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MORTGAGE CRISIS:  
EXPLORING INCENTIVES PREVALENT DURING THE BOOM  
AND BUST OF THE 2001-2007 MORTGAGE MARKET

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A Thesis

Presented to

The Faculty of Social Sciences

University of Denver

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In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

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by

Justin P. Nowicki

November 2015

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Title: MORTGAGE CRISIS: EXPLORING INCENTIVES PREVELENT  
DURING THE BOOM AND BUST OF THE 2001-2007 MORTGAGE  
MARKET

Advisor: Dr. Tracy Mott

Degree Date: November 2015

## **ABSTRACT**

The purpose of this thesis is to explain the mortgage market's behavior from 2001 through the first quarter of 2007 by discussing the economic incentives key market participants faced. By exploring incentives faced by key participants, a multifaceted yet logical explanation for the aggressive economic expansion and contraction appears. Throughout this paper I argue that the simultaneous acting upon of such incentives was fundamental to the market behavior and that the actions of each participant are, for the most part, understandable given the incentives that each faced. The paper will describe the monetary and cultural incentives underlying this behavior and show how they pertain to the macroeconomic context of the time and to the mortgage crisis. While the incentives discussed in this paper do not comprise an exhaustive list, they sufficiently cover the most vital influences. Most importantly, this thesis does not attempt to find one factor to be more important than another.

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## **INTRODUCTION**

The purpose of this thesis is to explain the mortgage market's behavior from 2001 through the first quarter of 2007 by discussing the economic incentives key market participants faced. By exploring incentives faced by key participants, a multifaceted yet logical explanation for the aggressive economic expansion and contraction appears. Throughout this paper I argue that the simultaneous acting upon of such incentives was fundamental to the market behavior and that the actions of each participant are, for the most part, understandable given the incentives that each faced. The paper will describe the monetary and cultural incentives underlying this behavior and show how they pertain to the macroeconomic context of the time and to the mortgage crisis. While the incentives discussed in this paper do not comprise an exhaustive list, they sufficiently cover the most vital influences. Most importantly, this thesis does not attempt to find one factor to be more important than another.

The paper is divided into two parts. Part One discusses the homebuyers, first explaining the expansionary period through an examination of structural incentives such as low interest rates and access to credit, and then analyzing personal incentives such as property ownership being central to the American

dream, herd mentality, speculation, and how individuals utilize the option theory of mortgages. Part One then examines the collapse of the mortgage system by highlighting why defaults occurred due to structural reasons forcing a homeowner into default, as well as personal motivations that impacted a homeowner's propensity to default.

Part Two examines the financial system. The structural changes that allowed for a booming mortgage market, such as low interest rates and financial innovation, are introduced and the many benefits to this new era of finance are highlighted. A significant portion of Part Two focuses on how and why lending standards diminished, while also emphasizing the increasingly unstable position the mortgage market was in prior to the crash.

In conclusion, I posit that the aggregate action of all involved parties, responding logically to incentives, allowed the mortgage market to enjoy an extraordinary expansion and suffer an inevitable collapse.

## **PART ONE: THE HOMEBUYERS**

Homebuyers tend to be minimally discussed in economic literature as a fundamental cause for the expansion and contraction in the 2001-2007 mortgage market. Part One explores the integral role of these participants and posits that the aggregate action of individual homebuyers, motivated by systemic and personal incentives<sup>1</sup>, were a primary cause of the market behavior. The systemic and personal incentives faced by homebuyers are in line with one another and also consistent with incentives faced by financial participants in the mortgage market discussed in part two of this thesis.

Chapter One provides an overview of the growing housing market. Chapters Two and Three present the systemic<sup>2</sup> and personal<sup>3</sup> motivations to purchase property respectively. Chapter Four provides an overview of the mortgage market crash. Chapters Five and Six present two frameworks that influence the propensity of borrowers to default utilizing Minsky's financial

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<sup>1</sup> Throughout this paper I will refer to two categories of incentives: systemic and personal. Systemic incentives are macroeconomic in nature; decided by the system which in turn influences individuals. Personal incentives are microeconomic influences; decided on an individual basis.

<sup>2</sup> Access to credit and affordability

<sup>3</sup> Culture, wealth building, and investment



instability hypothesis and the option theory of mortgages to discuss voluntary and involuntary foreclosure respectively.

## **CHAPTER ONE: A BOOMING MARKET**

Chapter One provides an overview of the expansionary period of the housing market with an emphasis on the homebuyer. The chapter begins by explaining that homeownership rates increased in 1995, before the conventional “mortgage bubble period,” due to increased income from the dot-com bubble, and then turns to a discussion of the post dot-com expansionary period of the housing bubble (2001-2007).<sup>4</sup> The rapid escalation in house prices and corresponding inflation of home valuation throughout 2007 is highlighted and will prove an integral part of the motivations for both expansion and contraction in the mortgage market.

### **INCREASED HOMEOWNERSHIP:**

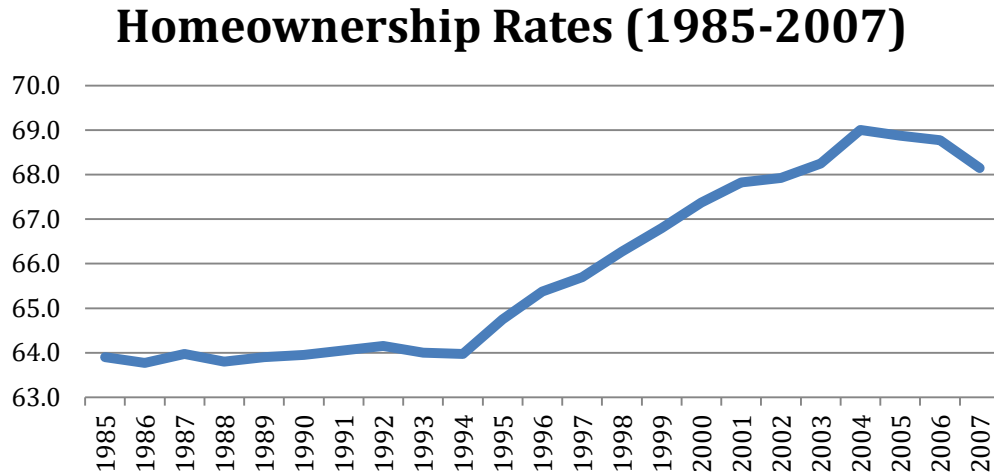
The mortgage boom is frequently discussed as a bubble that emerged in the wake of the dot-com crash (2001), however, it is important to realize that the housing market began to accelerate during the mid-1990s along with the dot-com

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<sup>4</sup> Throughout this paper references will be made to three specific periods: dot-com era (1995-2001), expansionary period (2001-Q12007), contraction (2007 and beyond).

bubble. Homeownership rates show a sharp increase in 1995 and continue to rise dramatically through 2005<sup>5</sup> (See Figure 1: Homeownership Rates (1985-2007))<sup>6</sup>.

**Figure 1: Homeownership Rates (1985-2007)**



Growth in homeownership during the dot-com era (1995-2001) is partially attributed to an increase in net-worth during and due to the dot-com bubble.<sup>7</sup> Increased wealth from stock market gains from 1995 through 2000 enabled individuals to buy property, building the housing market alongside the stock market bubble. Real wage growth also contributed, experiencing a 12.4 percent cumulative growth during the late 1990s<sup>8</sup> (see Figure 2: Real Median Household Income<sup>9</sup>).

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<sup>5</sup> While homeownership rates peaked in 2005, Q1 2007 is typically recognized as the peak of the housing bubble when housing prices and mortgage originations peaked and defaults/foreclosures began to accelerate.

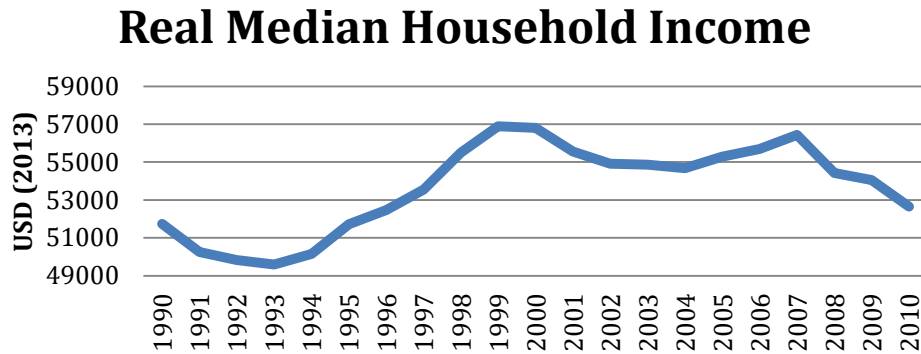
<sup>6</sup> Data from U.S. Census Bureau

<sup>7</sup> Baker, 2008

<sup>8</sup> Rios-Avila and Hotchkiss, 2014

<sup>9</sup> Data from Federal Reserve Bank of St. Louis

**Figure 2: Real Median Household Income**



It would seem that the bursting of the dot-com bubble in 2001 and subsequent income stagnation would have also quelled the American housing growth that inflated from 1995-2001<sup>10</sup>, as it did in Germany and Japan<sup>11</sup>. Instead, the US housing market continued to accelerate despite a decline in real income because borrowing rates accelerated, fueled by new and innovative home loan structures. As household income experienced a slight decrease in the first half of the 2000's, borrowing replaced growing incomes to continue the surge in homeownership rates. The borrowing-fueled expansionary period (2001-Q1 2007), frequently referred to as the mortgage bubble, will be the primary focus throughout this paper.

#### **INFLATING HOUSING PRICES:**

Before digging into the core of this thesis, exploring incentives, it is important to document the dramatic rise in home prices during the expansionary period. Prior to 1995, real house prices had been essentially unchanged for 100

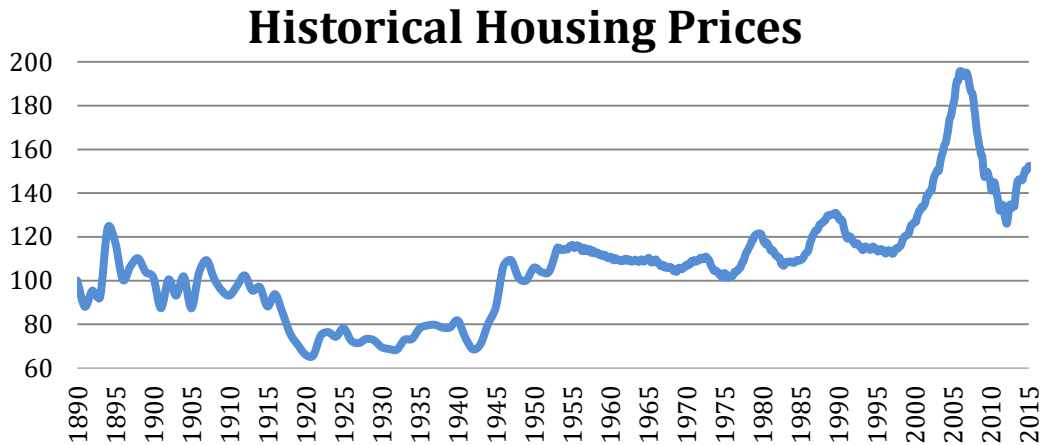
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<sup>10</sup> Rosner, 2001

<sup>11</sup> Mayer and Hubbard, 2008 and Japan specifically in Baker, 2008

years (after controlling for inflation and differences in house size and quality) but then experienced a significant explosion during the dot-com era and expansionary period (See: Figure 3: Historical Housing Prices<sup>12</sup>).

**Figure 3: Historical Housing Prices**



In 1997, the average purchasing price of a home was only 2 percent more than the average in 1897; by 2002, house prices had risen nearly 30 percent more than the rate of inflation.<sup>13</sup> Housing prices continued to surge until 2006, when the market began to abate. At its peak, the average price for a house was nearly twice the long-term average (1890-1997).<sup>14</sup>

In contrast, while property values nearly doubled, rental prices during the same period increased only modestly, by 10 to 17 percent in real terms, and were already trailing off by 2002.<sup>15</sup> This lopsided skew of home versus rental prices

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<sup>12</sup> Shiller, 2015

<sup>13</sup> Baker, 2002

<sup>14</sup> Beachy, 2012

<sup>15</sup> Baker, 2008, found that rents increased by 10 percent in real terms while Mayer and Hubbard, 2008, found that the cost of owning a home relative to renting increased

begins to hint that home values may have become over-inflated. It is evident, at least in hindsight, that during the expansionary period, a bubble was forming in the housing market and the explosion was founded on something other than the fundamentals of the housing market –such as population and income growth relative to the availability of existing housing, or in the intrinsic value of property ownership (low interest rates, and other factors that make real estate more attractive than bonds and stocks). If fundamentals were driving up the inflation in home prices, the price-to-income ratio and the price-to-rent ratio would remain stable. During the post dot-com expansionary era both ratios increased.

While it could be argued that the access to credit that allowed heightened demand had changed the fundamental factors, because this proved to be an unsustainable debt market I conclude that the fundamentals were unchanged. Instead, the market moved away from the fundamental value of homes to a market focused viewpoint. The move to a market centric focus directly impacts the incentives to the homebuyer (and financial system).

The increase in price-to-income indicates that borrowing decisions from homebuyers (and financing from lenders) are part of the cause for heightened demand in the housing market. The price-to-rent ratio is an indication that the influences were pushing market values above the intrinsic value of homes, providing stronger incentives for homebuyers to buy property rather than rent a

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between 10 and 17 percent relative to what it would be if the mortgage market was normally functioning. Shefrin and Statman, 2011, Found the cost of owning houses relative to renting increased dramatically from 2003 to 2006, suggesting the existence of a bubble, where home prices greatly exceeded their intrinsic values.

comparable space. These arguments are developed further in the subsequent chapters.

## **CHAPTER TWO: SYSTEMIC REASONS TO BUY**

This chapter addresses the systemic incentives to purchase property due to affordability remaining stable through innovative products and access to credit.

### **STABLE AFFORDABILITY:**

Heightened demand for housing caused a natural market response, increased property values. Exploding housing prices and stagnant income should have provided a natural barrier for many potential buyers entering the market. Rising prices and stagnant income should, theoretically, make housing less affordable, cooling off the expansionary trend. However, affordability remained stable.

The Housing and Urban Development (HUD) Composite Affordability Index shows that housing actually became more affordable during the boom. This index comes from the Department of Housing and Urban Development and measures the ratio of median family income to the income necessary to qualify for a mortgage to purchase a median priced house at prevailing interest rates. (See Figure 4: HUD Composite Affordability Index (1970-2007)<sup>16</sup>).

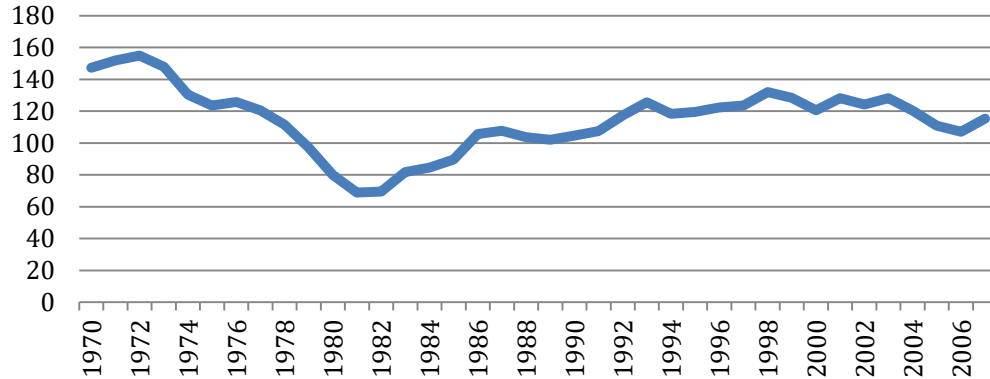
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<sup>16</sup> Data from U.S. Department of Housing and Urban Development, Composite Affordability Index



Figure 4: HUD Composite Affordability Index (1970-2007)

## HUD Composite Affordability Index (1970-2007)



Many Americans continued purchasing property at escalating prices despite stagnant (or slightly decreasing) income because the appeared affordability<sup>17</sup> remained stable due to access to credit markets and innovative mortgage products that made housing (seem) more affordable at the time. The appeared affordability of borrowing and access to credit provided systemic incentives to homeowners.<sup>18</sup>

### ACCESS AND NON-STANDARD MORTGAGES:

Housing is one of the largest expenses for a consumer, taking a significant proportion of income or net wealth. Typically, this purchase will need to be financed. Access to credit markets is therefore a prerequisite to buying property.

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<sup>17</sup> The use of the term “appeared affordability, as opposed to “affordability” is significant because many financing arrangements appeared affordable but in reality were not more affordable during the course of the loan.

