Does Population Growth Affect Housing Bubbles?

A study on population growth's influence on the U.S. housing market during the 2000's

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Abstract

The purpose of this dissertation is to investigate the relationship between population growth and house prices. It analyses whether housing bubbles existed in American cities during the recent financial crisis by comparing the housing market development among cities with similar population growth trends. I use two empirical methods in order to identify housing bubbles. The price-to-rent and the price-to-income ratios determine whether house prices reflect fundamental market values throughout the period. Moreover, the qualitative analysis examines how monetary conditions and changes in housing regulations affected the American housing market during the 2000's.

The dissertation concludes that positive population growth leads to increased demand, which initiate higher house prices and enhances the bubble formation risk. The analysis argues that bubbles existed in the cities with a sharp population growth rate prior to the crisis. However, the deviation between house prices and fundamental values were higher, before, during and after the financial crisis in cities with large stable population sizes. Hence, a sharp increase in population, which equals a steep rise in demand, is necessary to cause house prices to extensively exceed fundamental values and create housing bubbles. Furthermore, the findings indicate that both expansionary monetary policy and favorable housing market regulations facilitated the housing market's boom and bust.

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Furthermore, I want to express my appreciation towards NHH and the various lectures I have taken during my curriculum. The set of academic tools and the understanding of macroeconomic concepts I acquired there, have enabled me to interpret and gain in depth knowledge on the recent financial crisis.

Merete Myrmo

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1 Introduction

Problem defined

This dissertation aims to investigate;

Did population growth prior to the financial crisis contribute to bubble formations in the American housing market?

Background

The recent and ongoing recession, known as "The Financial Crisis", is considered to be the most severe economic decline since The Great Depression in the 1930's (Shiller, 2008). The United States are considered as the crisis epicenter. However, it is difficult to determine exactly what caused the economic downturn.

The U.S. experienced an exceptional increase in asset prices prior to the crisis, especially house prices augmented considerably, compared to other economic growth periods. Consumption and employment were high and the economy boomed. The country was in the middle of an upward turning spiral. However, similar to all previous expansion phases, neither this one could grow infinitely. Hence, the financial boom had to come to an end, and with the bust went most of the asset price increase and expected profit.

In the preceding years, the U.S. has suffered from a slow recovery and the country has struggled to regain its economic strength. However, the healing process has varied greatly among American cities. Several newspaper articles and TV programs continuously report on the weak situation in certain U.S. cities, like Detroit and Cleveland, where particularly the housing market battles high foreclosure and redemption rates, abandoned property and low turnover (e.g. Seelye, 2011 and Dennis, 2011).

Seen in a historical perspective, the American population consists of mostly immigrants. From 1820 to 1924, over 36.5 million Europeans immigrated to the U.S., with the purpose of finding work and acquiring own land (Schrover, 2009). Today, this still remains "the American dream", achieving professional success and owning a home. Relative to European countries, U.S. internal migration is considered high (Zimmermann, 1995). In the 20th century the nation went through a strong urbanization, where both immigrants and people from rural

areas contributed to a strong city growth. However, according to the Census Bureau, growth patterns among American cities have varied strongly since 1970. While some cities have struggled with depopulation, others have experienced rapid growth.

Population growth seems to have a strong impact on city resources. Depopulation poses challenges maintaining demand for services and goods offered in an area, while increased population on the other hand faces constraints regarding supply, which requires additional investments. The housing market is such a resource, which needs to be adjusted according to population size.

Prior to the recent crisis, the housing market in American cities developed differently. Some experienced high price growth, while others held a constant price level. Several economists have argued that there existed a bubble in the U.S. housing market prior to the crisis (e.g. Krainer, 2003, Himmelberg, 2005, Economist, 2005). On the other hand, the variation in price development among U.S. cities indicates that this might not be the case for all areas.

The differentiated housing market evolution, prior to, during and after the financial crisis among U.S. cities, in addition to their greatly varied population growth patterns during the same period, makes me want to investigate whether there exists a relationship between population growth and house prices. Hence, in this dissertation I will explore whether population growth contributes to housing bubble formations.

Limitations

In order to limit the area of research, I look at housing bubble formations in U.S. cities throughout the 2000's in light of the recent crisis. For my analysis, I choose 15 American cities based on their population growth since 1970. Moreover, five cities with a steep population increase, five cities with a relatively stable population development, and finally, five with a strong population decline over the period. Hence, the dissertation investigates if house price development has been similar for cities with the same population growth trend. It mainly uses American house price index figures, demographic data provided by the American Census Bureau and other economic statistics from various governmental agencies as basis for the analysis.

My further objectives, first and foremost, are to investigate underlying factors that facilitate bubble expansions. The dissertation takes a closer look at how monetary policy and

governmental changes prior to the crisis influenced demand for dwellings. In addition to examine whether there are other common features for cities with similar population growth besides house prices.

