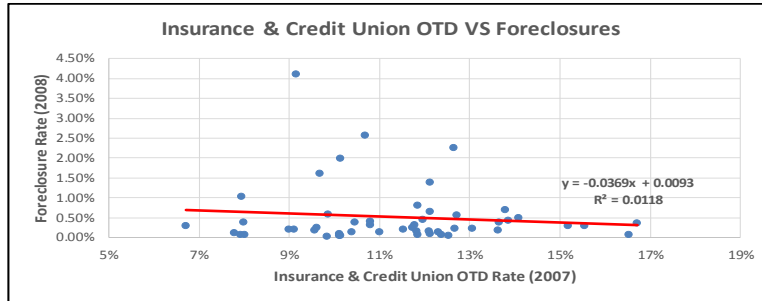
7.1.4 Commercial Bank OTD VS Foreclosures



| Regression Statistics | | Statistical Significance Statistics | | | | |
|-----------------------|---------|-------------------------------------|----------------|-------------|----------|---------|
| Multiple R | 0.23301 | Coefficients | Standard Error | t Stat | P-value | |
| R Square | 0.05429 | Intercept | 0.010936 | 0.003612509 | 3.02726 | 0.00393 |
| Adj. R Square | 0.03499 | Commercial | -0.0807669 | 0.048155472 | -1.67721 | 0.09987 |
| Standard Error | 0.00748 | t Critical (two tail) | | | 2.009575 | |
| Observations | 51 | | | | | |

Description: Commercial banks were found to have the strongest negative relationship of all the purchaser types examined in our research. Commercial banks have demonstrated that they are very strong at containing risk during the OTD process; however they make up a small proportion of total OTD at 7.18%, the second smallest player in the market. The intercept term was statistically greater than zero (green), while the slope term was not (red). Each point represents one of 51 states in the US.

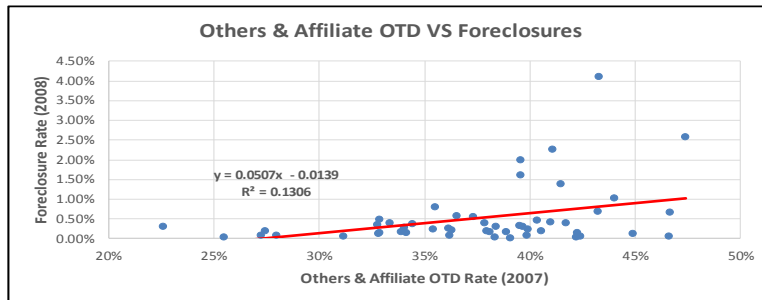
7.1.5 Life Insurance/Credit Union OTD VS Foreclosures



| Regression Statistics | | Statistical Significance Statistics | | | | |
|-----------------------|----------|-------------------------------------|----------------|-------------|----------|---------|
| Multiple R | 0.10867 | Coefficients | Standard Error | t Stat | P-value | |
| R Square | 0.01181 | Intercept | 0.00933317 | 0.005586742 | 1.670593 | 0.10118 |
| Adj. R Square | -0.00836 | Insurance | -0.0369421 | 0.048278151 | -0.76519 | 0.44783 |
| Standard Error | 0.00765 | t Critical (two tail) | | | 2.009575 | |
| Observations | 51 | | | | | |

Description: Life insurance companies and credit unions consisted of approximately 11.36% of total OTD products in 2007. The results indicate that there was a small negative relationship between insurance/credit union's OTD and foreclosure rates in each US state indicating that the two variables move in opposite directions. Both coefficients were statistically insignificant. Each point represents one of 51 states in the US.

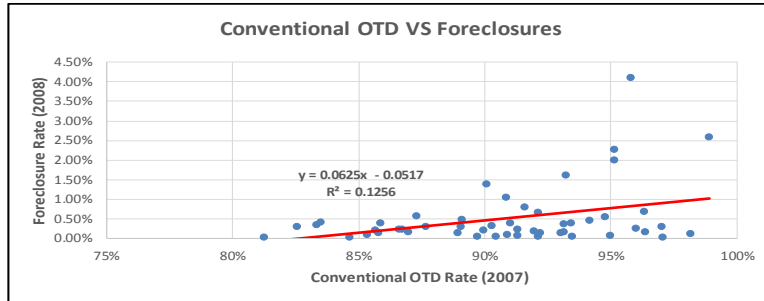
7.1.6 Others/Affiliate OTD VS Foreclosures



| Regression Statistics | | Statistical Significance Statistics | | | | |
|-----------------------|---------|-------------------------------------|----------------|-------------|----------|---------|
| Multiple R | 0.36137 | Coefficients | Standard Error | t Stat | P-value | |
| R Square | 0.13059 | Intercept | -0.0138575 | 0.007073467 | -1.95909 | 0.05581 |
| Adj. R Square | 0.11284 | Others | 0.05065446 | 0.018671682 | 2.712903 | 0.00918 |
| Standard Error | 0.00717 | t Critical (two tail) | | | 2.009575 | |
| Observations | 51 | | | | | |