<sup>18</sup> An in-depth explanation for how and why the financial markets granted access and were able to maintain affordability during this period will be discussed in Part Two. The description here will focus on its impact to homebuyer’s propensity to borrow.

Many factors can change the supply of loanable money and willingness of financial institutions to lend. During the boom, financial markets had ample liquidity and an appetite for residential lending.<sup>19</sup> Access to credit allowed for heavy borrowing while innovative financial products encouraged it.

Residential investments are easily advanced or postponed until adverse conditions in credit markets dissipate, thus appeared affordability has a significant impact on housing investment. Investment in housing will be relatively more affordable when interest rates are low or other financial innovations reduce up-front and/or short-term costs associated with borrowing. Many Americans took full advantage of the favorable conditions from 2001 through 2006 through a number of innovative mortgage products that were available to borrowers, making affordability, and the systemic incentive to borrow, even greater.

Prior to the mid-1990s, standard mortgages were the vast majority of originations.<sup>20</sup> Conventional mortgage products come in 10, 15, or 30-year terms with a fixed interest rate and typically require a minimum 20 percent down payment. During the expansionary period interest rates on standard mortgages dropped to extraordinarily low levels.<sup>21</sup> Elasticity in standard interest rates played

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<sup>19</sup> The importance here is that access was widespread, not why banks granted access; the latter will be discussed in Part Two.

<sup>20</sup> Baker, 2008

<sup>21</sup> See Part Two, Chapter Seven

a role in the recent United States housing boom.<sup>22</sup> While standard interest rates were low, non-standard products reduced both interest rates and down payments.

One new product, the adjustable rate mortgage (ARM), was particularly popular due to its unusually low interest rate. ARM loans have a low initial rate for two years and then a floating interest rate for the remainder of the loan. The initial rate<sup>23</sup> is typically below the fixed-market rate. Rates on ARM loans decreased substantially despite the 30-year fixed-rate mortgage remaining stable. Initial rates on ARM loans were so low that they were likely a negative interest rate when accounting for inflation during the same period.<sup>24</sup> The initial low rate is attractive to borrowers and provides a strong systemic incentive to advance a housing purchase to take advantage of market conditions. ARM loans are particularly useful for a homeowner planning on owning property short term or expecting to refinance soon, as ARM loans allow you to avoid paying an extra premium for a fixed-rate loan. ARM loans grew to 35 percent of originations during the expansionary period.<sup>25</sup>

Interest rates impact the affordability over the life of a loan, however, the upfront cost of borrowing due to a down payment is another consideration on the affordability of borrowing. The requirement that homebuyers make significant

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<sup>22</sup> Mayer and Hubbard, 2008

<sup>23</sup> Frequently referred to as a “teaser rate”

<sup>24</sup> Zywicki and Okloski, 2009

<sup>25</sup> Baker, 2008

down payments was eliminated in the 1990's<sup>26</sup> and banks began to offer financing with down payments lower than 20 percent. During the expansionary period, some borrowers were even able to finance property with no down payment. The use of low/no down payment products became prevalent during the dot-com era and continued through the expansionary period. Prior to the 1990's only 7 percent of mortgages had a down payment lower than 10 percent; by 2000, 50 percent of mortgages had down payments below 10 percent and 5 percent of mortgages had no (or an effective negative) down payment.<sup>27</sup> By reducing the upfront financial burden a significant barrier to purchase property is removed, enabling more Americans to afford (at least initially) property.

Another loan structure that must be introduced was a negatively amortizing loan. Negative amortization loans allow the borrower to make payments that are below the interest rate on the loan. While this reduces the cost of servicing the loan, the loan will become larger overtime since the borrower is not covering the interest rate expense.

**REFINANCING:**

Borrowers were also allowed, even encouraged, to refinance their homes. Refinancing is a process in which a homeowner takes on a new loan and prepays the original loan on the property. Refinancing was widely used during the dot-com era and expansionary period.

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<sup>26</sup> Rosner, 2001

<sup>27</sup> US Census Bureau, 1999

A borrower struggling to meet their contracted payments might refinance in an attempt to stay current on the loan. In this case the borrower will have to give up more equity from their house to refinance. If real estate prices decline the ability to tap into the home for additional equity will be substantially reduced. During the expansionary period “strong house price growth increased the amount of equity in homes and enabled borrowers to refinance their mortgages despite being behind on the monthly payments.”<sup>28</sup>

Borrowers also refinance when credit with more favorable terms is accessible, or property values have risen and they wish to utilize a portion of the new equity.<sup>29</sup> A refiner might seek to take advantage of low interest rates and increase their wealth position by reallocating ‘trapped’ equity into a more diverse asset portfolio.<sup>30</sup>

Other refiners are motivated by the ability to smooth consumption during negative income or expenditure shocks.<sup>31</sup> These borrowers are likely to extract or cash-out equity from the home and use that cash to fund consumer expenditures. Consumers who are motivated to refinance for consumption smoothing purposes have little to no liquid assets and typically use 60 percent of the equity extracted for consumption purposes.<sup>32</sup>

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<sup>28</sup> Schloemer, et al., 2006

<sup>29</sup> Discussed further in Chapter Five

<sup>30</sup> Rosner, 2001

<sup>31</sup> Rosner, 2001

<sup>32</sup> Rosner, 2001

## **HOME EQUITY LOAN:**

While many individuals borrowed as a means of financing new property, some borrowed, backed by already owned (or currently financed) property, as a means of increasing consumption. This type of loan, called a home equity line of credit, was legalized after pressure from banks beginning in the late 1970's.<sup>33</sup> In the early 1980's, many tax deductions were eliminated but deductions on home equity credit were still allowed.<sup>34</sup> Borrowing on equity from a home became more attractive than drawing on other lines of credit. The home equity loan market became more active throughout the mortgage boom with \$237b in loans outstanding in 1995 and \$445b by 2001 and over \$1t by Q3:2006.<sup>35</sup>

Most bankers believed that homeowners would not "pledge the house to buy a blouse."<sup>36</sup> Yet, many homeowners defied this prediction, proceeding to use home equity loans to buy blouses, cars, vacations, and more. There is broad agreement in economic literature that supports the notion of consumption supported by housing wealth.<sup>37</sup> Home equity credit allowed homeowners to "live beyond their income" by taking the equity out of their homes and consuming today.<sup>38</sup> Homeowners will increase consumption if the value of their property

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<sup>33</sup> Shefrin and Statman, 2011

<sup>34</sup> Shefrin and Statman, 2011

<sup>35</sup> Greenspan and Kennedy, 2007

<sup>36</sup> Story, 2008

<sup>37</sup> Greenspan and Kennedy, 2007 and Baker 2002

<sup>38</sup> Stiglitz, 2010

increases. In the rising home price environment during the expansionary period the availability of home equity beyond the initial purchase value of a house provided a strong incentive to undertake home-equity fueled consumption.

Homeowners also frequently use home-equity to bridge financing for personal consumption expenditures<sup>39</sup>; which has been particularly popular post dot-com crash as consumers attempt to maintain the lifestyle that the dot-com economic environment had allowed.<sup>40</sup> Borrowers who suffer negative income shocks or other adverse life events have been found to extract equity and obtain larger subsequent mortgages.<sup>41</sup> The lending industry has encouraged middle and low-income families to conclude that “borrowing against their homes is a sensible way to plug holes in household budgets.”<sup>42</sup>

While some criticize homeowners for treating homes like ATM machines,<sup>43</sup> others have heralded the growth in lending to riskier borrowers as a positive break-through in extending credit.”<sup>44</sup> The availability of home-equity credit served to entice homeowners to take on larger debt burdens backed by property, effectively raising the loan to value ratio on the property.

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<sup>39</sup> Greenspan and Kennedy, 2007

<sup>40</sup> Rosner, 2001

<sup>41</sup> Gerardi, Shapiro and Willen, 2008

<sup>42</sup> Schloemer, Li, Ernst, and Keest, 2006

<sup>43</sup> Shefrin and Statman, 2011 and Stiglitz, 2010

<sup>44</sup> Schloemer, Li, Ernst, and Keest, 2006

Changes in access, real and perceived affordability, and other reasons to leverage debt backed by property provided a strong systemic incentive for homebuyers and homeowners to increase their debt burdens. The desire for these participants to leverage debt will be seen to be in-line with those who provide the financing. The leveraging of debt directly impacted the expansion (and laid the groundwork for the contraction) of the economy.



## **CHAPTER THREE: PERSONAL MOTIVATIONS TO BUY**

In conjunction with the systemic influences there are a number of personal incentives that contributed to the heightened demand for property ownership. The American culture of homeownership was a strong influence in the propensity for individuals to become homeowners. Homeownership is also seen as a way to build wealth and an investment strategy. Herd mentality, which led to euphoric markets aggravated perceptions regarding property ownership.

### **AMERICAN DREAM:**

To own, rather than rent, property is a value deeply rooted in American history and the American dream. In early America, property ownership was even a prerequisite to voting rights.<sup>45</sup> The American culture of property ownership is deeply connected to individual liberties that embody our national identity. Homeownership is more than a utilitarian consideration and represents freedom while renting is associated with oppression by a landlord.<sup>46</sup>

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<sup>45</sup> (Lewis, 1970)

<sup>46</sup> (Shiller, Economic View: Mom, Apple Pie and Mortgages, 2010)

Aspirations beyond utilitarian consideration<sup>47</sup> propelled many into houses they could not afford by evoking emotions and cognitive errors, blinding homeowners to the financial risk they might undertake in the process.<sup>48</sup> Shefrin and Statman (2011) propose that “we are seduced by the expressive and emotional benefits of beautiful dream houses. We take pride in home ownership and feel powerful, knowing that no landlord can kick us out.”<sup>49</sup> Even in the wake of the mortgage crash, a 2011 poll by New York Times/CBS News revealed that nine out of 10 Americans agree property ownership is central to a sense of wellbeing and the American dream.<sup>50</sup> With the dot-com recession and stagnant incomes, borrowing to purchase property provided Americans access to the American dream as well as an ability to feel they were wealthier than they in fact were. This personal incentive to have these intangible benefits from property ownership is also significantly impacted by systemic influences that encourage the ideology around the non-utilitarian benefits to owning a home.

Government has encouraged homeownership as a value in the American dream through decades of government policies such as the establishment of agencies specifically designed to increase access to credit for purchasing homes<sup>51</sup>

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<sup>47</sup> Utilitarian considerations fulfill our need for shelter but can also be extended to financial decisions regarding storing or building wealth.

<sup>48</sup> (Shefrin and Statman 2011)

<sup>49</sup> Shefrin and Statman, 2011

<sup>50</sup> Stretifeld, 2011

<sup>51</sup> Examples are the Rural Housing Service, the Federal Housing Administration, and the Federal Home Loan Banks

as well as through tax benefits,<sup>52,53</sup> From the onset of the housing boom there was a rejuvenated push from the American government aimed to convince more Americans to own their own homes.<sup>54</sup> A political discourse targeted at restoring the American dream through homeownership began with the Clinton administration during the dot-com era.<sup>55</sup> In 1994 President Clinton declared:

I think we all agree that more Americans should own their own homes, for reasons that are economic and tangible and reasons that are emotional and intangible but go to the heart of what it means to harbor, to nourish, to expand the American dream.<sup>56</sup>

Executives at lending institutions echoed the political rhetoric. In 2003 Angelo Mozilo, CEO of Countrywide Financial, stated that “expanding the American dream of homeownership must continue to be our mission, not solely for the purpose of benefitting corporate America, but more importantly, to make our country a better place.”<sup>57</sup>

The goal of “reaching all-time high national homeownership levels by the end of the century” was targeted through making homeownership more affordable. Expanding creative financing, simplifying the home buying process,

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<sup>52</sup> Deductions for mortgage interest and real estate taxes, as well as a sizable exclusion on capital gains from home sales

<sup>53</sup> Doms and Motika, 2006

<sup>54</sup> Shefrin and Statman, 2011

<sup>55</sup> Rosner, 2001

<sup>56</sup> Clinton, 1994

<sup>57</sup> Morgenson and Rosner, 2011. At the time, Countrywide Financial was the largest mortgage lender in the US. In 2008 Countrywide would come close to collapse and experience an orchestrated buyout by Bank of America.

reducing transaction costs, changing conventional methods of design and building less expensive houses, among other means are found in an unprecedented partnership between regulators and regulated institutions.<sup>58</sup> In response to the sponsorship of a relaxation of standards, Former Federal Reserve Chairman Alan Greenspan used the term “democratization of credit.”<sup>59</sup> The change in lending standards, discussed in Chapter Two and further in Part Two enabled borrowers with less-than-perfect credit to access home loans they would have been denied in the past. For many this brought access to capital to communities that had previously been underserved.<sup>60</sup>

The increase in the American homeownership rate was partially driven by an increased propensity to be homeowners between 1995-2004.<sup>61</sup> The desire to own property is a personal value based on American culture, however, it is not a universal desire. Only 34.6 percent of Swiss families owned their homes in 2000, whereas 66.2 percent of American families owned homes that year.<sup>62</sup> The American dream provides a non-financial motivation to purchase property and frequently encourages property ownership beyond what is financially prudent.

The non-utilitarian draw to property ownership is the base for one personal incentive to purchase property and when coupled with systemic

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<sup>58</sup> US Department of Housing and Urban Development, 1995

<sup>59</sup> Schloemer, et al., 2006

<sup>60</sup> Schloemer, et al., 2006

<sup>61</sup> Doms and Motika, 2006

<sup>62</sup> Shiller, 2010

incentives through political changes that allowed many Americans access to credit markets for the first time, through relaxing standards which increased access and affordability, was a powerful force in the market.

### **BUILDING WEALTH:**

Individuals are also personally motivated to buy property for personal financial reasons.<sup>63</sup> Most households hold no, or low, corporate equity,<sup>64</sup> therefore property is a primary way for individuals to build and store wealth. Building equity also been referred to as a forced savings plan because homeowners theoretically pay back a mortgage and accumulate home equity, building their net worth due to the lack of liquidity that equity in a home provides.<sup>65</sup> Many households view the value of their homes as an important source of wealth for the future<sup>66</sup> The effect of growing home equity, for some, has adverse effects. Several studies have shown that when home values climb owners feel less need to save for the future.<sup>67</sup> Other homebuyers bought multiple homes as a fixed-income investment strategy. Some even bought property on a speculative basis<sup>68</sup>,

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<sup>63</sup> This is also partially a reason why the government pushes for homeownership due to its “forced savings plan” effect.

<sup>64</sup> Tracy, Schneider, and Chan, 1999

<sup>65</sup> Rosner, 2001. Although home equity became more liquid through home equity loan and the requirement that potential homebuyers have equity to put into a home diminished.

<sup>66</sup> Case, Shiller, and Quigley, 2001 and Dynan, K. and D. Maki, 2001 and Maki, D. and M. Palumbo

<sup>67</sup> Baker, 2002

<sup>68</sup> Mayer and Hubbard, 2008

expecting to cash in quickly on rising home values<sup>69</sup> with a buy and flip strategy. The personal incentive to buy property because of the desire for storing or building wealth was significantly impacted by euphoric expectations of home values and herd mentality.

#### **EUPHORIC MARKETS AND HERD MENTALITY:<sup>70</sup>**

In the early 2000s demand for housing caused prices to increase, price increases in turn caused speculation on future increases in prices which caused prices to rise further –a self-fulfilling prophecy. Many buyers over-extrapolated and assumed that housing prices would continue rising indefinitely.<sup>71</sup> This belief-based theory of overvaluation<sup>72</sup> is frequently motivated by Kahneman and Tversky’s (1974) representativeness heuristic<sup>73</sup> where “people expect even small samples of data to reflect the properties of the parent population. As a result, they draw overly strong inferences from these small samples, and this can lead to over-extrapolation.”<sup>74</sup> During the expansionary period homebuyers believed current conditions would continue to exist.

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<sup>69</sup> Baker, 2002. Families are buying homes in large part as an investment rather than primarily as a place to live

<sup>70</sup> Title stems from Minsky’s use of the term “euphoric economy” found in *Stabilizing an Unstable Economy*

<sup>71</sup> Barberis, 2011 and Beachy, 2012

<sup>72</sup> Can also be seen in Lakonishok, Shleifer, and Vishny, 1994 and Barberis, Shleifer, and Vishny, 1998, and Greenwood and Hanson, 2010

<sup>73</sup> Kahneman and Tversky, 1979

<sup>74</sup> Barberis, 2011. A model of bubble formation rooted in this heuristic can be found in Barberis and Shleifer, “Style Investing”, 2003

Over-extrapolation of home prices could be a primary driver of the increase in speculative buying where buyers purchased homes expecting the value to increase. Speculative buyers could be making decision based on an investment strategy or to get a larger house consistent with American dream mentality. Some buyers took on large debt burdens expecting increasing values to help pay off loans while others bought multiple properties intending to sell when the value had increased.