Additional assumptions are related to explanations behind population growth variations in U.S. cities. The dissertation considers migration as the main reason behind population growth variations, and treats fertility and mortality rates as identical for all U.S. cities, even though this might vary. In addition, it disregards the population's age composition, which also might affect demand for housing. Moreover, in the discussion regarding common features and attractiveness among cities, the dissertation will not touch upon on tax regulations, education, social responsibility or other distinctive benefits. Furthermore, it chooses not to elaborate on financial markets regulatory changes and financial innovations' role in housing market development during the crisis.

This dissertation contains some clear weaknesses. Firstly, results are conducted based on data from one crisis. Hence, other crises should be investigated in order to see whether similar results are obtained. Secondly, the analysis compares only 15 cities, however, a larger research base would provide more reliable findings. Thirdly, cities based on their population growth patterns are treated as equal members of a category, however, initial population size make large cities dominate data sets. Furthermore, changes in population size over four decades are used to determine growth nature, although population size might have been highly volatile throughout the period.

Outline of dissertation

The dissertation is organized as follows. Chapter 2, presents the theoretical framework, which will be used to analyze the underlying housing market mechanisms. Firstly, for terminology purposes, it describes theory behind price setting and provides insight in general business cycle theory. Secondly, it presents Minsky's financial crisis theory, in order to determine whether the recession qualifies as a financial crisis. Thereafter, financial bubble theory is explained, before lastly, it presents theory behind monetary transmission channels. Chapter 3 describes the data that makes the foundation for the further analysis. Furthermore, the chapter evaluates the relevance of the data sets and reliability of the sources. Moreover, in chapter 4, the housing market and U.S. population growth are placed in a historical context. The purpose is to better understand country specific regulations and housing market events that occurred

prior to the crisis, in order to find explanations behind house price volatility. In addition, it takes a closer look at 15 U.S. cities and identifies common characteristics for those with similar population growth trends. The dissertation's main analysis is conducted in chapter 5, 6 and 7, where the theories presented in chapter 2, are applied on the recent crisis. Firstly, chapter 5 investigates whether the recession qualifies as a financial crisis. Secondly, chapter six, use two methods within the bubble theory framework, price-to-rent and price-to-income ratios, to identify whether housing bubbles existed in the U.S. prior to the crises. Thirdly, chapter 7 analyze whether monetary policy affected property prices and if the effects contributed to housing bubble expansions. Chapter 8 discusses implications of the results generated in the previous chapters and provides a deeper insight in fundamental factors, changes in housing market regulations and common economic features for cities with the same population growth patterns. Finally, chapter 9 presents the concluding remarks, which determine that housing bubbles did exist in American cities with steep population growth prior to the crisis, and more generally that rapid population growth seems to increase the risk of housing bubbles.

2   Theory

The theory chapter presents five theoretical frameworks for; demand and supply in the housing market, business cycles, financial crises, financial bubbles and the monetary transmission channels.

In order to understand the underlying housing market mechanisms, theory of price setting is presented. As the most recent recession is one of many, the chapter explains theory regarding business cycles. In the further analysis, terminology from these theories is utilized. Furthermore, financial crises theory, bubble theory and monetary transmission mechanism theory are described, with the purpose of determine in later chapters whether housing bubbles exited in American cities prior to the recent crisis.

2.1   Supply and demand in the housing market

House prices depend on the relationship between supply and demand for real estate at all times. In order to find the intersection between supply and demand, it is necessary to look at underlying factors. In the short run, supply of real estate are close to fixed, due to construction constrains. However, in the long run, housing market adapt to increased demand (Corder and Roberts, 2008). Since the dissertation focuses on price fluctuations as a result of demand variations caused by population changes, it mainly looks at supply and demand in the short run.

2.1.1   Demand side

Demand for housing is clearly heterogeneous. It varies from cities, suburbs to the countryside. However, in this simplified illustration all demand for property is treated homogeneously. In the article "What affect house prices?" Jacobsen and Naug (2005) assume that house demand can be divided in two, demand for houses as owner-occupied dwellings and demand for houses as investment objects. They further assume that desire for owner-occupied housing is significantly larger than demand for houses as investment objects. Jacobsen and Naug focuses on demand for owner-occupied units, which include flats in housing cooperatives. Hereafter, their notation for demand and supply is used as a basis for the further housing market analysis. Demand for houses can be expressed as:

(2.1) $\quad H^D = f\left(\frac{V}{P}, \frac{V}{HL}, Y, X\right), \qquad f_1 < 0, \; f_2 < 0, \; f_3 > 0$

where

H^D = *Housing demand*

V = *Total housing cost for a typical owner (rent)*

P = *Index for prices for goods and services other than housing*

HL = *Typical housing cost for a tenant*

Y = *Household real disposable income*

X = *A vector for other fundamentals that affect housing demand*

f_i = *The derivative of f(•) with respect to argument i*

The equation show that housing demand decreases when cost related to owning a house rises relative to cost of renting for a tenant, or relative to cost of goods and services in general. It also appears that demand grows as households' disposable income rises. The vector X is a common variable for other factors that affect housing desire. These factors could be; demographics, policies, expectations regarding future income or future house prices.