Description: Affiliate institutions consist of bank holding companies and other off-balance sheet shell companies of large commercial banks. This is the largest group of OTD players in the US, with 37.5% of all originated mortgages belonging to these institutions. Despite the large size of this purchasers market, there was a weak positive relationship between OTD rates and foreclosures. The slope term is statistically significant and is statistically greater than zero (green); the intercept term is no significant (red). Each point represents one of 51 states in the US.

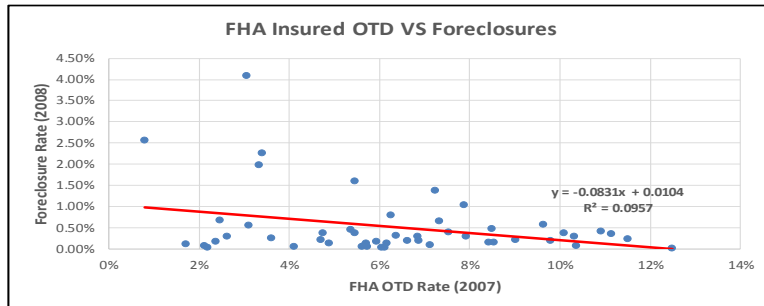
7.1.7 Conventional OTD VS Foreclosures



| Regression Statistics | | Statistical Significance Statistics | | | | |
|-----------------------|---------|-------------------------------------|------------|-------------|----------|---------|
| Multiple R | 0.35433 | | | | | |
| R Square | 0.12555 | Intercept | -0.0516988 | 0.021451927 | -2.40999 | 0.01975 |
| Adj. R Square | 0.1077 | Conventional | 0.06252949 | 0.023574651 | 2.652404 | 0.01074 |
| Standard Error | 0.0072 | t Critical (two tail) | | | 2.009575 | |
| Observations | 51 | | | | | |

Description: Conventional mortgages, as classified by the HMDA, are all mortgages that are not eligible for government sponsorship or support and may include prime, subprime, or Alt-A loans. There was a weak positive relationship between conventional mortgage in the OTD market and foreclosure rates in the following year. Both coefficients were statistically significant (green). Each point represents one of 51 states in the US.

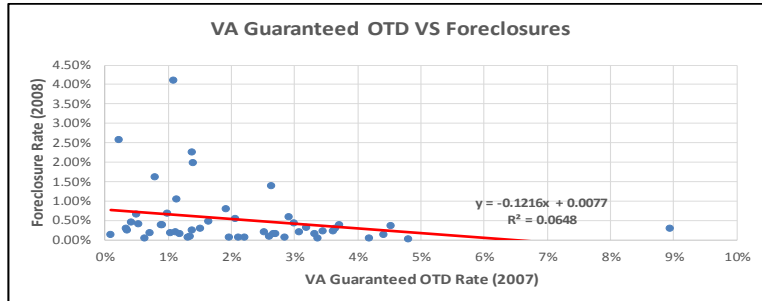
7.1.8 FHA OTD VS Foreclosures



| Regression Statistics | | Statistical Significance Statistics | | | | |
|-----------------------|---------|-------------------------------------|------------|-------------|----------|---------|
| Multiple R | 0.30939 | | | | | |
| R Square | 0.09572 | Intercept | 0.0103701 | 0.002515681 | 4.122185 | 0.00014 |
| Adj. R Square | 0.07727 | FHA | -0.0830528 | 0.036467562 | -2.27744 | 0.02716 |
| Standard Error | 0.00732 | t Critical (two tail) | | | 2.009575 | |
| Observations | 51 | | | | | |

Description: FHA mortgages are the most common form of government support within the mortgage OTD realm, with a market share of 6.3% in 2007. The relationship reveals that there is weak positive correlation between foreclosure rates and OTD rates of FHA loans; this is the opposite of what was expected. Both coefficients were statistically significant (green). Each point represents one of 51 states in the US.