Herd mentality, the tendency of humans to base their decisions on those taken by the majority, may explain the over-extrapolation of home values during the bubble. During the expansionary period, “herd” members were buying homes at increasing rates, influencing their peers’ decisions to do the same.

Herd mentality, like the representativeness heuristic, is a typical feature of human cognition. Since investors are human (not isolated, rational, and omniscient price calculators), such behavioral tendencies likely helped inflate the self-fulfilling housing bubble.<sup>75</sup>

Herd mentality reinforced the over-extrapolation of prices and served to encourage speculative purchasers and those that took on homes they could not afford.

Minsky supports the pro cyclical nature of the cycle, saying that people are momentum investors –consistent with over-extrapolation and herd mentality theories. In an explanation of Minsky’s work, McCulley (2009) stated:

Human beings are not wired to buy low and sell high; rather, they are wired to buy that which is going up in price. This seems to make no sense, particularly when there is a known limit to size and

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<sup>75</sup> Beachy, 2012

affordability constraints – why would rational people buy a house for a higher price than other folks in the same financial circumstances could afford to pay? But we are not talking about rationality here, but human nature.<sup>76</sup>

This explains the rationality behind the rise in home prices because homebuyers followed the market price of property rather than the value if home prices had relied on fundamentals. Because homebuyers were not driven to find the intrinsic value of a home, but to base their decisions based off what other homebuyers are doing, the market value was driven up. Minsky's insights are evident in the effects of innovations in mortgages and mortgage securities.<sup>77</sup>

Numerous personal incentives to buy property are prevalent in the US. Furthermore, these incentives are compounded by the systemic incentives presented in the previous chapter. The incentives on the homebuyer are closely related and in-line with the financial systems incentives which will be presented.

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<sup>76</sup> (McCulley 2009)

<sup>77</sup> Shefrin and Statman, 2011



## **CHAPTER FOUR: A CRASHING MARKET**

The motivations presented in Chapters One and Two establish that borrowers were motivated by personal and systemic incentives to engaged in property purchases during the expansionary period. The subsequent chapters in Part One will discuss the incentives which influenced homebuyer's decision to engage in behavior that crashed the market. This chapter examines how the house prices (property values) plateaued due to supply side growth and demand diminishing. The diminishing of house price appreciation was a catalyst for many borrowers to initially foreclose. The following chapters will discuss the involuntary reasons why homeowners were forced into foreclosure as well as a theory that supports voluntary default.

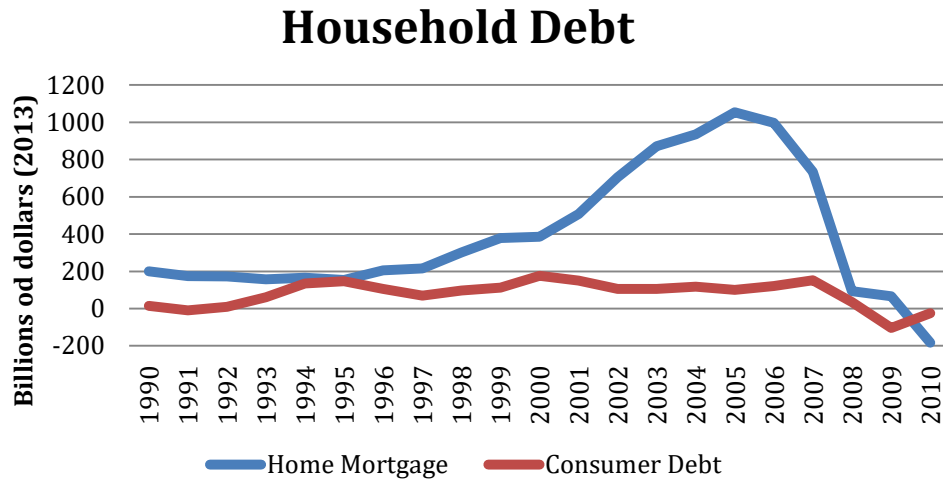
### **GROWING DEBT BURDEN:**

From 1995 through the height of the housing market, households took on larger levels of mortgage debt. The debt burden from home mortgages rose from \$200 billion to over \$1 trillion at the height of the market (see Figure 5: Household Debt)<sup>78</sup>

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<sup>78</sup> Data from the Board of Governors of the Federal Reserve System, 2012

Figure 5: Household Debt



#### THE CATALYST FOR COLLAPSE:

As long as supply and demand in the housing market kept pace with each other the boom was likely to continue. Housing values would continue to increase and the period of economic stability would continue. Housing starts began to outpace the number of homebuyers, even with historically easy access to credit, and home values were approaching a ceiling.

Increasing prices in the housing market had a substantial supply-side effect with housing starts increasing dramatically.<sup>79</sup> “By 2002, housing starts were almost 25 percent above the average rate over the three years immediately preceding the start of the bubble (1993-95).” In 2005 over 2 million new houses were constructed, far more than the historical average. An over-supply of rental housing was one of the first indications that supply was outpacing market demand (and capacity). In 2002 the vacancy rate in rental housing was just above nine

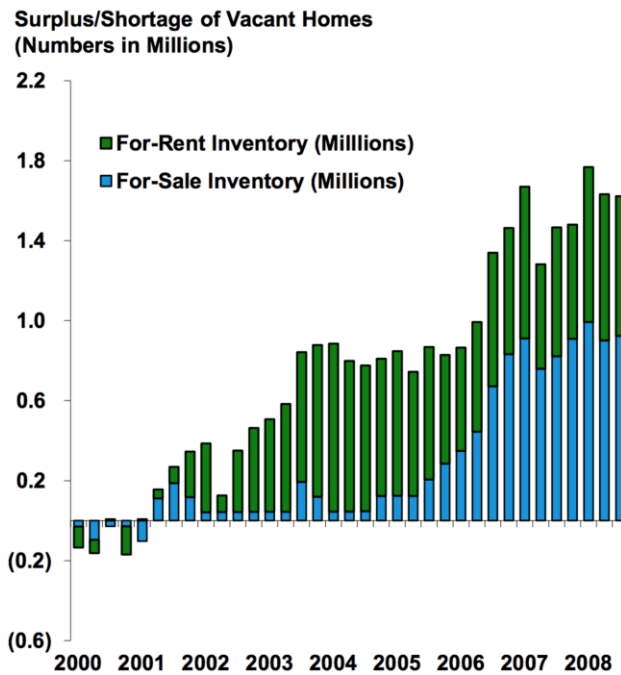
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<sup>79</sup> Baker, 2008

percent compared to an average 7.3 percent from (1993-95).<sup>80</sup> From 2005 on, vacancy in for-sale properties also began to increase. See Figure 6:

Surplus/Shortage of Vacant Homes<sup>81</sup> The vacancy rate on ownership units was almost 50 percent above its prior peak.<sup>82</sup>

**Figure 6: Surplus/Shortage of Vacant Homes**




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<sup>80</sup> Baker, 2008 and Shiller, 2006

<sup>81</sup> Freddie Mac, 2015

<sup>82</sup> Baker, 2008

A collapse in house price appreciation started in spring 2006.<sup>83</sup> As the supply of housing began to outpace demand prices became stagnant. When prices plateaued the first wave of foreclosures began.

Subsequent chapters will present the incentives that impacted a borrower's default. Two frameworks are relied upon to support the incentives and explain the foreclosure phase. Minsky's Financial Instability Hypothesis proposes that some borrowers were forced into default. In contrast, the option theory supports the notion that borrowers foreclosed because of a conscious rational decision. It is likely that both voluntary and involuntary defaults occurred, however, both voluntary and involuntary defaults are likely to be due to borrowing that put them at risk to either voluntary or involuntary default.

Initial defaults and foreclosures caused house prices to begin to decline sparking more defaults. Foreclosed properties went back on the market adding to the oversupply of housing and depressing values further.<sup>84</sup> Foreclosures in one geographic area have been found to cause house price depreciation.<sup>85</sup> When the pace of house price appreciation declines, some homeowners may lower their expectations about future house price appreciation, and hence may lower their demand for housing.<sup>86</sup>

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<sup>83</sup> Gerardi, et al., 2008 and Demyanyk and van Hemert, 2007, and Doms, Furlong, and Krainer, 2007 and Danis and Pennington-Cross, 2005

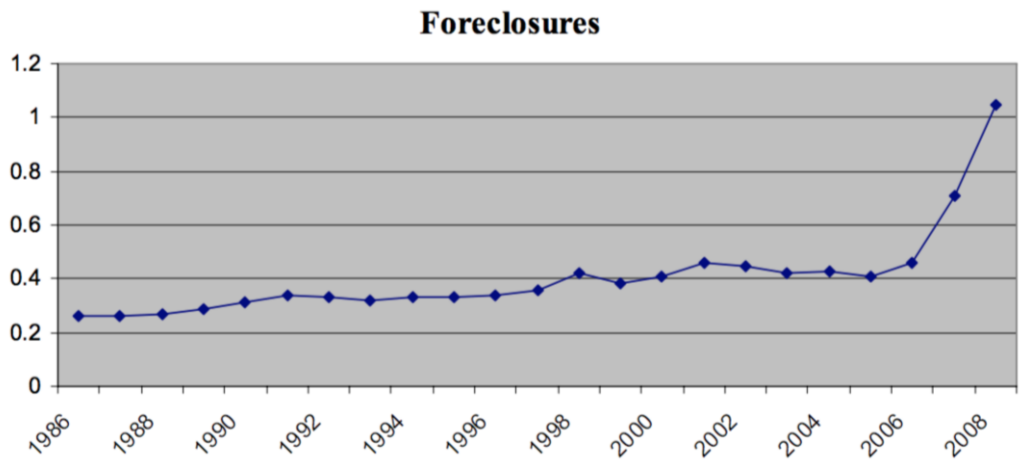
<sup>84</sup> Baker, 2008

<sup>85</sup> Schloemer, et al., 2006

<sup>86</sup> Doms, Furlong and Krainer, 2007

As defaults increased banks responded by increasing rates on existing ARM's and by tightening credit markets for new originations. Borrowers were caught with higher payments and less access to credit and a market with an even greater supply of housing.<sup>87</sup> Just as the conditions that grew the market were largely self-perpetuating the crashing markets had a positive-feedback loop as well. Foreclosures began to increase at a dramatic rate in late 2006 (see Figure 7: Foreclosures).<sup>88</sup>

**Figure 7: Foreclosures**



Vintage loans 2005 and 2006 were found to default in significantly higher numbers than loans originated prior to 2005 despite being relatively similar in

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<sup>87</sup> Baker, 2008, during crash credit market standards tightened, demanding 20 percent down and full documentation loans

<sup>88</sup> Zywicki and Okloski, 2009

observable characteristics.<sup>89</sup> The average default rate on vintage 2006 loans exceeds the default rate on the riskiest category of loans originated in 2004.<sup>90</sup>

Millions of Americans lost their homes during the downturn. 2007 saw foreclosure actions against 1.3 million properties.<sup>91</sup> It was estimated that in 2008 2.3m Americans would lose their homes and 3.4 million homeowners would default on their mortgages in 2009.<sup>92</sup>

#### **NEGATIVE HOME EQUITY:**

During the market crash many homebuyers found they had negative equity in their homes. Factors that determine home equity are the down payment at origination, stripping away of equity through refinancing, and depreciating home prices. High loan-to-value ratios were presented as a reason homeowners were able to afford property in Chapter Two. As house prices fell, borrowers who had paid a 90 percent, or sometimes even an 80 percent down payment were left with negative value in their houses.<sup>93</sup> Negative amortizing loans are also likely to result in negative home equity. Deprecating home prices were presented earlier in this chapter.

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<sup>89</sup> 2001 was also a particularly bad vintage. Gerardi, et al., 2008 and Demyanyk and Van Hemert, 2010

<sup>90</sup> Gerardi, et al., 2008

<sup>91</sup> Stiglitz, 2010 citing Moodys

<sup>92</sup> Stiglitz, 2010 citing Moodys

<sup>93</sup> Stiglitz, 2010

Home equity loans and mortgage refinancing led many homeowners to extract all their equity in their homes.<sup>94</sup> High housing prices have also fostered consumer spending generally.<sup>95</sup> As several recent studies have shown, households view the value of their homes as an important source of wealth for the future<sup>96</sup> When they see home values climb, they feel less need to save for the future. In addition, increases in home values allow households to directly increase their consumption by borrowing against their increased equity.

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<sup>94</sup> Shefrin and Statman, 2011

<sup>95</sup> Baker, 2002

<sup>96</sup> Case, Shiller, and Quigley, 2001 and Dynan and Maki, 2001

## CHAPTER FIVE: MINSKY'S FINANCING

There are two theoretical motivations for the collapse in the mortgage market; this chapter explores involuntary foreclosure. The three types of borrowers from Minsky's financial instability hypothesis are used as a basis to explain involuntary foreclosure. Because of the binary nature of an involuntary outcome the incentive present in this case refers to the decisions borrowers made before the foreclosure event. These incentives were presented previously as reasons for a borrower to become highly leveraged. Involuntary foreclosure is simply a consequence of those actions.

### **MINSKY MOMENT:**

Minsky's financial instability hypothesis was notably applied to the mortgage crisis in McCuley (2009) and referred to as a "Minsky moment."<sup>97</sup> Minsky's financial instability hypothesis<sup>98</sup> provides a framework important to discussing different types of borrowers during the mortgage boom. Minsky describes three types of borrowers; hedge, speculative, and Ponzi. With hedge financing a borrower is able to cover interest and principal payments with current cash flow. Borrowers in this category are the lowest risk of default because they

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<sup>97</sup> The term "Minsky moment" was first used by Paul McCulley in McCulley 2009

<sup>98</sup> Minsky, 1992



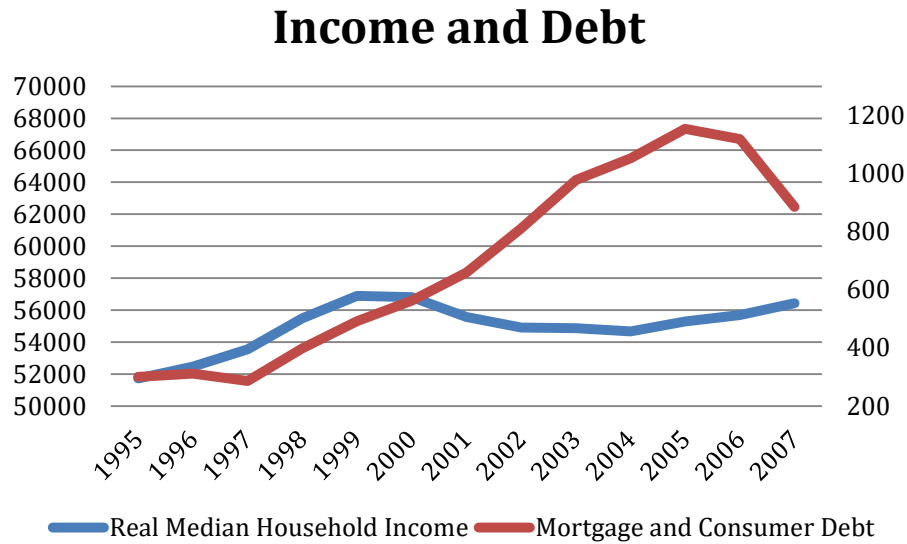
have the ability to pay off mortgages regardless of the market value of the underlying property. Many borrowers, however, fall into the speculative category of financing. Speculative borrowers are able to cover some but not all of their contracted payments. These borrowers might have enough cash flow to cover interest payments but not enough to reduce their principal and will roll over maturing debt. Borrowers in this category require either property values to rise or interest rates to decrease. A third group of borrowers fall into the Ponzi financing category. Ponzi financing is similar to speculative but with negative amortization, these borrowers require refinancing or a sale of their house just to meet interest payments on a loan.

During the expansionary period household debt rose dramatically while household income increased remained stagnant (See: Figure 8: Income and Debt).<sup>99</sup>

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<sup>99</sup> Federal Reserve Bank of St. Louis

Figure 8: Income and Debt



Many borrowers in this market used the questionable financing practices based on speculation and even Ponzi financing.<sup>100</sup> These borrowers are inherently risky because they rely on macroeconomic factors to continue servicing their debt. During the expansionary period with rising home values these borrowers were able to meet their payments by refinancing or selling the property. However, if home prices were stagnant or lost value homebuyers would not only be illiquid but also insolvent. This is the first of two of theorems in Minsky's financial instability hypothesis.