The costs related to owning a house, V, can be expressed as:

(2.2) $\quad \frac{V}{P} \equiv \frac{PH}{P} \, BK = \frac{PH}{P}\left[i(1-\tau) - E\pi - [E\pi^{BK} - E\pi]\right]$

where

BK = *housing cost per real dollar invested in a house*

PH = *price for an average unit in the respective area*

i = *nominal interest rate*

τ = *nominal tax rate on capital income and expenses*

$E\pi$ = *expected inflation (expected rise in P and HL measured as a rate)*

$E\pi^{PH}$ = *expected rise in PH measured as a rate*

Expression $[i(1 - \tau) - E\pi]$ is the after tax real interest rate. It represents actual house loan costs and income loss from alternatively placing the down payment in a bank. Expression $[E\pi^{BK} - E\pi]$ describes increase in housing wealth. If the expression is positive, wealth will rise and owning a house is considered relatively more profitable, hence, demand climbs.

Equation (2.2) may be simplified to:

(2.3) $\quad \frac{V}{P} \equiv \frac{PH}{P} BK = \frac{PH}{P}[i(1 - \tau) - E\pi^{BK}]$

BK is now expressed as after tax nominal interest rate minus expected increase in nominal house prices.

Even though equations (2.1) and (2.3) are based on owner-occupied housing, it is likely that the same factors also affect investment motivated ownership. Hence, investment motivated ownership enhances demand even further.

If equation (2.3) is placed into equation (2.1), and then solved for price for an average unit in the respective area, PH, the expression is:

(2.4) $\quad \ln PH = \beta_1 \ln P + (1 - \beta_1) \ln HL + \beta_2 \ln Y + \beta_3 BK + \beta_4 \ln H + \beta_5 g(X),$

where

$H = total\ housing\ stock$

The second variable in equation (2.1) shows the relative relationship between cost of owning a house and cost of renting. If cost of owning a house grows relative to cost of renting, demand for housing falls.

The third variable, real disposable income, Y, can be defined as:

(2.5) $\quad Y = \frac{YN}{P^{\alpha_1} HL^{\alpha_2} PH^{\alpha_3}}, \qquad \alpha_1 + \alpha_2 + \alpha_3 = 1, \quad \alpha_1 < \beta_1, \ \alpha_1 < \beta_2$

where

$YN = nominal\ disposable\ income$

Equation (2.5) shows that higher house prices reduce purchasing power in the housing market. If price level, P, house rent, HL, or house prices, PH, increase, the population's real disposable income, Y, decreases. Consequently, demand for houses decline.

The last variable in equation (2.1) is X. This variable includes all other factors that affect housing demand.

Most owner-occupied property is to a certain extent financed through loans. It is important to look at banks' lending policy, which is affected by banks profitability, government policy, customers expected ability to repay loans and the collateral value.

(2.6) $L^S = h\left(O, REG, Y, U, \frac{PH}{P}\right)$ $h_1 < 0, \ h_2 > 0, \ h_3 < 0, \ h_4 > 0, \ h_5 < 0$

where

L^S = banks' supply of credit to households
O = banks' profitability
REG = measure of government regulation of bank lending
U = unemployment rate
h_i = the derivative of h(•) with respect to argument i

Equation (2.6) show that supply of credit declines if banks profitability decline, government regulations tightens, expected income fall or unemployment rise.

Other factors that might affect housing demand can be; governmental regulations, bank policies, demographic changes, household preferences, urbanization effects, size of population, number of people in the start-up-phase and internal migration.

2.1.2   Supply side

The housing supply can be expressed as

(2.7) $H_t^S = (1 - \delta)H_{t-1} + C_t$

where

H_t^S = Unities supplied in period t

δ = Depreciation rate

H_{t-1} = Uniities suppliet in last period t-1

C_t = New dwellings in period t

Equation (2.7) shows that housing supply relies on; housing quantity offered in the previous period, depreciation rate and number of new dwellings offered in the present period. In the short run, depreciation rate is considered to be close to zero, hence, supply is inelastic.

As stated in Jacobsen and Naug; in a perfect market, market equilibrium is where housing supply equals demand.

(2.8) $H^D = f\left(\frac{V}{P}, \frac{V}{HL}, Y, X\right) = H^S = P$

Higher demand causes house prices to rise, as a result of the time lag associated with constructing dwellings. However, the market will adapt to increased demand in the long run, as long as there are no restrictions related to regulations or policies. Construction growth in addition to rise in offered dwellings will reduce house prices.