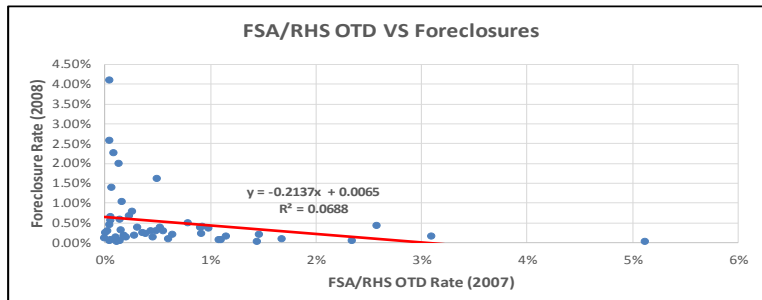
7.1.9 VA OTD VS Foreclosures



| Regression Statistics | | Statistical Significance Statistics | | | |
|-----------------------|---------|-------------------------------------|------------|-------------|----------|
| Multiple R | 0.25463 | | | | |
| R Square | 0.06484 | Intercept | 0.00774412 | 0.001756605 | 4.408568 |
| Adj. R Square | 0.04575 | VA | -0.1215811 | 0.065963668 | -1.84315 |
| Standard Error | 0.00744 | t Critical (two tail) | | | 2.009575 |
| Observations | 51 | | | | |

Description: VA guaranteed loans are loans that are guaranteed to war veterans and their families, and are highly documented and well tracked by numerous government agencies. The regression analysis specifies that there is a negative relationship between VA guaranteed loans and foreclosure rates in the following year. The intercept coefficient was statistically significant (green). Each point represents one of 51 states in the US.

7.1.10 FSA/RHS OTD VS Foreclosures



| Regression Statistics | | Statistical Significance Statistics | | | |
|-----------------------|---------|-------------------------------------|------------|-------------|----------|
| Multiple R | 0.26236 | | | | |
| R Square | 0.06883 | Intercept | 0.00654923 | 0.001277209 | 5.127764 |
| Adj. R Square | 0.04983 | FSA/RHS | -0.2137236 | 0.112296755 | -1.9032 |
| Standard Error | 0.00743 | t Critical (two tail) | | | 2.009575 |
| Observations | 51 | | | | |

Description: FSA and RHS loans are the smallest loan type in the OTD market, consisting of 0.66% of the total OTD industry in 2007. We found that there was a very strong negative relationship between FSA/RHS OTD volumes and foreclosure rates. The intercept coefficient was statistically significant (green). Each point represents one of 51 states in the US.