If hedge financing dominates, then the economy may well be an equilibrium seeking and containing system. In contrast, the greater the weight of speculative and Ponzi finance, the greater the likelihood that the economy is a deviation amplifying system.<sup>101</sup>

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<sup>100</sup> Shefrin and Statman, 2011

<sup>101</sup> Minsky, 1992

The second theorem of the financial instability hypothesis is that over periods of prolonged prosperity, the economy transits from financial relations that make for a stable system to financial relations that make for an unstable system.<sup>102</sup> The period of economic stability and rising property values encouraged leveraging among borrowers. Highly leveraged borrowers were speculative or Ponzi in nature and when property values leveled off, large debt burdens backed by assets valued less than the debt forced them to default because their debt was structured such that values must increase for them to meet their financial obligations. Essentially the period of stability was destabilizing. Widespread defaults then sparked a collapse of asset values, further exacerbating the cycle.<sup>103</sup>

Minsky supports the pro cyclical nature of behavior consistent with the euphoric markets and herd mentality presented in the previous chapter. Minsky insists that herd mentality and over-extrapolation of home prices encourages increasingly risky debt structures that ultimately undermine stability.

Humans are not only momentum investors, rather than value investors, but also inherently both greedy and suffering from hubris about their own smarts. It's sometimes called a bigger fool game, with each individual fool thinking he is slightly less foolish than all the other fools. And yes, a bigger fool game is also sometimes called a Ponzi Scheme.<sup>104</sup>

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<sup>102</sup> Minsky, 1992

<sup>103</sup> Minsky, 1992

<sup>104</sup> McCulley, 2009

The borrowers that defaulted due to overleveraged and unsustainable financing practices were overly susceptible to the home buying incentives presented in previous chapters.

McCulley insists that during the expansionary period the primary motivation for borrowers was the supply of Ponzi credit rather than the interest elasticity of demand. Banks would only loan to Ponzi holders if they believed asset prices would continue to rise.

**PAYMENT SHOCK:**

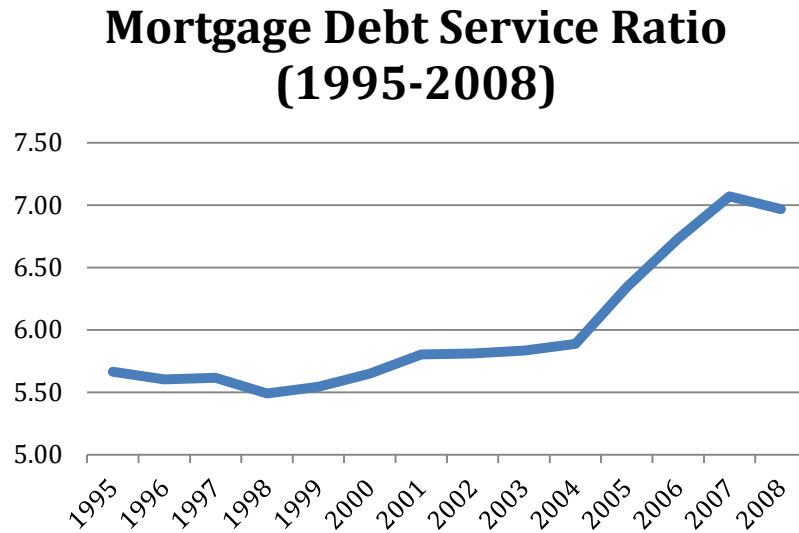
Borrowers that were speculative or Ponzi in nature could be forced into default by a change in asset values. With adjustable rate mortgages borrowers could also be at risk to cash flow issues because of an unexpected uptick in mortgage payments.<sup>105</sup> ARM loans are particularly susceptible to this structural shock as they put the borrower at risk to macroeconomic changes in interest rates. This is because ARM rates, after the two-year initial rate, float with market interest rate. As the housing bubble collapsed a credit crisis dramatically increased ARM rates. This was a significant factor in defaults during the collapse period. The mortgage debt service ratio (DSR) shows the percentage of disposable personal income that goes to mortgage debt service payments (See Figure 9: Mortgage Debt Service Ratio (1995-2008))<sup>106</sup>.

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<sup>105</sup> Schloemer, et al., 2006

<sup>106</sup> The Federal Reserve Board, 2015

**Figure 9: Mortgage Debt Service Ratio (1995-2008)**



As the debt to income ratio increases, homeowners are left with a smaller liquidity buffer if rates increase loan payments. The DSR increases throughout the expansionary period putting borrowers at heightened risk to payment shock related default.

However, the evidence from loan-level data shows that resets cannot account for a significant portion of the increase in foreclosures.<sup>107</sup> Local economic conditions may affect lower credit quality borrowers more than high credit quality borrowers because weaker borrowers generally are thought to be more vulnerable to income or liquidity shocks that damage their ability to repay a loan. Therefore,

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<sup>107</sup> Mayer, Pence, and Sherlund, 2008 and Foote, Gerardi, Goette, and Willen, 2007 show that the overwhelming majority of defaults on subprime ARMs occur long before the first reset.

local economies that have suffered adverse economic shocks would be expected to have greater delinquency rates.<sup>108</sup>

**ADVERSE EVENTS:**

Adverse events, such as unemployment and health problems, impact an individual's income or expenses, changing cash flow needed for debt payments and may cause an individual to default on a mortgage due to events largely outside of their control. Many of these events (e.g. unemployment) are correlated with changes in the macro economy. The adverse events theory posits that these events cause foreclosures, however these are poor explanations for the recent crash:

Adverse trigger events plainly cannot explain the record levels of foreclosures of recent years. Indeed, during the time that foreclosures skyrocketed, the economy remained relatively robust, with low unemployment and modest but positive economic growth.<sup>109</sup>

The unemployment rate did not rise, but actually fell by .4 percentage points between 2005 and 2006.<sup>110</sup> The mortgage collapse directly caused the economic crisis and recession, the inverse of what the adverse trigger events theory posits. Instead, defaults may be the result of payment shock or negative home equity.

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<sup>108</sup> Doms, Furlong and Krainer, 2007

<sup>109</sup> Zywicki and Okloski, 2009

<sup>110</sup> Doms, Furlong and Krainer, 2007

## **CHAPTER SIX: OPTION THEORY OF MORTGAGES**

While the previous chapter presented a view that foreclosure was involuntary, it is not a complete explanation for the foreclosures during the crash. This chapter explores voluntary foreclosure and is motivated by the options theory of mortgages. The voluntary option to default is based on the inherent economic incentive to make a rational decision on how to maximize monetary gain and minimize monetary loss.

### **OPTION THEORY:**

Borrower's decisions regarding paying a loan have long been discussed under an options model. The default option, a put option, can put the house back to the lender allowing the borrower to 'keep' the loan. A delinquency option essentially is the borrower borrowing again from the lender at a rate of the mortgage plus a penalty rate, which gives the borrower access to a line of credit. The final option, prepayment, is a call option where the borrower can prepay a loan if credit rates fall. A borrower is likely to exercise a put or call option when it is in the money.

Under the option theory of mortgages, a loan's down payment determines how far out of the money the option is at inception. The down payment therefore provides a fundamental reason for a loan to be exercised in a specific way and

strongly supports the notion that home equity is the primary driver in loan defaults during the mortgage crisis.

**DELINQUENCY/LINE OF CREDIT:**

The delinquency option gives the borrower time to evaluate and fix their financial situation. In a delinquent state the loan will eventually end up in default, prepayment, or back on track. Borrowers face significant costs while being delinquent. Fees accrue over time, making it cost more over the long run to get a loan back on track. Delinquency will also appear on a credit report and will temporarily decrease a borrower's credit score. This blemish on a record will diminish a borrower's ability to take out loans in the future and increase the cost of future loans.

Despite these costs many borrowers take advantage of this line of credit to get a period of free rent, income/consumption smoothing, and time to alleviate a financial mess.<sup>111</sup>

Delinquency rates decline with equity in the prime market but not in the low borrower credit score market, which indicates that delinquency is more like a short term borrowing option (line of credit) in the low borrower credit score market while being a prelude to foreclosure in the high borrower credit score market.<sup>112</sup> In theory high quality borrowers have more to lose from delinquency

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<sup>111</sup> Ambrose, Buttimer, and Capone, 1997

<sup>112</sup> Cutts and Order, 2004



due to their better credit record. They also have greater access to credit markets, which should allow them to weather difficult financial times.<sup>113</sup>

Delinquent loans can default or be refinanced to become current. When a loan is delinquent for a long time it will typically end in prepayment because the holder refinanced.<sup>114</sup> The decision to become delinquent on a mortgage depends on both the ability and the willingness of the borrower to repay the loan.<sup>115</sup>

#### **PREPAYMENT/CALL OPTION:**

The call option allows a borrower to prepay a loan. This situation exists either when the house has positive equity and the borrower can sell the house or when the property can be refinanced at a lower rate.

Borrowers have a strong incentive to refinance when rates drop or their credit quality improves due to significant rate differences between grades within the low borrower credit score market as well as between the low borrower credit score market and the high borrower credit score market. When interest rates fall, prime borrowers will more or less ruthlessly exercise their option to refinance into a lower rate mortgage.<sup>116</sup>

Borrowers also have a strong incentive to refinance when they are struggling to stay current, or are delinquent, but have equity in the property.<sup>117</sup> A

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<sup>113</sup> Courchane, Surette, and Zorn, 2004

<sup>114</sup> Danis and Pennington-Cross, 2005

<sup>115</sup> Doms, Furlong and Krainer, 2007 and Baker, 2008

<sup>116</sup> Cutts and Order, 2004

<sup>117</sup> Danis and Pennington-Cross, 2005 and Doms, Furlong, and Krainer, 2007

positive equity position makes the borrower more likely to attempt to preserve such a position by selling rather than letting the property go into foreclosure. The borrower does not want to give the bank the value between the loan and equity in the house. The higher the home equity the greater the incentive to the borrower to keep their loan current.

The increase in home values (and therefore home equity) during the expansionary period encouraged many borrowers to exercise the prepayment option with more favorable refinancing terms or to extract equity from the home value. The rising value environment also made loan performance strong as borrowers had a strong incentive to keep loans current. Strong house price growth increased the amount of equity in their homes and enabled them to refinance their mortgages despite being behind on the monthly payments.<sup>118</sup>

An ability to exercise this option diminishes the propensity to default due to payment shock because a borrower with positive equity in a property will not only have a strong incentive to maintain the loan (for risk of losing the equity) but also will typically have options to refinance by stripping away a portion of the remaining equity to stay current on the loan.

The prepayment/refinancing option was utilized heavily during the expansionary period. In 1997 only 8 percent of homeowners had refinanced at least once but beginning in 1999 the percentage had risen to 47 percent.<sup>119</sup>

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<sup>118</sup> Schloemer, et al. 2006

<sup>119</sup> Peter, Glenn and Dean, 2000

**FORECLOSURE/PUT OPTION:**

Homeowners in strong housing markets have greater incentive to keep the mortgage current; if there is a potential capital gain on the house and if you default, you also risk giving up some or even all of that capital gain. Risky borrowers can be bailed out by strong house price appreciation; likewise, relatively safe borrowers may still default if the adverse shock to house prices is severe enough. If home values fall sufficiently to put the market value of a property below the loan value borrowers will ruthlessly exercise their option to default.<sup>120</sup>

The put option gives the borrower the ability to put the house back to the lender. Due to the non-recourse nature of loans in the United States the lender cannot force the borrower to repay the loan value, they must accept the home in its current market value state.<sup>121</sup> Because of the non-recourse nature of most US mortgages a borrower can default and save the difference between the loan amount and the value of their home. The theoretical motivation to exercise the put option therefore is based on the loan-to-market value of the property,<sup>122</sup> even if the borrower had the funds to make loan payments.

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<sup>120</sup> Cutts and Order, 2004

<sup>121</sup> Stiglitz, 2010

<sup>122</sup> When a borrower now owes more to the bank than the house is worth: the house is 'underwater'.

Under the option theory of foreclosure default is strategic decision based on incentives inherent with changes in asset value. Default is both voluntary and rational for the borrower because the borrower could continue to pay the loan but chooses not to.<sup>123</sup>

Ruthless/frictionless default is when borrowers give the property rights in exchange for release from the mortgage obligation whenever the market value of the mortgage exceeds the value of the underlying property. The degree to which borrowers exercise ruthless/ frictionless default is highly debated.<sup>124</sup>

Kenneth Lewis of Bank of America believes that “cash-strapped borrowers now believe bailing out on a house is one of the easier ways to get their finances back under control.”<sup>125</sup> Bank of America observed that borrowers would default on mortgage debt first before falling behind on other forms of debt (car payments, credit cards, etc.). Lewis attributes this largely to changing social norms. For a borrower with a high loan to value ratio they may not have positive equity in their home: it would be easy to default on a home first, rather than other forms of debt. The mortgage debt would disappear and they would have lost relatively little.

In a macroeconomic environment with widespread underwater homes it is likely that borrowers can simply default on their mortgage and move into an

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<sup>123</sup> Stiglitz, 2010. Stiglitz refers to this as an economically rational decision.

<sup>124</sup> Ambrose, Capone and Deng, 2001

<sup>125</sup> Anders, 2007

identical neighboring house, alleviating their financial mess. Stiglitz reminds us that the borrower “might hesitate, worrying about what walking away would do to his credit reputation. But with everyone going into default, the stigma was likely to be muted.” Herd mentality is present here as well, making it seem okay to default on an underwater home regardless of one’s solvency.

Empirical studies traditionally have tended to support the option theory of foreclosure. Empirical results confirm that loan to value ratios have been found to be an important factor in mortgage delinquency prior to the market crash in 2007 and support the notion that the home price collapse was the source of the crisis.<sup>126</sup> This can be seen in a correlation between lower default rates where real estate prices have increased.<sup>127</sup> Foreclosures are more likely in housing markets with lower house price growth<sup>128</sup> Locations that saw declines in prices exhibited higher levels of delinquency and default.<sup>129</sup> High loan to value ratios were the most important observable risk factor that increased over the period.<sup>130</sup> And patterns in recent house price appreciation are far and away the best single predictor of delinquency levels<sup>131</sup> This explains why later vintage year loans performed worse

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<sup>126</sup> Danis and Pennington-Cross, 2005 and Gerardi, et al., 2008 and Demyanyk and van Hemert, 2007

<sup>127</sup> Zywicki and Okloski, 2009

<sup>128</sup> Schloemer, et al., 2006

<sup>129</sup> Doms, Furlong, and Krainer, 2007 and Ambrose, Capone, and Deng, 2001

<sup>130</sup> Gerardi, Shapiro and Willen, 2008 and Gerardi, et al., 2008 and Demyanyk and Van Hemert, 2010

<sup>131</sup> Doms, Furlong and Krainer, 2007

than other vintages, despite being relatively similar in other observable characteristics.<sup>132</sup>

While all homebuyers during in this period were subject to large swings in home values, a specific group of loan products allowed buyers to be particularly at risk to negative home equity. Many borrowers took on low or no-down payment loans. These borrowers were particularly susceptible to negative home equity from the beginning of their loan because the loan had no buffer against negative equity. Interest only loans had a similar problem because borrowers never accrue any equity if they only make interest payments.<sup>133</sup> Many loans were offered with both low/no down payment and interest only payment schedules. Low down payment loans are correlated with heightened default rates.<sup>134</sup> High loan to value lending accounts for roughly 10 percent of originations in 2000, rising to over 50 percent by 2006.<sup>135</sup> One study found that conventional mortgages with loan to value ratios at origination of 91–95 percent were twice as likely to default as loans with loan to value of 81–90 percent and five times more likely to default than those with loan to value of 71–80 percent.<sup>136</sup>

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<sup>132</sup> Demyanyk and Van Hemert, 2010

<sup>133</sup> Zywicki and Okloski, 2009

<sup>134</sup> Zywicki and Okloski, 2009

<sup>135</sup> Gerardi, et al., 2008

<sup>136</sup> Doms, Furlong, and Krainer, 2007 and Gerardi, Shapiro, and Willen, 2008 and Ambrose, Capone, and Deng, 2001

Loan to value ratios might be the primary reason why vintage loans 2005 and 2006 are found to default in significantly higher numbers than loans originated prior to 2005.<sup>137</sup> The average default rate on vintage 2006 loans exceeds the default rate on the riskiest category of loans originated in 2004.<sup>138</sup> As house prices fell even borrowers who had paid a 90 percent, or sometimes even an 80 percent down payment were left with negative value in their homes.<sup>139</sup> These findings suggest that the amount of equity in one's home is the primary consideration in a homebuyer's propensity to default.