Figure 2.1 Housing market price setting
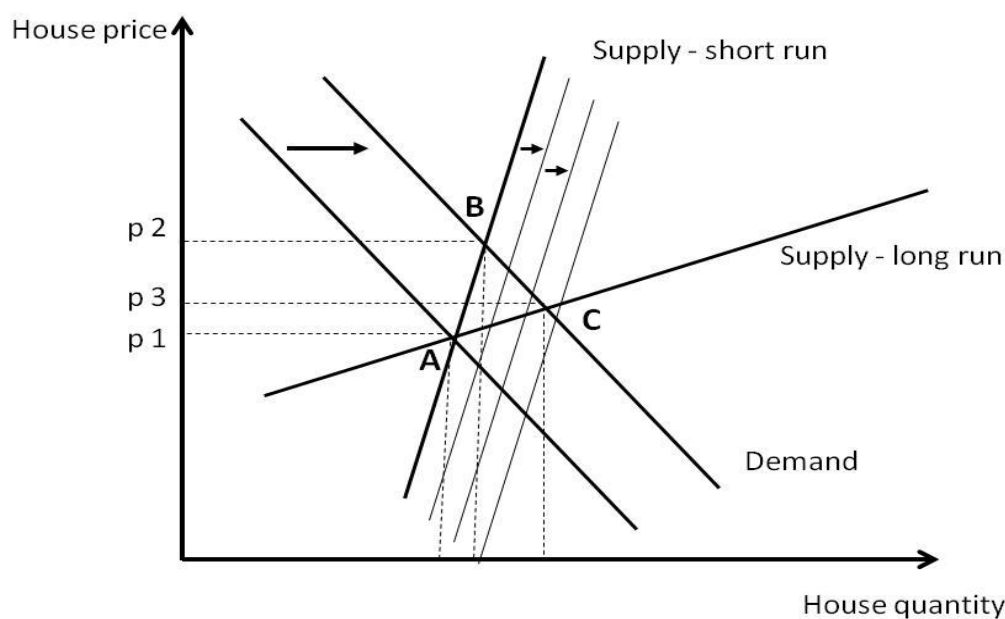
Source: Jackobsen and Naug, 2004

Figure 2.1 shows the difference between supply and demand in the short and long run. Starting in equilibrium A, higher demand pushes the demand curve to the right and a new intersection is obtained in point B. The price increases from P_1 to P_2. As more dwellings get constructed, supply curve also shifts to the right, and pushes the price down. Hence, a new equilibrium occurs in C, with the corresponding price P_3.

2.2 Business cycle theory

History shows that all economies experience fluctuations. Economists have for many years tried to describe changes in economic output. In order to analyze financial crisis and bubble formations, it is natural to use terminology from business cycle theory, hence, a brief introduction to the theory is given below.

2.2.1 Business cycle definition

A business cycle as it is defined by Burns and Mitchell (1946) is: "*A type of fluctuations found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; the sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own*".

2.2.2 Business cycle characteristics

Figure 2.2 Business cycle phases
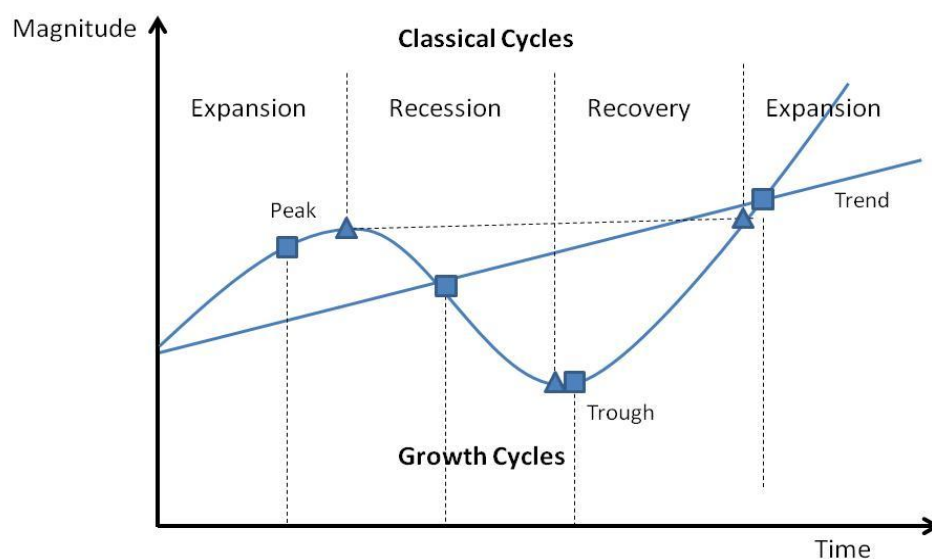
A recession is a period where series lies below the trend. Hence, deviation is negative. An expansion is the opposite. A recession stretches from a peak to a trough. The peaks and troughs exist where the deviation between series and trend is largest, where actual growth rate equals trend growth rate (Bendictow and Johansen, 2005).

A time series can be defined as:

(2.9) $\quad X = C + T + SEA + U$

where

C = *cyclic component*
T = *trend component*
SEA = *seasonal component*
U = *unknown component*

Furthermore, a trend cyclic curve can be defined as:

(2.10) $\quad Y = C + T$

1) In classical cycles, the peak and trough are equivalent to local minimum and maximum points in a trend cyclic curve, where $\frac{dY}{dt} = 0$.