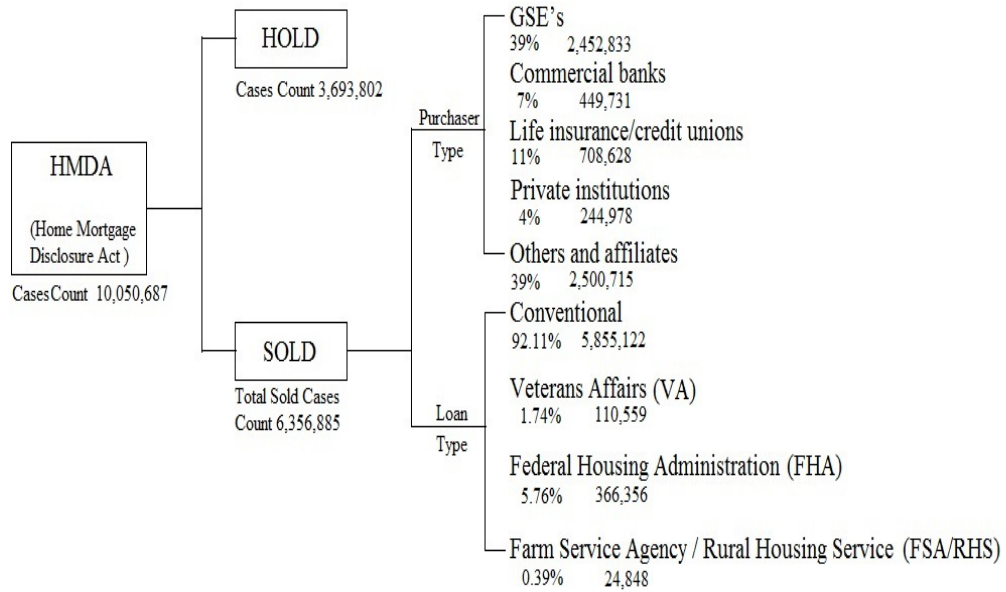
7.3 Foreclosure.com Raw Data

| State | Total Housing Units (2007) | Total Foreclosures (2008) | Percentage of Foreclosure |
|----------------------|----------------------------|---------------------------|---------------------------|
| Alabama | 2,137,012 | 3,495 | 0.16% |
| Alaska | 282,271 | 839 | 0.30% |
| Arizona | 2,667,550 | 60,292 | 2.26% |
| Arkansas | 1,287,472 | 5,342 | 0.41% |
| California | 13,308,705 | 342,445 | 2.57% |
| Colorado | 2,127,358 | 29,299 | 1.38% |
| Connecticut | 1,438,548 | 9,414 | 0.65% |
| Delaware | 388,619 | 215 | 0.06% |
| District of Columbia | N/A | N/A | 0.12% |
| Florida | 8,716,601 | 173,231 | 1.99% |
| Georgia | 3,961,643 | 22,837 | 0.58% |
| Hawaii | 506,751 | 349 | 0.07% |
| Idaho | 631,022 | 4,999 | 0.79% |
| Illinois | 5,246,116 | 84,523 | 1.61% |
| Indiana | 2,777,953 | 6,587 | 0.24% |
| Iowa | 1,329,388 | 1,186 | 0.09% |
| Kansas | 1,219,100 | 985 | 0.08% |
| Kentucky | 1,906,198 | 3,713 | 0.19% |
| Louisiana | 1,858,586 | 1,006 | 0.05% |
| Maine | 696,681 | 397 | 0.06% |
| Maryland | 2,318,430 | 3,312 | 0.14% |
| Massachusetts | 2,722,323 | 7,861 | 0.29% |
| Michigan | 4,526,914 | 17,839 | 0.39% |
| Minnesota | 2,304,473 | 8,834 | 0.38% |
| Mississippi | 1,254,936 | 1,850 | 0.15% |
| Missouri | 2,647,379 | 12,762 | 0.48% |
| Montana | 435,586 | 842 | 0.19% |
| Nebraska | 780,592 | 2,345 | 0.30% |
| Nevada | 1,102,409 | 45,147 | 4.10% |
| New Hampshire | 594,126 | 1,007 | 0.17% |
| New Jersey | 3,498,786 | 15,786 | 0.45% |
| New Mexico | 862,095 | 2,750 | 0.32% |
| New York | 7,940,072 | 13,198 | 0.17% |
| North Carolina | 4,124,066 | 5,432 | 0.13% |
| North Dakota | 310,438 | 42 | 0.01% |
| Ohio | 5,065,254 | 14,848 | 0.29% |
| Oklahoma | 1,623,100 | 5,678 | 0.35% |
| Oregon | 1,609,764 | 10,944 | 0.68% |
| Pennsylvania | 5,478,158 | 10,320 | 0.19% |
| Rhode Island | 450,877 | 1,147 | 0.25% |
| South Carolina | 2,022,033 | 2,873 | 0.14% |
| South Dakota | 356,264 | 115 | 0.03% |
| Tennessee | 2,724,979 | 5,978 | 0.22% |
| Texas | 9,433,149 | 36,151 | 0.38% |
| United States | 127,895,430 | 1,009,485 | 0.79% |
| Utah | 925,295 | 9,563 | 1.03% |
| Vermont | 311,420 | 101 | 0.03% |
| Virginia | 3,273,206 | 7,380 | 0.23% |
| Washington | 2,744,324 | 15,064 | 0.55% |
| West Virginia | 882,631 | 601 | 0.07% |
| Wisconsin | 2,558,278 | 9,499 | 0.37% |
| Wyoming | 242,344 | 86 | 0.04% |

Foreclosures in 2008 by Percent of Housing Units Under Foreclosure

Source: Lucy, W. H., and Herlitz, J. (2009).

7.4 HMDA Data Breakdown



Description: Breakdown of HMDA data by category. Hold refers to all mortgages that were not sold to the OTD Market in 2007; sold refers to all mortgages that were sold by the originating institution within the year (studied within our research paper); purchaser and loan type are breakdowns of mortgages in the OTD market (percentage and amount of loans provided).