Similar to serial refinancees, borrowers who took out a home equity line of credit against equity that accumulated during the boom also defaulted in higher numbers.<sup>140</sup> These borrowers stripped away at equity making them more susceptible to negative home equity. "Negative equity for homes in foreclosure are more often the result of post-purchase cash-out refinancing or home equity loans are more responsible for the presence of negative equity than housing price declines."<sup>141</sup>

Loans during the expansionary period were safe only if house prices kept rising, giving owners an increasing capital cushion, however it should have been

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<sup>137</sup> 2001 was also a particularly bad vintage. Gerardi, et al., 2008 and Demyanyk and Van Hemert, 2010

<sup>138</sup> Gerardi, et al., 2008

<sup>139</sup> Stiglitz, 2010

<sup>140</sup> Zywicki and Okloski, 2009

<sup>141</sup> LaCour-Little, Rosenblatt and Yao, 2008

fairly evident that this was unsustainable. The empirical evidence on the impact of house price depreciation on default rates is consistent with the theoretical model of options and tends to indicate that this is the primary motivation impacting a borrower's propensity to default during the mortgage crash.

Homebuyers are rational and behaved logically to the rational incentives or maximizing gain and minimizing loss. During this period the result was widespread foreclosure.

While Chapters Five and Six portray involuntary and voluntary defaults as explicitly different they include a significant amount of similarity in how and why a borrower would fall into one situation versus the other. The conditions which predicate a borrower becoming a speculative borrower from a previous hedge position, or borrowers who initially engaged in speculative finance, in some cases decided to default voluntarily because that was economically more efficient due to the "underwater" home value. The line between voluntary and involuntary default is partially a manifestation of how bad a situation a homebuyer finds themselves in.



## **PART TWO: THE FINANCIAL SYSTEM**

While homebuyers made a conscious decision to borrow, sometimes on a speculative or Ponzi basis, and subsequently defaulted on their loans, the financial system allowed borrowers access to a credit market and also created the inherently risky products that homebuyers took advantage of during the expansionary period. Part Two discusses the incentives for financial intermediaries and presents a logical basis for their role in the boom and bust.

Chapter Seven presents how Federal Reserve interest rate policy provided stimulus to restart the economy after the 2001 dot-com market crash and was a catalyst for the increase in mortgage originations. Chapter Eight highlights an important systemic change from an originate and hold lending model to originate and distribute, which dramatically transformed the financial system and was imperative to the expansionary period. Chapter Nine will discuss how the financial system transitioned from strong performance to a rapid crash. Chapter Ten focuses on the mortgage originator, the entity most influenced by incentives. Chapter Eleven concludes part Two by highlighting inherent problems with other financial system entities that also influenced instability during this period of lending.

## **CHAPTER SEVEN: A MACROECONOMIC DRIVER**

The exuberant growth of mortgage lending at the beginning of the expansionary period can be traced directly to government actions taken to offset the economic downturn stemming from the stock market slide which began in late 2000. The NASDAQ, for instance, trading at 4234 on September 1, 2000, dropped 46 percent to trade at 2292 on Jan 2, 2001, and continued to devalue through 2002.<sup>142</sup> In an effort to stave off recession, the Federal Government turned to the Federal Reserve (FED) for help. The FED has the ability to indirectly affect lending rates to Americans. Interest rate changes have long been a tool used to control business cycles, reigning in excessive growth and stimulating a stagnant economy. While interest rate changes helped stimulate the economy in general, they also had a direct and significant impact on the mortgage industry in 2001 because of their effect on the incentive to borrow and finance property.

### **FEDERAL RESERVE POLICY:**

Through manipulation of interest rates the FED has a powerful tool to send signals to borrowers and investors. While interest rate policy cannot mandate that consumers and investors behave in a certain way, this macro tool has a

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<sup>142</sup> Data from Yahoo Finance

significant impact on changing the incentive structure present in the financial system.

In an aggressive but not unprecedented rate drop, The FED funds target rate was cut from 5-6 percent in 2000 to under 2 percent by the end of 2001.<sup>143</sup>

FED policy was largely guided by the recession during the dot-com bust and housing in particular was targeted to reinvigorate the economy. Paul Krugman explains:

To reflate the economy, the Fed doesn't have to restore business investment; any kind of increasing demand will do. How might demand increased? Consumers, who already have low savings and high debt, probably can't contribute much. But housing, which is highly sensitive to interest rates, could help lead the recovery.<sup>144</sup>

The idea to stimulate housing as a way out of the dot-com recession was supported by many. Paul McCulley of PIMCO supported the notion that Alan Greenspan needed to create a housing bubble to replace the NASDAQ bubble.<sup>145</sup> Many in government supported this move including the sitting president George W. Bush who stated “I'm am pleased the Fed has cut interest rates. I believe the cut was needed. It's a strong statement to ensure our economy does not go into a tailspin.”<sup>146</sup>

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<sup>143</sup> Data from Fedpimerate.com

<sup>144</sup> Hammond, 2012

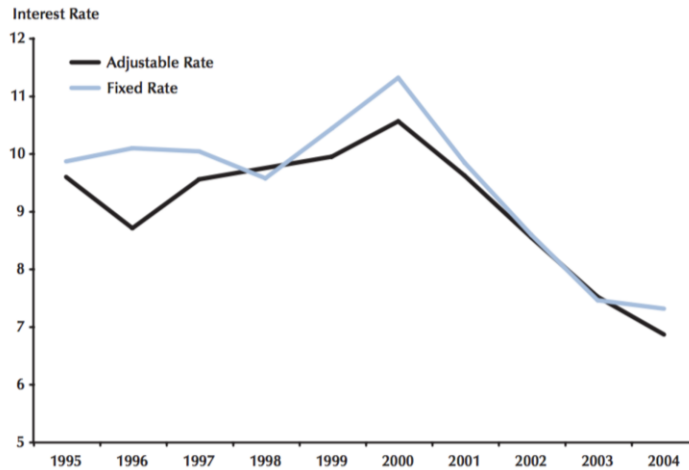
<sup>145</sup> Hammond, 2012

<sup>146</sup> Money, 2001

**MORTGAGE INTEREST RATES:**

The FED rate cut had a direct impact on mortgage interest rates. As seen in Figure 10: Interest Rates,<sup>147</sup> both adjustable and fixed rate mortgage products saw a significant reduction in interest rates.

**Figure 10: Interest Rates**



A core motivation for increased borrowing in Part One was an expansion of the availability and affordability of credit to homebuyers including those with low credit scores. Figure 11: Interest Rates by Credit Score,<sup>148</sup> shows that interest rates became favorable for borrowers in all credit score categories.

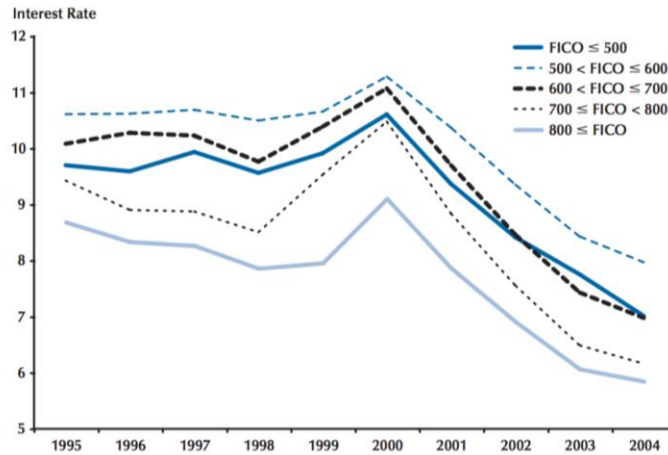
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<sup>147</sup> LoanPerformance ABS securities data base of subprime loans

<sup>148</sup> LoanPerformance ABS securities data base of subprime loans

**Figure 11: Interest Rates by Credit Score**

**Interest Rates by Credit Score**



The interest rates on the riskiest loans by credit score became lower than rates on the safest loans by credit score prior to 2001. Lowering the interest rates for the riskiest (by credit score) borrowers made loans more affordable for borrowers with bad credit; in other words, the most at risk of a future default had increasingly easy access to loans.

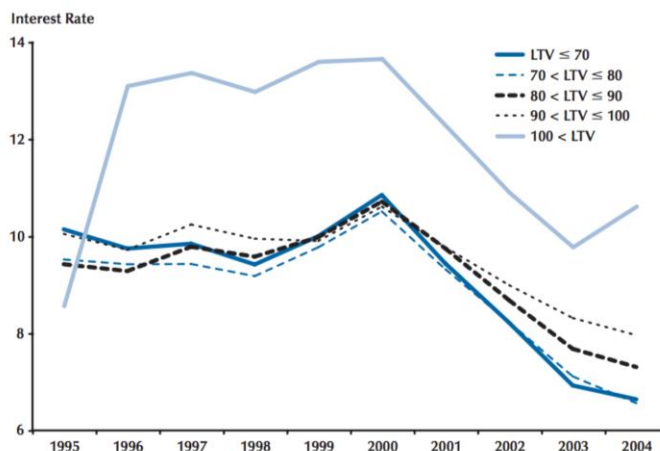
During the expansionary period borrowers became highly levered through the use of low/no down payment mortgages. These loans were important to reducing the up-front financial burden on homebuyers. Figure 12: Interest Rates by Loan to Value,<sup>149</sup> shows that lending was favorable to borrowers with high loan to value ratios.

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<sup>149</sup> LoanPerformance ABS securities data base of subprime loans

**Figure 12: Interest Rates by Loan to Value**

**Interest Rates by LTV**



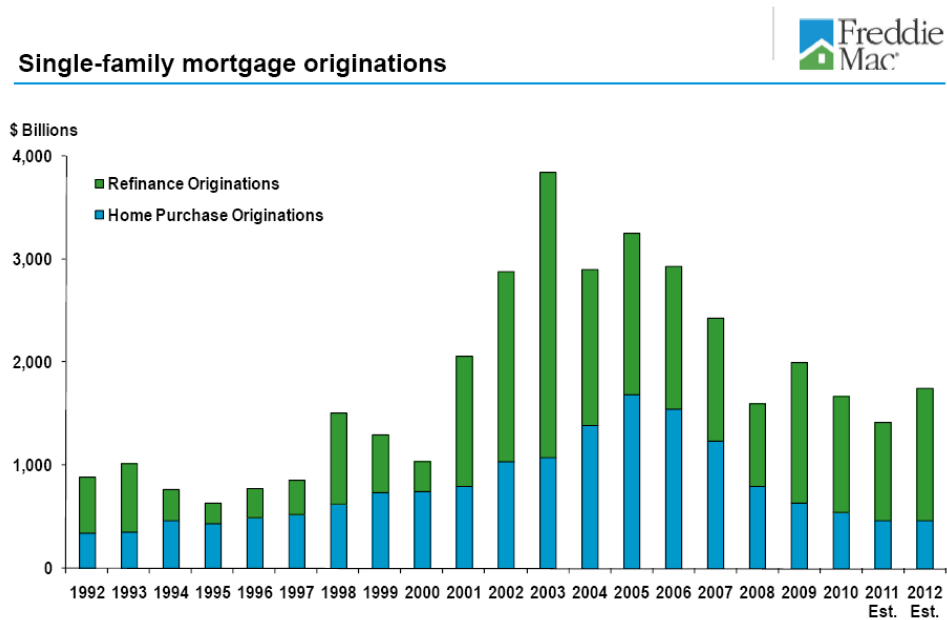
Loans with the highest loan-to-value ratios were available at interest rates comparable to the lowest loan-to-value ratios prior to 2001. Even loans with a value greater than the asset they backed eventually dipped below the rates on standard 20 percent down mortgages prior to 2001.

**STIMULATED BORROWING:**

The easing of interest rates for all types of loans (credit score, loan-to-value, adjustable vs. fixed, etc.) acted as a macroeconomic lever effecting the systemic incentive for Americans to borrow. While a number of other incentives enticed individuals to purchase property during the expansionary period, favorable interest rates were the catalyst to the period and the core of the homebuyer's systemic motivation. Mortgage origination began to accelerate in 2001 as rates began to fall, and originations continued to grow as interest rates fell

further throughout the expansionary period. See Figure 13: Single Family Mortgage Originations.<sup>150</sup>

**Figure 13: Single Family Mortgage Originations**



Source: U.S. Department of Housing and Urban Development and Federal Financial Institutions Examination Council. 2011 and 2012 data based on the September 2012 estimate of Freddie Mac's Office of the Chief Economist.

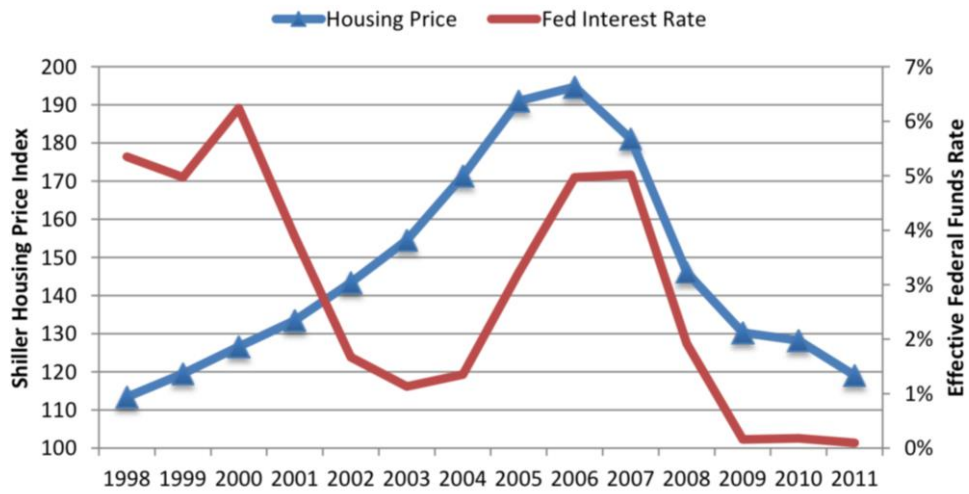
In Figure 14: The Housing Bubble and Credit Access we can see how, with some lag, fed interest rates influenced housing prices.<sup>151</sup>

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<sup>150</sup> Freddie Mac, 2015

<sup>151</sup> Beachy, 2012

**Figure 14: The Housing Bubble and Credit Access**  
**The Housing Bubble and Credit Access**



Without interest rate manipulation, borrowing would not have been as favorable and recovery from the stock market recession would not have been as swift. The goal of rejuvenating a depressed economy through interest rate changes and targeting housing seemed to work.<sup>152</sup> See Figure 15: Annual GDP Growth (1997-2004).<sup>153</sup>

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<sup>152</sup> Baker, 2008

<sup>153</sup> Data from database: World Development Indicators



**Figure 15: Annual GDP Growth (1997-2004)**



Stiglitz asserts that, for Americans who took equity out of their homes, this had “sustained the American economy– and to a large extent the global economy” but remained a “debt– financed consumption binge supported by a housing bubble.”<sup>154</sup> Low interest rates provide the necessary push to rejuvenate the economy through increased mortgage origination. As discussed in Part One during the period from 2001-2005 favorable rates were instrumental in getting individuals into housing. The ability to refinance or take out home equity loans due to low rates also allowed Americans to maintain or increase consumption despite stagnating or declining income.

#### **ISSUES WITH FEDERAL INTEREST RATES:**

Alan Greenspan’s lowering of rates in the wake of the dot-com crash served its intended purpose, to restart the economy. There is no doubt that the Federal Reserve interest rate policy, led first by Chairman Alan Greenspan and

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<sup>154</sup> Stiglitz, 2010

later by Ben Bernanke, also contributed to the enormous growth of the subprime market.<sup>155</sup> The low interest rate environment gave a strong incentive to homebuyers to leverage household finances and buy property or utilize a home equity line of credit to finance consumption. Perhaps that incentive was too strong or sustained for too long.

Many say the interest rate policy went too far and may have been a fundamental contributor to the bubbles collapse. As early as 2001, Congressman Ron Paul warned of an impending bubble and identified housing as its potential sector. Throughout expansionary period, Paul continually voiced his concern that the boom was being fed by an increase in supply of money.<sup>156</sup> Stiglitz, also concerned over the government policy writes:

Regulators stood back and let it all happen, they not only claimed that they couldn't tell whether there was a bubble until after it broke, but also said that even if they had been able to, there was nothing they could do about it. They were wrong on both counts.<sup>157</sup>

While Bernanke inherited a bubble in the making, he also came to office while Wall Street was enjoying record profits and many Americans were purchasing their first homes. If he tried to stop some of the reckless real estate lending and the complex securitization, he would be blamed for bringing down the economy. On the contrary, perhaps Greenspan did not believe there was a

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<sup>155</sup> Mayer and Hubbard, 2008. Although it was one of many factors.

<sup>156</sup> Hammond, 2012

<sup>157</sup> Stiglitz, 2010. and Chomsisengphet, 2006. Stiglitz believed that more than just the regulators of interest rate policy were at fault.

bubble, or did not believe policy measures could have deflated the bubble gradually and that it would be easier to fix things after it popped. The Fed did engage in seventeen consecutive interest rate hikes between June 2004 and June 2006,<sup>158</sup> but these seemed to have little impact on the bubbles continued formation.