2) In growth cycles, the peak and trough exist where the curve growth rate is equivalent to the trend growth rate, $\frac{dY}{dt} = a$, where a represents the trend growth.

The difference between the two interpretations has implications for time setting and extent of the business cycles. When there are positive growth trend periods, troughs will arrive earlier and peaks later in a classical cycle than in a growth cycle. Hence, the expansion phase is longer, and the contraction phase shorter, in classical cycles (Bedictow and Johanson, 2005). In the further analysis, the classic cycle terms are applied.

Many governments operate with a loss function in an attempt to control economic fluctuations, which varies depending on desired output gap. The output gap equals deviation as a percentage from trend growth rate. The production gap grows larger if the λ value is higher. λ indicates governments' targeted fluctuation in a loss function (Bedictow and Johanson, 2005).

The business cycle length is calculated by finding correlation between an output gap and the same output gap with different time lags.

Not all fluctuations meet business cycle requirements. Burns and Mitchell stated in 1946, three requirements that have to be met, in order for a fluctuation to be considered a business cycle.

1) Duration – time between turning points
2) Depth – difference between peak and trough
3) Diffusion – the same tendencies need to be found in several central components

In the U.S., the National Bureau of Economic Research (NBER) determines whether there is/has been a recession or expansion. NBER defines a recession as:

"A period between a peak and a trough, and an expansion is a period between a trough and a peak. During a recession, a significant decline in economic activity spreads across the economy and can last from a few months to more than a year. Similarly, during an expansion, economic activity rises substantially, spreads across the economy, and usually lasts for several years."

As stated in their definition, NBER does not only rely on GDP as a measurement for a recession. The reason for this is that the data is often subjected to revision, in addition to being published once each quarter, which is not considered adequately frequent. A recession is often determined after a business cycle has passed (Balke, 1991).

A less accurate method regarding the termination of a present recession is the "two quarters rule". This is a method that relies on a two quarter coherent fall in GDP, however, it is considered as a highly unreliable rule of thumb (Thøgersen, 2010). Measuring methods like the Bry-Boschan and the Romer's rule, are considered better methods (Thøgersen, 2010).

2.3   Financial crisis theory

A financial crisis creates a negative deviation from the financial growth trend. Many economists have made efforts to analyze these incidents in history in order to find connections that can help us better predict future fluctuations. To mention some; Minsky (1972), Kindleberg (2005), Reinhart and Rogoff (2009), Herring and Wachter (2003) and Dimond and Dybvig (1983). Today, Minsky's five phase model is considered the most accurate (Grytten, 2010). Hence, the further analysis is based on his model.

2.3.1   Financial crisis definition

Financial crises can be defines is different ways. According to Minsky (1982): *"Financial instability and crises are facts of economic life. Precise definitions are not necessary, for the major episodes of instability, whether runaway inflation, a speculative bubble, an exchange crisis, or debt deflation, can be identified by pointing"*.

According to Eichengreen & Portes (1989): *"A financial crisis is a disturbance to financial markets, associated typically with falling asset prices and insolvency among debtors and intermediaries, which ramifies through the financial system, disrupting the market's capacity to allocate capital within the economy"*.

2.3.2 Minsky's crisis model

Based on Hyman Minsky's theories regarding financial crises in "The Financial Instability Hypothesis" from 1978, one has developed a model that seems to fit well with stages in a financial crisis. The theory describes financial crisis caused by macroeconomic shocks, hence a classical macroeconomic framework can be used when presenting the theory. The model assumes that wealth is determined at a macro level. A second assumption regards firms' liabilities, which are considered highly substitutable with money in public portfolios. A negative shift in anticipated profits causes wealth to decline, and the public to shift portfolio preferences towards money. A rise in interest rates will cause a fall in expected profits. The model builds on monetary policies impact on the economy, and emphasizes weaknesses regarding instability in the money market, credit structure and speculation. The model consists of five stages;