8.0 References

8.1 Works Cited

- Anderson, C. D., Capozza, D. R., and Van Order, R. (2011). Deconstructing a Mortgage Meltdown: A Methodology for Decomposing Underwriting Quality. *Journal of Money, Credit and Banking*, 43, 610-631.
- Apostolik, R., Donohue, C., and Went, P. (2009). *Foundations of Banking Risk*. John Wiley & Sons, Inc.
- Butler, C. (2009). *Accounting for Financial Instruments*. John Wiley & Sons Ltd.
- Casu, B., Clare, A., Sarkisyan, A., and Thomas, S. (2012). Does OTD Reduce Credit Risk Taking? Empirical Evidence from US Bank Holding Companies. *The European Journal of Finance*, 770-788.
- Demyanyk, Y., and Van Hemert, O. (2008). Understanding the Subprime Mortgage Crisis. Retrieved from <http://ssrn.com/abstract=1020396>.
- Demiroglu, C., and James, C. (2012). How Important is Having Skin in the Game? Originator-Sponsor Affiliation and Losses on Mortgage-Backed Securities. *The Review of Financial Studies: Oxford Journals*, 3218-3258.
- Gaieda, O. E., Aloui, C., Salha, O. B., and Nguyen, D. K. (2012). Did the OTD Contribute to the Release of the Subprime Crisis? Empirical Investigation of American Banks. *International Journal of Business*, 81-97.
- Gregory, J. (2012). *Counterparty Credit Risk and Credit Value Adjustment* (2nd ed.). John Wiley & Sons Ltd.
- Gupta, R. K., Sharma, H., and Mitchem, C. E. (2010). The Home Mortgage Disclosure Act and Subprime Lending. *The Journal of Applied Business Research*, 26, 97-108.
- Hagendorff, B., Hagendorff, J., Keasey, K., and Gonzalez, A. (2014). The Risk Implications of Insurance OTD: The Case of Catastrophe Bonds. *Journal of Corporate Finance*, 387-402.
- Hoy, M., Livernois, J., McKenna, C., Rees, R., and Stengos, T. (2001). *Mathematics for Economics* (2nd ed.). London: The MIT Press.

- Hull, J. C. (2012). *Risk Management and Financial Institutions* (3rd ed.). John Wiley & Sons, Inc.
- Jiang, W., Nelson, A. A., and Vytlačil, E. (2013). OTD and Loan Performance: Ex Ante and Ex Post Relations in the Mortgage Market. *The Review of Financial Studies: Oxford Journals*, 11, 455-483.
- Keys, B. J., Mukherjee, T., Seru, A., and Vig, V. (2009). Financial Regulation and OTD: Evidence from Subprime Loans. *Journal of Monetary Economics*, 56, 700-720.
- Keys, B. J., Mukherjee, T., Seru, A., and Vig, V. (2010). Did OTD Lead to Lax Screening? Evidence from Subprime Loans. *The Quarterly Journal of Economics*, 307-362.
- Lucy, W. H., and Herlitz, J. (2009). Foreclosures in States and Metropolitan Areas. *University of Virginia*, 1-70.
- Mian, A., and Sufi, A. (2009). The Consequence of Mortgage Credit Expansion: Evidence from the U.S. Mortgage Default. *The Quarterly Journal of Economics*, 1449-1496.
- R-Square* (2014). Retrieved from <http://web.maths.unsw.edu.au/~adelle/Garvan/Assays/GoodnessOfFit.html>.
- Sarmiento, C. (2012). Credit OTD Decisions. *Applied Economics Letters*, 53-56.
- Shi, L. (2012). The Effect of Mortgage Broker Licensing On Loan Origination Standards and Defaults: Evidence from U.S. Mortgage Market 2000-2007. *Department of Economics University of Washington*, 1-50.
- T-test* (2014). Retrieved from <http://www.encyclopedia.com/topic/T-Test.aspx>.
- Vogelvang, B. (2005). *Econometrics: Theory and Applications with EViews*. England: Pearson Education Limited.

8.2 Works Consulted

- Foreclosure.com (2014). *Foreclosure Data – 2008*. Retrieved from <http://www.foreclosure.com>.
- Freedman, C. (1998). The Canadian Banking System. *The Bank of Canada*, 1-38.
- FFIEC (2014). *HMDA Data*. Retrieved from <http://www.ffiec.gov/hmdaadwebreport/aggwelcome.aspx>.
- Normal Distribution Figure* (2014). Retrieved from <http://www.soc.napier.ac.uk/~cs181/Modules/CM/Statistics/Statistics%203.html>.

The Seven Deadly Frictions of Subprime Mortgage Credit OTD (2014). Retrieved from <http://post.nyssa.org/nyssa-news/2010/04/the-seven-deadly-frictions-of-subprime-mortgage-credit-OTD.html#sthash.TZeUCY0e.s8HmHPuD.dpuf>.

Wikipedia (2014). *Coefficient of Determination*. Retrieved from http://en.wikipedia.org/wiki/Coefficient_of_determination.

Wikipedia (2014). *Student's T-test*. Retrieved from http://en.wikipedia.org/wiki/Student's_t-test.