There is no doubt that interest rate policy changes during the expansionary period could have served to quell the over exuberant markets. Why they did not is a significantly more complicated question. The Government after all was following their own best course of action. There was a strong logical reason to lower rates at the beginning and also many incentives in failing to raise them during the expansionary period. Questioning if the bubble existed, the political climate during the expansionary period, as well as hesitation if raising interest rates aggressively was the best move to make are all significant incentives that impacted government policy during the period.

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<sup>158</sup> Shefrin and Statman, 2011

## **CHAPTER EIGHT: A SYSTEMIC CHANGE**

At the same time that interest rate policy changes at the beginning of the expansionary period stimulated the incentives for borrowing and lending in the macro economy, financial innovation fundamentally changed the mortgage market. A systemic institutional change had profound effects on the mortgage market when the financial system moved away from the conventional originate and hold lending model and adopted the originate and distribute (OTD) model. The change also brought with it peculiar incentives to the financial players in the market. In the last chapters of this thesis, the reaction to the incentives faced by financial players, both institutions and individuals, will provide a logic for the financial systems aggressive support for the mortgage market expansion and how logical reactions to the incentives also injected significant risks into the mortgage market. This chapter presents an overview of the OTD model of lending and the benefits it presented to each participant in the mortgage market.

### **THE RISE OF ORIGINATE AND DISTRIBUTE:**

In the originate and hold model a lender deals directly with a potential homebuyer to issue a loan. The originating entity will hold the loan on its books for the life of the debt. The originating bank must have sufficient capital to issue

the loan and will also hold the default risk for the life of the loan. Profits are generated through interest accrued from lending.

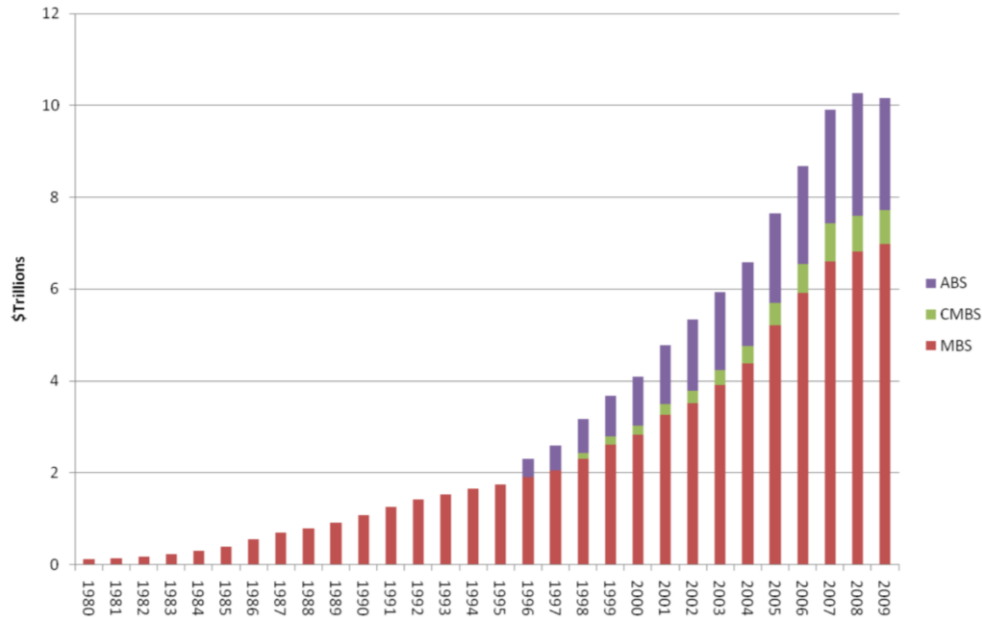
Under an originate and distribute model the mortgage originator issues a loan but instead of holding the loan on its books, the loan is sold to a financial intermediary. The financial intermediary repackages mortgages by pooling them together and dividing the pool into portions called tranches. The tranches become investments (mortgage-backed securities or MBS) and are sold to investors worldwide through a secondary exchange. This systemic change ushered in a dramatic increase in lending due the numerous incentives it presented to each entity involved, in particular deep rate reduction for primary lenders and investment vehicles for investors in the booming real estate sector.

While a secondary mortgage market had been around for close to forty years, the acceptance of OTD lending caused the securitization of mortgages grow rapidly from 1995 through the peak of the housing market (see Figure 16: Securitization 1980-2009).<sup>159</sup>

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<sup>159</sup> Rosen, 2010

**Figure 16: Securitization 1980-2009**



Securitization rates (the ratio of the dollar-value of loans securitized divided by the dollar-value of loans originated) grow from under 30 percent in 1995 to over 80 percent in 2006,<sup>160</sup> Securitization was popular with all loan categories, (see Figure 17: Securitization Rates<sup>161</sup>). The “subprime”<sup>162</sup> loan securitization rate grew from less than 30 percent in 1995 to over 58 percent in 2003, and the conventional securitization rate increased from 50 percent in 1995-97 to more than 75 percent in 2003.

<sup>160</sup> Keys, Mukherjee, Seru, and Vig, 2010

<sup>161</sup> Data from Chomsisengphet, 2006. Original source, *Inside MBS and ABS*. Subprime securities include both MBS and ABS back by subprime loans. Securitization rate equal securities issue divided by originations in dollars.

<sup>162</sup> See section: SUBPRIME for a definition of subprime loans used in this paper.

**Figure 17: Securitization Rates**

Year	Loan Type			
	FHA/VA	Convention	Jumbo	Subprim
1995	101.1	45.6	23.9	28.4
1996	98.1	52.5	21.3	39.5
1997	100.7	45.9	32.1	53.0
1998	102.3	62.2	37.6	55.1
1999	88.1	67.0	30.1	37.4
2000	89.5	55.6	18.0	40.5
2001	102.5	71.5	31.4	54.7
2002	92.6	72.8	32.0	57.6
2003	94.9	75.9	35.1	58.7

**ORIGINATION:**

A primary benefit of securitization for the mortgage originator is mitigating default risk by moving loans off lender balance sheets and into the hands of investors. Every loan has a number of embedded risks, such as interest rate risk and default risk. The originator, not wanting to hold these risks, can offload the loans to an investor who is looking for fixed income flows. This scenario is mutually beneficial for the originating bank as well as the investor. By having the option to move a mortgage off of their books through a liquid secondary market originators are able better to adjust their risk profile.<sup>163</sup> During the expansionary period mortgage originators increasingly preferred to take a fee for originating and servicing the loan instead of holding the risk and receiving interest payments.<sup>164</sup> By 2006, 60 percent of outstanding U.S. mortgage debt was traded in mortgage-backed securities (MBS).<sup>165</sup>

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<sup>163</sup> Jiangli and G., 2008 and Casu, Clare, Sarkisyan, and Thomas, 2010

<sup>164</sup> Rajan, 2005

<sup>165</sup> Chomsisengphet, 2006

Because originators move loans off their balance sheets, changes in origination volume have a small impact on bank balance sheets except for the need to temporarily hold mortgages while the sale process takes place. Essentially, the originate and distribute model allowed investors to buy repackaged mortgages debt thus providing financial banking to originate loans rather financing loans exclusively with bank deposits. This served as a massive liquidity injection into the mortgage market. Institutional investors became as important as commercial banks at providing credit to the U.S. economy.<sup>166</sup> Because investors in mortgage backed securities are from all over the world, liquidity in the mortgage market during the boom was largely based on global liquidity rather than local liquidity or the Federal Reserve rate.<sup>167</sup>

Liquid securitization markets make it easy for banks to hold loans they originate for a short period of time. The originate and distribute model of lending offers flexibility to adjust the volume of mortgages originated quickly without having to make large adjustments to equity capital or asset portfolio.<sup>168</sup>

Securitization completely transformed the origination of loans by controlling risk to the lenders and increasing the available liquidity to lend out as well as making it relatively easy for lenders to adjust lending.

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<sup>166</sup> Singh and Bruning, 2011

<sup>167</sup> Rajan, 2005

<sup>168</sup> Rosen, 2010



## **SECURITIZATION:**

Loans from originating institutions are securitized by investment banks and then sold to investors. Investment banks act as a financial intermediary and receive fees for restructuring illiquid loans into liquid products traded on a secondary exchange. Mortgage-backed securities are issued by government-sponsored entities (such as Fannie Mae, Ginnie Mae, and Freddie Mac) or private financial firms (such as Countrywide Financial, Wells Fargo, Bear Stearns, Lehman Brothers, and Goldman Sachs). The bulk of securitized mortgages (\$3.6 in January 2006) has been comprised of “agency” (government-sponsored) pools while the remainder (\$2.1 trillion as of January 2006) has been securitized in “non-agency” (private) securities.<sup>169</sup>

Once a loan is repackaged and moved off the books, the investment bank, much like the originating bank, is clear of the default risk, which is now in the hands of investors where it will ultimately stay.<sup>170</sup>

Securities are structured in a variety of ways and can become very complex, however, all mortgage-backed securities have two basic tenets that spread risk and make them an attractive investable asset: pooling and tranching. Though a standardization of contractual terms mortgages can be pooled together

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<sup>169</sup> Keys, Mukherjee, Seru, and Vig, 2010

<sup>170</sup> Stiglitz, 2010. While the investment banks kept some of the securities in special investment vehicles off their balance sheets most were purchased by investors. Typical investors of mortgage-backed securities were pension funds, hedge funds (which typically levered themselves).

into a diversified bundle.<sup>171</sup> The pool structure makes investing in mortgages less risky because default risk is spread throughout the pool. Pool performance is theoretically more predictable than the performance of any individual asset.<sup>172</sup> Moody's generally projected that ~10 percent of the individual loans would fail.<sup>173</sup> Instead of risking holding onto a single mortgage that might default, leaving you valueless, owning a pool of mortgages would give you, if Moody's predictions were correct, 90 percent of the value.

Pooling offers advantages through the dilution of risk and also through diversification. Pools can diversify by holding assets with a variety of different characteristics such as assets from different geographical regions. Because local banks lend mostly to members of their community if a large employer in that community shuts down, moves, or natural disaster strikes, it would have a significant impact on the borrower's ability to pay (adverse events). Borrowers in this geographic region would be unable to meet their mortgage payments and the bank might risk going bankrupt. Convention said that it was unlikely that mortgages from dissimilar geographical regions would experience problems at the same time.<sup>174</sup> Other ways to theoretically diversify bundles of mortgages would be to include assets with different loan structures or credit quality. Some

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<sup>171</sup> Rajan, 2005

<sup>172</sup> Rajan, 2005

<sup>173</sup> Sloan, 2007

<sup>174</sup> Stiglitz, 2010

securities were even made up by bundling multiple pools of diversified securities, creating what is called a collateralized debt obligation (CDO) or bundling multiple CDOs to create a CDO<sup>2</sup>.

It is said that pooling reduces adverse selection - the probability that a seller cherry picks the bad assets to sell. Since the performance of a pool is more predictable than the performance of any individual asset, the buyer (and the market) can attribute underperformance of the pool to misbehavior by the seller. Since sellers are typically repeat sellers in this market, this is thought to be enough to keep them honest, and refrain from selling a disguised pool of “losers.”<sup>175</sup>

The pool of mortgages is then divided up into pieces, called tranches, allowing the risk of default to be stratified. Tranching is done for the:

Same reason Tyson Foods offers you chicken pieces rather than insisting you buy an entire bird. Tyson can slice a chicken into breasts, legs, thighs, giblets –and lord knows what else –and get more for the pieces than it gets for the whole chicken. Customers are happy because they get only the pieces they want.<sup>176</sup>

Investment banks divide up pools of mortgages into tranches and sell the pieces to investors. Each tranche is given an interest rate according to its risk of default. A basic MBS payout structure might have a highly risky first loss tranche absorbing the first 3 percent of the losses, a mezzanine tranche absorbing the following 3 to 7 percent of losses, and a senior tranche absorbing any remaining

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<sup>175</sup> Sloan, 2007. Theoretically this logic could be applied to the originators on loan quality as well.

<sup>176</sup> Sloan, 2007

loss.<sup>177</sup> This structure shields investors in the senior tranche from losses until they exceed 7 percent of the notional amount of the assets. Cash flow from securities can also be structured “differing in liquidity, maturity, contingency, and risk, each of which appeals to a particular clientele.”<sup>178</sup>

Essentially Investment banks were providing investments that investors wanted, and attempted to stay neutral in their market position<sup>179</sup> while increasing efficiency in the mortgage market. There is a saying on Wall Street that when the ducks quack, feed them. The investment banks helped the originators feed the investors and in turn provided originators the benefits of being free of default risk and flush with additional liquidity.

#### **GOVERNMENT BACKED SECURITIES:**

Created by congress under the Department of Housing and Urban Development, quasi-private firms (government-sponsored entities or GSE) such as Fannie Mae and Freddie Mac were sponsored to increase lending to higher risk borrowers.

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<sup>177</sup> Rajan, 2005

<sup>178</sup> Rajan, 2005

<sup>179</sup> While outside the scope of this paper, investment banks must hedge their position during the time that mortgages remain on their books while repackaging and selling the assets. A number of complex derivative transactions were utilized to accomplish this and have been the subject of scrutiny during the credit crisis.

Government interaction directly in the housing market was no new concept. Expanding homeownership rates historically has been a “linchpin” of American financial and social policy.<sup>180</sup> Ron Paul explains:

Ever since the 1930s, the federal government has involved itself deeply in housing policy and developed numerous programs to encourage homebuilding and homeownership. Government sponsored enterprises Fannie Mae and Freddie Mac were able to obtain a Monopoly position in the mortgage market, especially the mortgage-backed securities market because of the government. Laws passed by Congress such as the Community Reinvestment Act required banks to make loans to previously underserved segments of their communities, thus forcing banks to lend to people who normally would be rejected as a bad credit risks.<sup>181</sup> It should be noted that Ron Paul’s opinion differs from that of many

other, notably including the Harvard Center for Housing Studies and Paul Krugman.

Fannie Mae and Freddie Mac received \$13.6 billion worth of indirect federal subsidies in 2000.<sup>182</sup> With government sponsorship comes an explicit promise by the treasury to bail out these GSE’s in times of economic difficulty.<sup>183</sup> The government use of GSEs served as a massive injection of liquidity to the market. Furthermore, relaxed lending standards allowed lending specifically to the riskiest borrowers in the US. Although, many opinions, both pro and con,

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<sup>180</sup> Zywicki and Okloski, 2009. Due to a belief that the “benefits of widespread homeownership outweigh the costs”

<sup>181</sup> Hammond, 2012

<sup>182</sup> Hammond, 2012

<sup>183</sup> Hammond, 2012

exist regarding GSEs and the CRA. Both are largely promoted due to the American Dream's focus on property ownership.

In contrast to Ron Paul's view the "vast majority of subprime lending to lower – income borrowers and neighborhoods was outside the requirements and scrutiny of the CRA:"<sup>184</sup>

Banks didn't engage in lending in their assessment areas, they did so at a lower rate than the market in general and accounted for only a small fraction of subprime loans to lower – income borrowers and lower – income neighborhoods. The data suggests that far from being forced into risky corners of the market, the institutions under the scrutiny of the CRA were crowded out by unregulated lenders.<sup>185</sup>

#### **INVESTING:**

Investors widely saw mortgage-backed securities as a good product. The risk to an investor was diluted through the pool structure of securitization and tranching made products that fit every risk profile, the mortgage market was hot, and yields were good. Generally, MBSs are traded actively, much like bonds are, so there is very little liquidity risk, especially in the case of MBS' that originated from the GSEs, which are especially enticing to investors due to an implicit or explicit government guarantee.<sup>186</sup> Non-agency securities have no such guarantee, however, private MBS were considered an extremely safe investment, often said to have the same credit worthiness as treasuries but with a return 1-2 percent greater.

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<sup>184</sup> Park, 2008

<sup>185</sup> Park, 2008

<sup>186</sup> Hammond, 2012 and Keys, Mukherjee, Seru, and Vig, 2010

The vast majority of tranches in non-agency deals carry triple-A ratings, and credit risk (i.e., the risk that all principal will not be returned) is channeled to a small percentage of lower-rated tranches by cash flow rules that are designed to protect the “senior” higher rated bonds.<sup>187</sup>

These securities are primarily used to provide safe income. Furthermore, rating agencies confirmed the safety and gave MBS’ high ratings.<sup>188</sup>

A substantial reason the MBS investors bought in was due to high ratings from the three rating agencies, Standard & Poor's (S&P), Moody's, and Fitch Group. Credit rating agencies play a vital role by certifying the safety of many investable assets. MBS’ in general received very high ratings, many rated AAA, as high as a treasury bond.

The early MBS’ were created during a booming period in housing and performed very well. Not surprisingly, investors clamored for more. Mortgage-backed securities were the largest segment of the US bond market<sup>189</sup>. During the expansionary period the U.S. secondary mortgage market became the largest fixed-income market in the world.<sup>190</sup>

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<sup>187</sup> Keys, Mukherjee, Seru, and Vig, 2010

<sup>188</sup> More on rating agencies in the next section.