1. Displacement

2. Overtrading

3. Monetary expansion

4. Revulsion

5. Discredit

Figure 2.3 Minsky's five phases
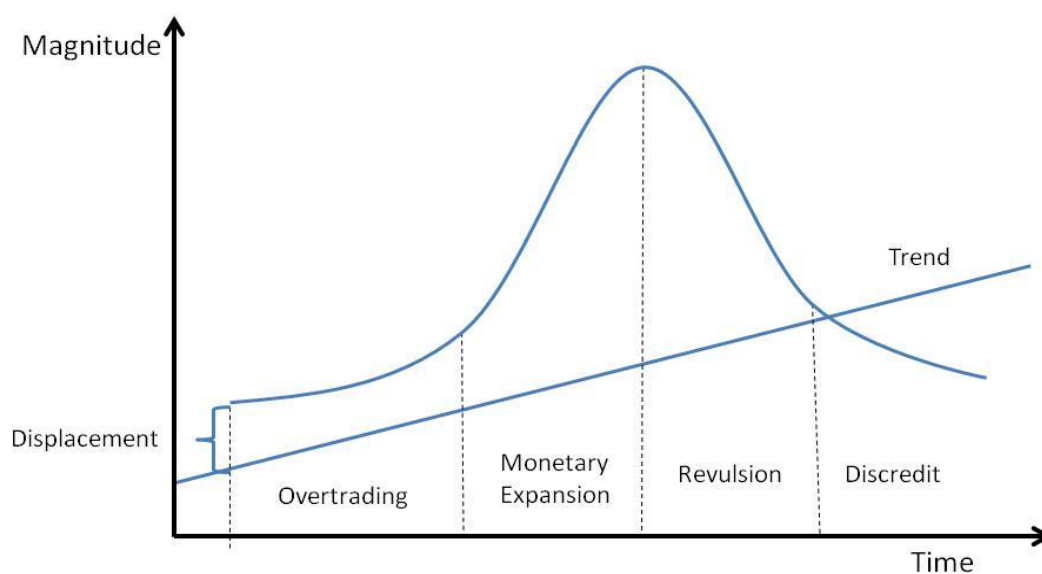
Source: Grytten, 2010

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2.3.3 The IS-LM and AD-AS models

In order to analyze the crisis' five stages, classical macroeconomic tools are applied. This dissertation uses shifts in linear IS-LM and AD-AS graphs to illustrate effects of economic changes as simplistic as possible.

The IS-LM model assumes a closed economy with fixed prices (Gartner, 2009);

> Each point on the IS-curve represents equilibrium between GDP and the corresponding interest rate. The IS-curve can only be influenced by changes in fiscal policy. The downward slope of the curve indicates that lower interest rate leads to an increase in output, first and foremost through higher investments.

> The LM-curve represents equilibrium in the money market and can only be influenced through monetary interference. The upward sloping curve indicates the relationship between money and interest rate. If GDP increases, demand for money raises, hence, the interest rate climbs.

The AD-AS models show the relationship between aggregated demand and supply in the economy. It takes price changes, hence, inflation into consideration.

> The equilibrium in the IS-LM model is referred to as the aggregated demand and each intersection composes the AD-curve for a given price level. The downward slope can be explained by the negative relationship between price and demand for production. The curve shifts right when a monetary expansion occurs.

> The AS-curve represents the aggregated output companies are willing to produce for each price level. It reflects constrains in the labor market, moreover, there is an assumption of natural unemployment.

Figure 2.4 IS-LM and AD-AS model
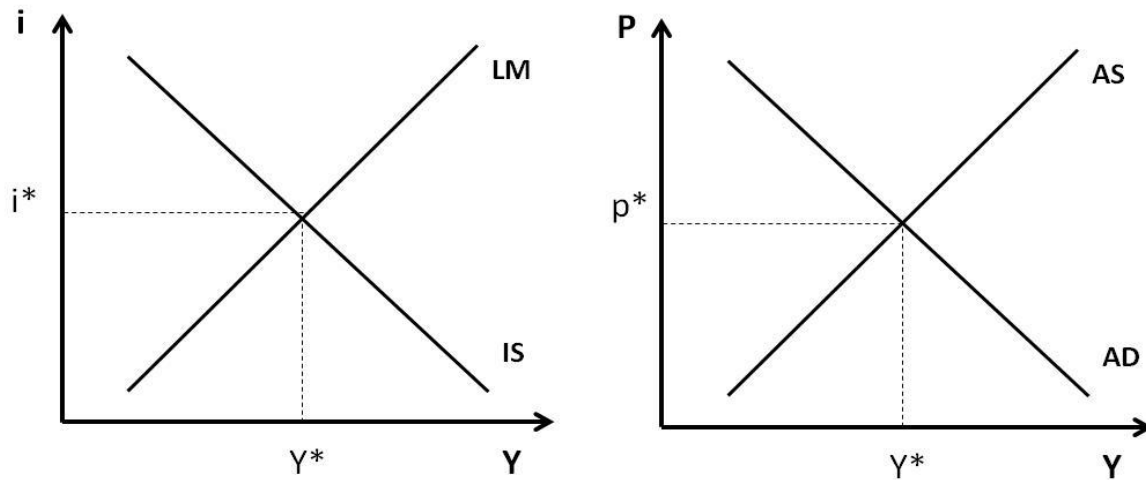
Displacement

The first phase takes place when the economy is exposed to a positive exogenous shock, which makes it leave its growth trend. This might for example be caused by government regulations, financial innovations, technological innovations or war. The change increases profit possibilities and profit expectations rises.

A positive shock makes the IS-curve shift outwards, see to the left in figure 2.5, hence, GDP and interest rate augment. The central bank expands money supply in order to prevent currency from appreciating. The increased market liquidity shifts the LM-curve outwards. If the liquidity boost is large enough, the new interest rate appears even lower than the initial interest rate, which encourages additional investments. The new intersection in the IS-LM model also causes a positive shift in the AD-curve and prices rise.

Figure 2.5 Displacement
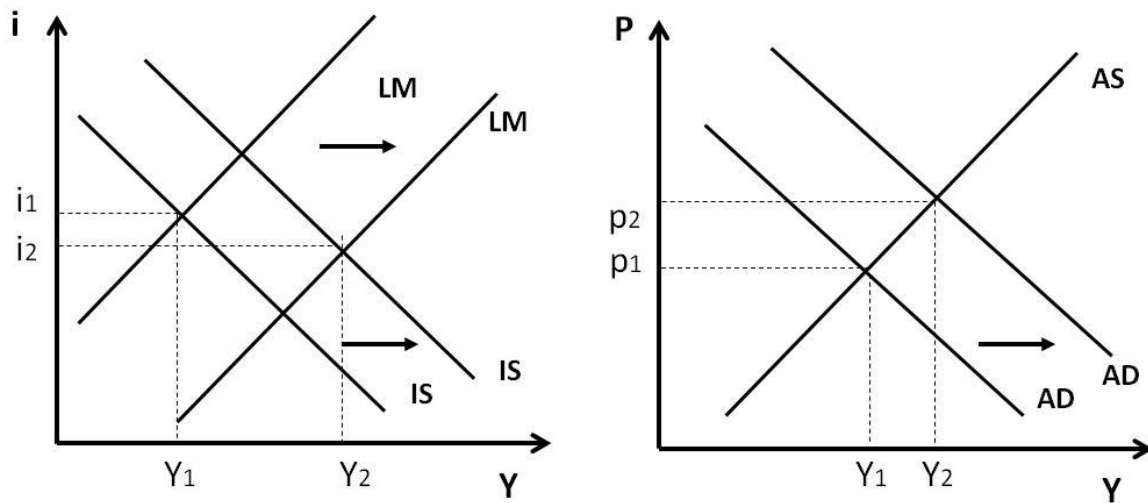
Overtrading

In the second phase, expectations related to a positive shock cause people to raise their demand for assets. Higher anticipated prices stimulate increased investments. Speculation creates a state of overtrading where people, who not participate in speculative activity under normal circumstances, decides to speculate in order to obtain a share of the expected profit.

The anticipated profit and increased investments lead to a further shift in the IS-curve, both interest rate and GDP rise and the AD-curve shifts outwards, as seen in figure 2.6. The additional shift in the AD-curve to the left pushes prices higher.

Figure 2.6 Overtrading
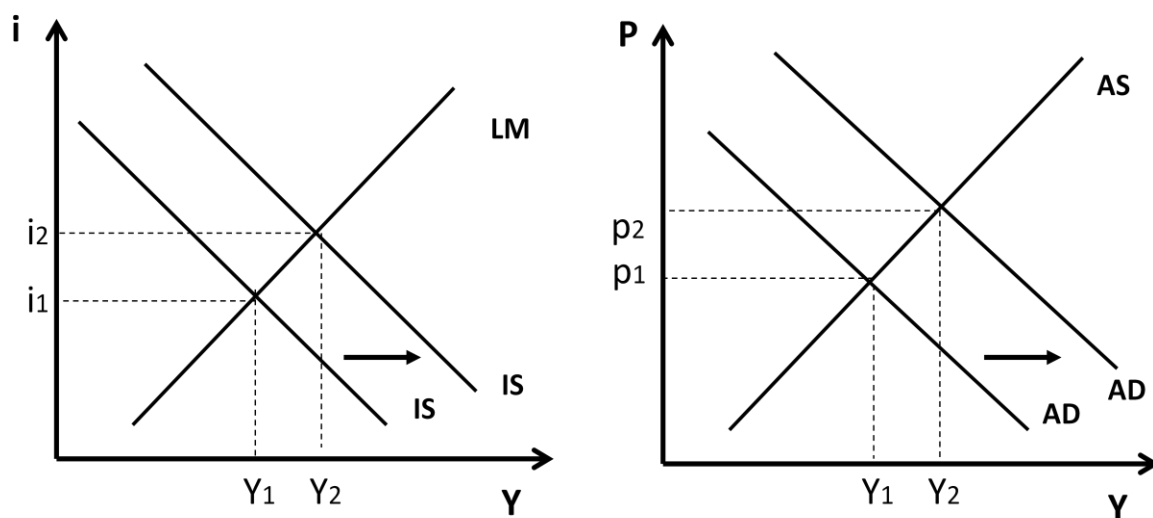
Monetary expansion

In the third phase, demand for money augments as a result of higher interest rate caused by additional investments. The central bank provides the market with liquidity to prevent the currency from appreciating. As access to money grows, lending between banks and credit supply increases. Additional money supply makes credit markets more competitive, and creditors may loosen lending requirements to attract new clients. Banks might afford to take higher risk, and offer credit at lower interest rates, which might let people with lower credit ratings access financing. When additional people get market access, demand for investments rises further, and pushes prices higher. The increased prices have no longer root in fundamental values.