<sup>189</sup> Schloemer, et al., 2006

<sup>190</sup> Chomsisengphet, 2006

## **BENEFITS TO BORROWERS:**

Strong market conditions that prevailed since 2000, allowed for exotic and potentially risky loan structures to develop and gain in popularity.<sup>191</sup> These structures, presented in Part One, allowed for more affordable loans. Borrowers were also able to put less and less equity into their homes when financing and loan-to-value ratios skyrocketed due to the market's better appetite for risk.<sup>192</sup>

Liquidity and risk sharing allowed originators to lend to more risky borrowers, who were underserved previously. The ability to spread risk and the increase in added liquidity not only meant that banks were lending to high credit score borrowers, but began to increase lending to low credit score borrowers as well.<sup>193</sup> By spreading risk to investors, the risk bearing capacity of economies is increased and originators were ultimately able to make loans to riskier borrowers.<sup>194</sup> Banks also switched from targeting the high credit score borrowers to the low credit score market to maintain loan volume.<sup>195</sup>

Low borrower credit score lending is a relatively new and rapidly growing segment of the mortgage market that expands the pool of credit to borrowers who, for a variety of reasons, would otherwise be denied credit.<sup>196</sup> For instance, those

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<sup>191</sup> Gramlich, 2007

<sup>192</sup> Keys, Mukherjee, Seru, and Vig, 2010

<sup>193</sup> Keys, Mukherjee, Seru, and Vig, 2010

<sup>194</sup> Rosen, 2010 and Purnanandam, 2010 and Rajan, 2005)

<sup>195</sup> Keys, Mukherjee, Seru, and Vig, 2010

<sup>196</sup> Bostic, Calem, and Wachter, 2005 and Nichols, Pennington-Cross, and Yezer, 2005



potential borrowers who would fail credit history requirements in the standard (prime) mortgage market have greater access to credit in the low borrower credit score market. Two of the major benefits of this type of lending are the increased number of homeowners and the opportunity for these homeowners to create wealth by building equity in their property. Low borrower credit score lending was especially prevalent in neighborhoods with high concentrations of minorities and weaker economic conditions.<sup>197</sup> Securitization, and low borrower credit score debt, is partially responsible for the increase in homeownership by 6 percent during the boom.<sup>198</sup> Loans from first-time purchases have gone up to 38 percent post-2000 from 28 percent pre-2000.<sup>199</sup> Inside B&C Lending – a publication which covers low borrower credit score mortgage lending extensively – reports that total “subprime”<sup>200</sup> lending (B&C originations) has grown from \$65 billion in 1995 to \$500 billion in 2005.”<sup>201</sup>

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<sup>197</sup> Calem, Hershaff, and Wachter, 2004 and Chomsisengphet, 2006

<sup>198</sup> Keys, Mukherjee, Seru, and Vig, 2010

<sup>199</sup> Keys, Mukherjee, Seru, and Vig, 2010

<sup>200</sup> See section: SUBPRIME for a definition of subprime lending used in this paper.

<sup>201</sup> Keys, Mukherjee, Seru, and Vig, 2010

## **CHAPTER NINE: FROM BOOM TO CRASH**

Through the first quarter of 2007 the mortgage market remained strong. Firms were profitable, investments performed well, and affordable credit was accessible to Americans. The expansionary market was a reaction to each individual and institutional incentives. While this market was building, there were many incentives that led to a housing and mortgage market that was on the precipice of collapse. This chapter will explore how the financial system turned from strong performance to crisis while the subsequent chapters will highlight specific behavior in the financial systems key entities that put the market in a position susceptible to a crash.

### **A FINANCIAL COLLAPSE:**

During the expansionary period the financial system experienced a significant positive feedback loop. Access to credit allowed buyers into the market and thus increased asset prices. Rising asset prices supported mortgage performance making mortgage-backed securities perform well. Strong performance in securities markets flooded the lending market with capital allowing and encouraging originators to issue more loans. The cycle repeated itself.

During the expansionary period financial markets showed almost no signs of an impending disaster. By 2006 signs that housing markets were unsound began to show. The rate of increase in home prices had slowed to close to zero and defaults on low borrower credit score adjustable-rate mortgages began to rise.<sup>202</sup> However, other measures of financial stability remained stable. “Corporate bond spreads and the Chicago Board Options Exchange’s volatility index (the VIX) were still at very low values by historical standards.”<sup>203</sup> Securitization markets continued strong performance with small haircuts on securitized bonds in the repurchase market.<sup>204</sup> Market metrics provide an indication of the confidence in the economy at the time. While select individuals and institutions raised red flags market metrics suggest that most did not see an impending disaster ahead.

In 2007 when the mortgage market began to quickly deteriorate, total mortgage lending amounted to \$14,560 billion and 50 percent of US mortgages were funded via securitization.<sup>205</sup> When mortgages, particularly those of the riskier variety began to perform poorly, investors took notice.

As long as the secondary loan market had enough demand, banks were able to off-load their originated loans without any disruption. The delay from

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<sup>202</sup> Demyanyk and Van Hemert, 2010

<sup>203</sup> Demyanyk and Van Hemert, 2010

<sup>204</sup> Gorton and Metrick, 2009. Haircuts measure the excess collateral a firm must offer to use a particular security as collateral. A 10 percent haircut would mean that a firm could only borrow \$90 for every \$100 of collateral it offered.

<sup>205</sup> Bank, 2008

origination to the final sale of these loans did not impose significant credit risk on the originating banks during normal periods. The year 2007 saw a reduction in investor demand in the secondary mortgage market, leaving banks sitting on disproportionately large amounts of mortgages they had originated with intent to distribute. The problem was magnified for banks with higher securitization rates. Liquidity constraints in the secondary markets as well as poor performance of loans held on originators books caused several bankruptcy filings from originators during the first quarter of 2007.<sup>206</sup>

Signs of stress in this market became visibly clear by the middle of 2007. In June 2007, credit rating agencies began to downgrade mortgage-backed securities.<sup>207</sup> By August 2007 problems at major financial firms and investment funds became prevalent due to losses on mortgage-related products. Several large “subprime” mortgage lenders went bankrupt.

Markets reacted by increasing risk spreads, especially on bank-related securities. Haircuts on securitized assets in the repurchase markets started to accelerate. By late 2007, the market for newly-issued mortgage-backed securities issued by private firms had come to a halt.<sup>208</sup>

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<sup>206</sup> Greenlaw et al., 2008

<sup>207</sup>(Demyanyk and Van Hemert, 2010

<sup>208</sup> Demyanyk and Van Hemert, 2010

In one study, the average loss for banks during 2007 and 2008 was 26 percent, with almost one quarter of the banks losing over 50 percent of their market value.<sup>209</sup> The bust would claim the lives of 360 lending institutions.<sup>210</sup>

It could be said that lenders, with an approving nod from government, simply went too far in their sub –prime lending practices. When the inevitable homeowner defaults began, they exposed weak spots in mortgage-backed securities, which in turn caused the spreading lack of confidence in these investments, withdrawal of investor funding, and liquidity crisis for lenders. Ultimately, bankruptcy and foreclosure emerged rather a panacea of widespread homeownership and escalating investor profits.

The mortgage crash immediately caused the subsequent credit crisis. While many refer to these economic events in tandem they are distinct events with related but distinct causes. The credit crisis is not discussed here based on the logic that, had a mortgage crisis not occurred, a credit crisis would have not occurred as well. Because the mortgage crisis precluded the credit crisis it became the topic of this thesis. Many refer to the economic crisis as a mortgage crisis, or specifically a subprime-mortgage crisis<sup>211</sup>. As should be clear throughout this paper it is my view that the economic issues are multi-faceted and integrated. The crisis is a series of incentives faced by individuals and incentives that encouraged

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<sup>209</sup> Rosen, 2010

<sup>210</sup> Zywicki and Okloski, 2009

<sup>211</sup> See section: SUBPRIME for a definition of subprime lending used in this paper.

the behavior exhibited during the boom and bust. Again, it was the aggregate action, not a singular part of the system, that caused a boom with massive underlying risk that led to an inevitable collapse.

## CHAPTER TEN: LENDING INSTITUTIONS

The final two chapters examine the risks and incentives that led to them in the financial system. Loan originators merit special attention as key entities in the financial system. Originators have now become an intermediary originating mortgages for homebuyers and reselling them to investors. As the supply side of mortgages for the homebuyers as well as the supply side of mortgages for the financial system, the mortgage originators decision to lend is in a particularly precarious position. This chapter provides an analysis of some peculiar incentives present to originators of debt, which prompted an escalation of lending even as signs of an overvalued boom were emerging. It is my firm belief that every piece of the system (financial and homebuyers) played a significant role in the crisis, however, lending institutions faced particularly strong incentives and were central to the system.

### **SUBPRIME:**

The mortgage crisis is frequently referred to as the subprime mortgage crisis. This thesis has refrained from using the term subprime mostly because the term subprime does not have an industry standard.<sup>212</sup> Loans and securities marketed as subprime are typically comprised of either riskier borrowers

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<sup>212</sup> Cutts and Order, 2004

(borrower quality) or riskier loan structures.<sup>213</sup> Many of the “innovative” products presented in Part One (i.e. ARM loans, etc.) would typically be considered subprime. Similarly, loans made to low credit score borrowers are also considered subprime loans. Securities with risky loan structures and/or made to low credit score borrowers would be marketed as subprime mortgage backed securities. The growth in subprime loans is consistent with what I refer to as “access and affordability” discussed in Part One.<sup>214</sup>

During the expansionary period, subprime lending was largely heralded as a great success.<sup>215</sup> This type of lending allowed 9 million new homeowners to live in their own homes and use property to build wealth.<sup>216</sup> The subprime mortgage loan market grew from \$35 billion in 1994 to \$665 billion in 2005.<sup>217</sup> The subprime share of total mortgage originations climbed from 10 percent to 23 percent.<sup>218</sup>

Many attribute the mortgage crash to the expansion of subprime lending with defaults occurring largely from loans given to riskier borrowers and/or loans

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<sup>213</sup> This will be the definition used in this paper.

<sup>214</sup> Great lengths were made throughout this paper to attempt to differentiate between loans made to risky borrowers or loans made with risky loan structures, however, in finance and most economic literature the term subprime is used indiscriminately. Any quantitative references to the subprime market are comprised of loans or pools of mortgages marketed as subprime.

<sup>215</sup> Gerardi, et al. 2008 and Schloemer, et al., 2006

<sup>216</sup> Singh and Bruning, 2011 and Cornett, 2008

<sup>217</sup> Schloemer, et al., 2006

<sup>218</sup> Schloemer, et al., 2006



with risky structures.<sup>219</sup> Certainly both inherently risky products as well as access to credit to riskier borrowers were contributing factors to the instability in the mortgage market. The following subsections will examine why lenders issued these loans.

#### **QUESTIONING THE BUBBLES EXISTANCE:**

There was significant debate during the expansionary period as to whether the mortgage market was experiencing a boom or not. While lending was more risky because of lower borrower quality and inherently risky loan structures, positive market conditions kept them from default.<sup>220</sup> House price growth increased the amount of equity in homes enabling borrowers who might have been close to default to refinance, maintaining mortgage performance. Strong performance served to encourage the use of innovative loan products; which encouraged even more aggressive loans throughout the expansionary period.<sup>221</sup>

Because of exceptionally strong loan performance, economists heavily debated the stability of the mortgage market.<sup>222</sup> In 2005, TIAA-CREF published two competing views.<sup>223</sup> Shiller (2005), citing the rise in home values beyond

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<sup>219</sup> Zywicki and Okloski, 2009 and Beachy, 2012

<sup>220</sup> Zywicki and Okloski, 2009 and Schloemer, et al., 2006 and McCulley, 2009

<sup>221</sup> Zywicki and Okloski, 2009

<sup>222</sup> Demyanyk and Van Hemert, 2007 and Baker, 2008. Other notable views come from Mayer, and Sinai (2005) and McCarthy and Peach (2004)) arguing that housing was reasonably valued and Gallin (2008), Gallin (2006) and Davis, Lehnert, and Martin (2008)) arguing that it was overvalued.

<sup>223</sup> Shefrin and Statman, 2011

historical mean, provided support that there was a bubble, while Peach (2005) argued that increased home prices and the ratio of rental incomes to home prices were reflecting improvements in the quality of houses and changes in the financing market to suggest a bubble was not present.

Others argued that while theoretically we knew the system was at heightened risk, we did not understand the true quantitative repercussions.<sup>224</sup> This could be due to an inability to model decreases in asset prices or a belief that defaults would be insensitive to drops in asset prices.<sup>225</sup>

In 2004, Alan Greenspan dismissed the possibility that the US was in a housing bubble: “a national severe price distortion,” he declared, was “most unlikely.” In 2005, Ben Bernanke insisted that home-price increases “largely reflect strong economic fundamentals.”

The absence of a widespread realization of the extreme risk in the mortgage market at the time allows for individuals and institutions to make decisions based on the incentives presented to them without questioning how much risk they were injecting into the system. At the very least, the questionable nature of a realization of risk encourages decisions to be made so that individuals and institutions don't fall behind their competition.

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<sup>224</sup> Rajan, 2005 and Gerardi, et al., 2008

<sup>225</sup> Gerardi, et al., 2008

**COMPETITION:**

The financial system, and originators in particular, are in business for profit. In order to compete in the lending market, banks need to originate the loan types that are in demand, otherwise risk losing business to competing firms. The lending institutions faced a strong incentive to follow keep up with their competitor's practices otherwise risk losing business. The brokerage market during the expansionary period was brutally competitive due to the entry into the market of independent brokers, especially online mortgage lenders.<sup>226</sup> Competition manifested itself in two ways, servicing borrowers with increasingly higher credit risk<sup>227</sup> and offering inherently risky loan structures<sup>228</sup>. Lenders originated products that were in demand (inherently risky products) and began to issue loans to riskier borrowers out of a need to find buyers for their mortgage products. Eventually the pool of homeowners they were attracting subsisted largely of subprime borrowers. As long as the secondary market had an appetite for subprime loans, this was not a problem for lenders as subprime loans were typically accompanied by higher fees.

**FEE BASED INCENTIVE:**

Because mortgage originators operating under the originate and distribute model collect fees regardless of loan performance, they had little incentive stop risky lending. While many insist that the originate and distribute model induced

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<sup>226</sup> Bank, 2008

<sup>227</sup> Bank, 2008

<sup>228</sup> Rajan, 2005

risky behavior because the originators were not holding the loans on their books (moral hazard), theoretically this is a poor explanation because investors would care about the credit quality of the loans and stop buying the securities. However, because of the lack of transparency in mortgages and securities I cannot fully discount that moral hazard was not present. Asymmetric information was involved; one considers the originate to distribute model method the loan originators have less incentive to follow the methods that would otherwise been employed to avoid the dangers of asymmetric information and adverse selection.<sup>229</sup> Banks in the originate and distribute market were in a volume driven business, not a quality business. The innovative structures were particularly popular and thus helped drive volume. The riskier loans and loans made to weaker borrowers also typically came with higher fees. Banks also received a larger fee for selling a bigger loan,<sup>230</sup> further incentivizing banks to push both risky products and larger loans.

Low/no down payment loans enabled borrowers to buy higher priced houses. Similarly, with liar loan, where individuals were not required to prove their income to get a loan, the borrower and/or the lender could intentionally overstate the borrowers income in order to qualify for a larger loan at a more favorable rate.<sup>231</sup> Low documentation loans comprise more than 50 percent of the

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<sup>229</sup> Stiglitz 2010

<sup>230</sup> Schloemer, et al., 2006

<sup>231</sup> Stiglitz, 2010

subprime mortgages and 90 percent of these loans had inflated incomes compared to IRS documents.<sup>232</sup> ARM loans were also particularly advantageous to the lenders, because they necessitated repeated refinancing. At each refinancing, originators received more fees. The lending institutions had a strong incentive to provide these high risk mortgages and the homebuyers also demanded these products.

The mortgage market during this period had an especially peculiar incentive. Both borrower and lender incentives to maximize the size of the loan were in line. Mortgage originators got a larger fee for originating a larger mortgage, and again for selling it off and most borrowers wanted the largest mortgage possible.<sup>233</sup> Originators did not hold any risk if the borrower did not repay, so selling the highest fee-generating loan possible was best for them, giving them little incentive to issue safer or smaller loans.

Because of this mutual incentive, homebuyers and banks both ended up inflating estimates of what the buyer could afford and exaggerating the value of the house.<sup>234</sup> A number of empirical studies support the notion that banks originated with the sole intent of selling mortgages to earn fees, not for risk management.<sup>235</sup>

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<sup>232</sup> Schloemer, Li, Ernst, and Keest. 60 percent of the stated amounts were exaggerated by more than 50 percent

<sup>233</sup> Stiglitz, 2010

<sup>234</sup> Stiglitz, 2010

<sup>235</sup> Rosen, 2010

**TRANSPARENCY:**

The originate and distribute model was intended to, among other things, improve credit risk transfer, making the financial system safer. It was also argued that banks would sell their safest assets, or at least not their worst assets, to reassure investors.<sup>236</sup> While banks have an incentive to issue a larger volume with less regard for quality, theoretically investors would be cognizant of the risk they were holding and still demand loans of high quality, averting moral hazard.

However, originate and distribute lending involves transactions among distant participants, where the originator is supposed to act in the best interest of the borrower and investment bank/investor. This relationship is fundamentally vulnerable to adverse behavior due to a misalignment of incentives. Because of the originators incentive to initiate a large quantity of loans they are at risk to reduced screening efforts.<sup>237</sup>

When a bank decides to issue a loan, some characteristics of the decision are easy to credibly communicate to third parties, however, there are other soft pieces of information that cannot be easily verified by parties other than the originating institution itself. “As the originating institution sheds off the credit risk and as the distance between the originator and the ultimate holder of risk increases, loan officers’ ex-ante incentives to collect soft information

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<sup>236</sup> Greenbaum and Thakor, 1987

<sup>237</sup> Bank, 2008

decreases”<sup>238</sup> Evidence suggests that reliance on hard information for subprime loans increased as securitization did.<sup>239</sup>

Originate and distribute banks originated and sold large amounts of loans with inferior soft information.<sup>240</sup> Banks with aggressive involvement in the originate and distribute model of lending did not actively screen their borrowers along the soft information dimension. Because of the absence of this information banks with higher originate and distribute participation have higher mortgage default rates while banks that originated loans with an intention to keep on their balance sheets had lower default rates.

The quality of loans deteriorated for six consecutive years before the crisis hit and banks were acutely aware of it.<sup>241</sup> Standards were poor, especially with loans that incorporated unverified incomes.<sup>242</sup> Lenient underwriting standards magnify the risk of loans that already include high-risk features.<sup>243</sup>

A portion of the stock market decline for banks in 2007-2008 was related to the banks’ pre-crisis distribute activity.<sup>244</sup> Over 80 percent of traded banks reported at least some distributed sales while only a few banks specialized in

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<sup>238</sup> Stein, 2002 and Rajan, Seru, and Vig, 2009

<sup>239</sup> Rajan, Seru, and Vig, 2009

<sup>240</sup> Purnanandam, 2010

<sup>241</sup> Demyanyk and Van Hemert, 2007

<sup>242</sup> Shefrin and Statman, 2011

<sup>243</sup> Schloemer, et al., 2006

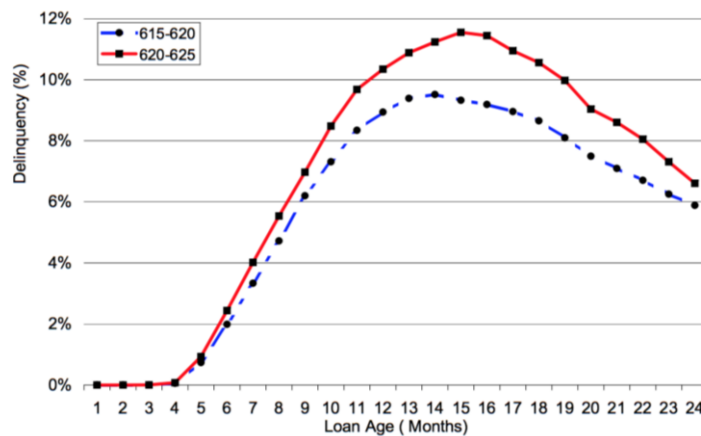
<sup>244</sup> Demyanyk and Van Hemert, 2010

originating and selling mortgages. For most banks, mortgage sales were a small part of their business. The issues in securitization markets had an impact on these low-OTD banks that was, in general, not likely to be solvency-threatening. The risky proportion of a bank's stock price was larger for banks with more significant distributed sales.

Banks did less screening for subprime mortgages they planned to sell.<sup>245</sup> Conditional on being securitized, the portfolio that is more likely to be securitized, defaults by around 20 percent more than a similar risk profile group with a lower probability of securitization (these two portfolios have similar observable risk characteristics and loan terms).

Further evidence can be seen by examining default levels around securitization cutoff levels. See (Figure 18: Delinquencies on the Margin)<sup>246</sup>

**Figure 18: Delinquencies on the Margin**



<sup>245</sup> Keys et al, 2010

<sup>246</sup> Keys, et al., 2010. The same results follow for full documentation loans



Around cutoffs loans have similar observable risk features, demographic characteristics, and loan terms. Loans just above a credit score threshold default more 20 percent more frequently than loans just below the cutoff.

## CHAPTER ELEVEN: OTHER ISSUES

While lenders are a key intermediary between the homebuyers and the rest of the financial system, a significant role in the market is controlled by the behavior of the investment banks, rating agencies, and investors. The whole mortgage market is an intricate machine where all the parts must move simultaneously for the system to work. Chapter Ten presented many risk enhancing actions that lenders took that it would seem would be a concern for the other financial participants. However, the other financial participants responded to their own incentives which allowed the system to build an incredible amount of risk.

### **REPACKAGING:**

Investment banks have the same fee based incentives as the originators, focusing on maximizing the quantity of loans they can move into investors' hands. For investment banks repackaging loans into MBS, the complex derivative structures are designed and marketing crafted to entice investors to buy the products. Banks and investment banks, just like the originators, have an incentive to originate the assets that are in high demand and thus feed the frenzy.<sup>247</sup>

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<sup>247</sup> Rajan, 2005

Due to the complexities of securitization, securities were inherently opaque.<sup>248</sup> To make the securities even riskier securitizers were, to an extent but not fully, aware of the decreasing loan quality due beyond that of the inherently risky loan structure and borrower quality.<sup>249</sup> However, possibly the biggest flaw was that investment banks, similar to the “soft information” screening failure, had their own standards failure. Rochard Bowen, Sr VP & chief underwriter, Citigroup 2002-09 found that 60 percent of loans did not meet Citibank’s credit policy.<sup>250</sup>

Alan Sloan provides the details of one particularly disastrous mortgage pool by a top tier firm.<sup>251</sup> Goldman Sachs Alternative Mortgage Products (GSAMP) assembled 8274 second mortgage loans valued at \$494mm. The average equity a borrow in the pool had at inception was 0.71 percent: 99.29 percent of the home value was loaned, and 58 percent of the loans were no or low documentation. This particular deal was sliced into 13 separate tranches and 68 percent of the issue was rated AAA by two rating agencies.<sup>252</sup> 25 percent of the issue was rated investment grade at levels from AA to BBB. In this pool 93 percent was rated investment grade. Less than 18 months after the issue, 17

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<sup>248</sup> Shefrin and Statman 2011

<sup>249</sup> Demyanyk and Van Hemert 2007

<sup>250</sup> Shefrin and Statman 2011. Bowen claims to have tried to raise awareness of the issues.

<sup>251</sup> Sloan, 2007

<sup>252</sup> As secure as US treasury bonds

percent of the borrowers had already defaulted on their loans.<sup>253</sup> Investors who paid face value for these securities suffered heavy losses.

#### **RATING AGENCIES:**

Faced with a prospectus over 300 pages when investing in a MBS, investors largely relied on rating agencies when investing in deals. Rating agencies are considered as objective and reliable judges of securities quality.<sup>254</sup> Rating agencies have come under significant attack for the generous ratings given to most MBS.

The rating agencies behaved in an understandable way. The rating agencies relied on limited data and bad quantitative models. The ratings seem justified because the limited data on the market said these were good investments. The rating agencies, just like the investment banks, used flawed models.<sup>255</sup> Analysts used fairly sophisticated tools, but were hampered by the absence of episodes of falling prices in their data. The problems were particularly severe for subprime loans, since there were none before 1998.<sup>256</sup> Many analysts anticipated the crisis in a qualitative way, laying out, in various ways, a roadmap of what could happen, but never fleshed out the quantitative implications.<sup>257</sup> Finally, they

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<sup>253</sup> The rating agencies had predicted a 10 percent loss over the life of the security.

<sup>254</sup> Shefrin and Statman 2011

<sup>255</sup> Stiglitz, 2010 and Baker, 2008

<sup>256</sup> Gerardi, et al., 2008

<sup>257</sup> Gerardi, et al., 2008

expected home values to remain high (or at least not collapse), or they may have expected subprime defaults to be insensitive to a big drop in home values.<sup>258</sup>

Others criticize the rating agencies for giving good ratings because they are being paid to rate securities. If securities are rated highly, investors will continue to buy, banks will continue to produce, and the rating agencies will have more securities to rate and generate fees from.<sup>259</sup> Some have suggested that rating agencies chose to lower their standards for rating mortgage securities rather than lose business to competitors.<sup>260</sup>

Moody's and Standard & Poor's, among others, might not have fully understood risk, but they did understand incentives. They had an incentive to please those who were paying them. And the competition among the rating agencies just made matters worse: if one rating agency did not give the grade that was wanted, the investment banks could turn to another. It was a race to the bottom.<sup>261</sup>

#### **INVESTORS:**

Stiglitz<sup>262</sup> maintains that the warning signs were clearly ignored, claiming that it was well known that the financial sector was engaged in “shenanigans” and that this should have served as a warning to investors. “To any rational individual, there was a high likelihood that many of these ‘novel’ mortgages would

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<sup>258</sup> Gerardi, et al., 2008. They concluded that analysts had a good sense of sensitivity of foreclosures to prices but over predicted the trajectory of house prices

<sup>259</sup> Stiglitz 2010 and Hammond, 2012

<sup>260</sup> Shefrin and Statman 2011 and Baker 2008

<sup>261</sup> Stiglitz, 2010

<sup>262</sup> Stiglitz, 2010

eventually not be repaid, no doubt of future losses would have to be made until the mortgage actually went into delinquency.”

Investors, however, were searching for higher yields and kept increasing their demand for mortgage-backed securities.<sup>263</sup> This demand partially led to an increase in the subprime share of the mortgage market (from around 8 percent in 2001 to 20 percent in 2006) and in the securitized share of the subprime mortgage market (from 54 percent in 2001 to 75 percent in 2006).<sup>264</sup> Investment managers also had an incentive to herd with one another because herding provides insurance that the manager will not underperform his peers.<sup>265</sup>

The risks that investors took may not have been apparent to investors, due to obscured transparency issues from investment banks and originators. The investors relied on rating agencies, however, this reliance may have drawn in many investors who were not financially sophisticated or aware of nuances in the mortgage market.<sup>266</sup> Stiglitz describes the selling of mortgages to investors as the ‘greater fool theory.’ Many investors abroad did not understand America’s unique mortgage market, especially the idea of nonrecourse mortgages. According to Stiglitz<sup>267</sup>, investors did not take a realistic look at the loans they owned until mortgages started to default.

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<sup>263</sup> Demyanyk and Van Hemert, 2007

<sup>264</sup> Demyanyk and Van Hemert, 2007

<sup>265</sup> Rajan 2005

<sup>266</sup> Rajan 2005

<sup>267</sup> Stiglitz, 2010

Eventually, the market would collapse and mortgage-backed securities would quickly lose value. The average collateralized debt obligation (CDO) lost about half of its value between 2006 and 2008.<sup>268</sup> “It was then that investors slowly started to take a realistic look at the risks they were holding in their investments, not just looking at the returns.”<sup>269</sup> The investors began to speculate that they held more exposure for too low of a rate in their portfolios. Investors in large numbers suddenly wanted to cash out and a number of hedge funds and major brokerage firms collapsed.<sup>270</sup> This marks the beginning of the credit crisis, where credit markets froze.

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<sup>268</sup> This American Life

<sup>269</sup> Stiglitz, 2010

<sup>270</sup> Stiglitz, 2010 and Singh and Bruning, 2011

## CONCLUSION

This paper explored many of the structural and personal incentives inherent in the mortgage market from 2001 to 2007. The mortgage expansion and contraction was not the fault of one entity, action, or change in the economy/financial system but a logical reaction to the incentives faced by individuals and institutions. These incentives worked together to cause an incredible economic expansion that also had extreme, and largely unrecognized, risks which ultimately led to a severe crash.

While the housing market began to accelerate in 1995, due to the dot-com bubble, we consider the period between 2001 and 2007 to be an economic period defined by the mortgage markets expansion and contraction. This is because the continued expansion of homeownership and increase in property values after the dot-com crash is fueled by the ability of homebuyers to borrow rather than on an increase in income or wealth.

An American culture of property ownership, which dates back to this country's founding, was reinvigorated during expansionary period due to rhetoric from politicians and private sector executives. Individuals were driven by more than a utilitarian consideration when electing to purchase property on credit. Some Americans were buying property for the first time, fulfilling a piece of the



“American dream” while others we’re attempting to build wealth through equity in property. A culture that values property ownership gave Americans a personal incentive while Access and affordability caused a structural incentive for homeowners to borrow. The financial system during the expansionary period offered easy access to credit at very favorable rates.

A number of incentives encourage the financial system to participate in the mortgage market. The rise of securitization provided a new method for investment banks and investors to become involved and profit off of mortgages. This also allowed the mortgage originators increase liquidity so they could provide more loans to homebuyers. The financial system and investors believed that securitization had increased the safety of investing in mortgages. During the expansionary period, due to the perceived increase in safety and liquidity injection from securitization, lenders began to issue mortgages to previously underserved groups of Americans. A rapid rise in house prices due to the demand for property caused strong performance in mortgage-backed securities. This culminated into a self-fulfilling prophecy where markets continued to assume that mortgage-backed securities were a safe investment and continued providing liquidity to borrowers fueling an increase in house prices which made mortgage-backed securities continue to perform well.

The incredible growth in the mortgage market during the early 2000s is a response to each individual’s (both homebuyers and financial system institutions and the people that make up the organizations) incentives and, albeit shortsighted, perceptions of the markets sustainability, which in aggregate allowed and

enormous bubble to form. It quite understandable why the market behaved the way did. However, at least in hindsight, it is easy to identify significant risks within this booming market. Risky lending practices in the form of high-risk loans such as low/no down-payment and adjustable-rate/ negative amortization loans and loans made to high-risk borrowers might have a relatively low propensity for default while house prices are rising and interest rates remain low, however, they have a very high propensity for default when house prices are stagnant or decreasing and interest rates fall. The era of rising property values and ultra-low interest rates was unsustainable.

A catalyst for collapse came when the supply houses outpace demand. Some high-risk borrowers began to default which caused credit markets to tighten. While some borrowers were forced into default other borrowers responded to the underwater value of their property by defaulting on their loans regardless of their ability to pay. The financial system suffered a catastrophic collapse in response to turmoil from the housing market fallout. This is largely due to linkages within the financial system that intertwined financial institutions balance sheets as well as highly leveraged institutions. The financial crisis and credit crisis that resulted from the mortgage market crash is not discussed in this thesis. The decision to focus on the housing crisis specifically is rooted in the belief that the housing market precipitated the financial/credit crisis.

The mortgage market is a very complicated system that has many influences acting on it at one time. Much of the literature surveyed for this thesis provides a deeper examination of these incentives on an individual basis. Many of

those works attempt to assert that one, or a few factors were the fundamental reason for the markets failure. The attempt to stay neutral on the merits and pitfalls of individual ideas in this paper is largely rooted in a belief that the aggregate action of each participant in the market, acting on the incentives presented to them, is the cause for exuberance during the 2000s.

The purpose of this paper is to highlight the complex interactions in the market and provide an awareness of why the market behaved the way it did through an examination of the incentives each participant faced. It is my personal belief, and one this paper supports, that had one incentive been changed and the behavior of one participant modified the market would have been unable to produce quite as large of a bubble. If the homebuyers had different incentives that lowered demand to buy property the market would have failed to take off, if lenders did not have the incentives to underwrite risky loans the market would have been quieter and safer, and if the rest of the financial system was not interested in asset-backed securities due to an incentive to invest money elsewhere liquidity would not have been available to support the massive amount of borrowing.

It must be stressed that when this period is examined as a means to draw conclusions on how the behavior that caused the crash can be mitigated in the future, most, if not all, suggestions have known drawbacks and potentially unknown adverse consequences, just as the changing mortgage market during the 2000s resulted in a realization of many unintended adverse events.

Another question remains, are we at risk to this market repeating itself. In my opinion the short answer is no, the conditions are not present now and are not likely to be present in the near future for this to be repeated. The conditions for this massive expansion and contraction were very unique. Many pieces needed to behave in a very precise way. Removing one key component, or even diminishing it, would not allow these market conditions to exist. The market conditions simply do not currently exist for another similar event.

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