Figure 2.7 illustrates how increased monetary supply shifts the LM-curve further to the right. In consequence, interest rate declines and GDP rises further. This also causes the AD-curve to shift to the right and prices continue to rise.

Figure 2.7 Monetary expansion
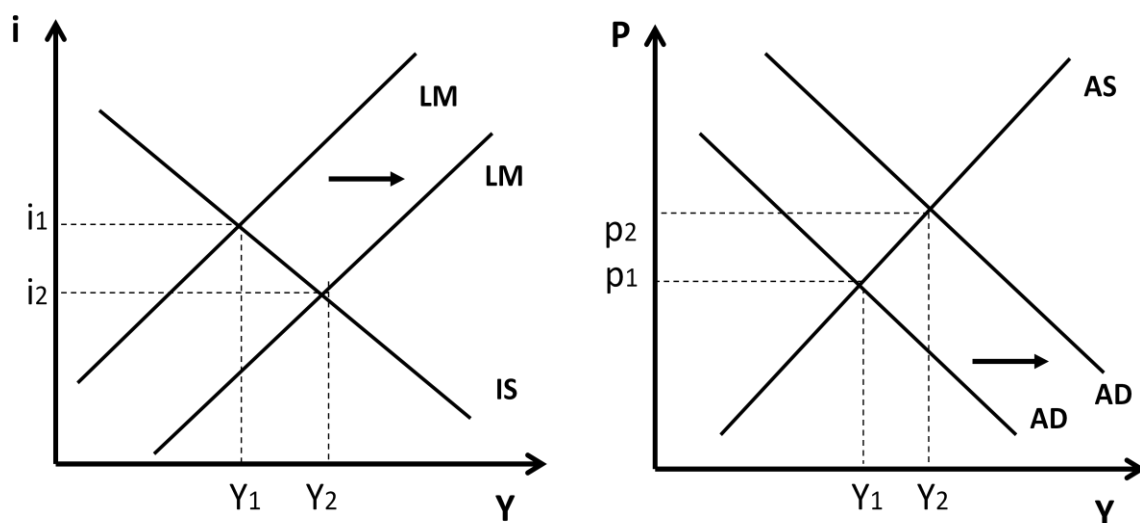
Revulsion

In the fourth phase, the peak is reached and a sudden change occurs, also known as the Minsky moment. People recognize that asset values have exceeded fundamental values and start to sell their assets to realize gains and ensure liquidity. A situation of financial distress hits the market. Optimism turns to pessimism and demand drops. As demand diminishes prices start to contract. Banks become more restrictive regarding lending practices and credit granting.

The LM-curve shifts to the left as a result of reduced market liquidity, shown on the left side in figure 2.8. The interest rate rises and it becomes even more expensive to serve loans. A drop in investments shifts the AD-curve to the left, hence, prices and GDP fall.

Figure 2.8 Revulsion
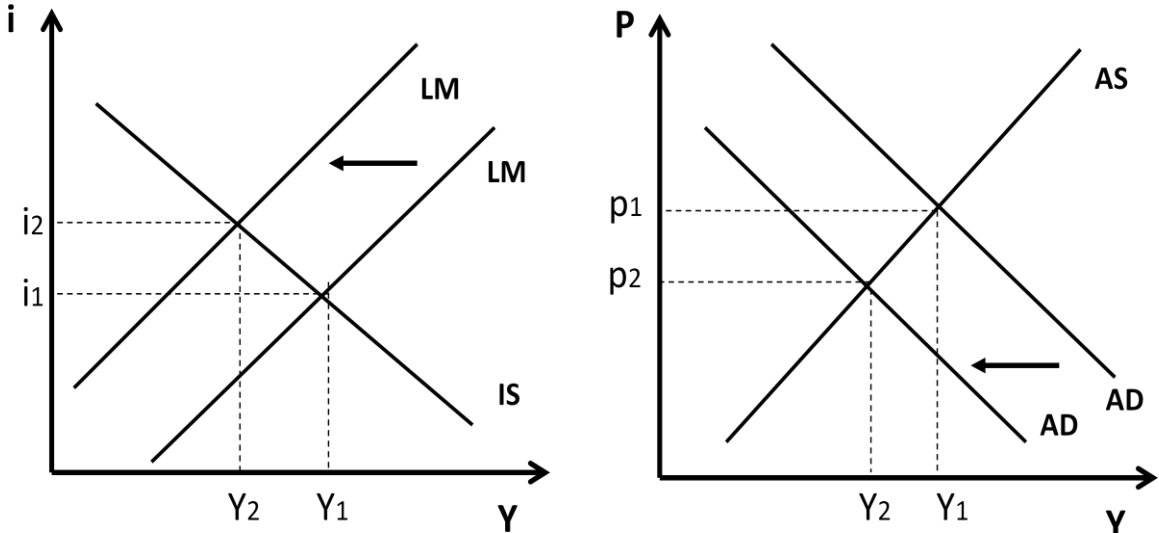
Discredit

In the fifth phase many investors face great losses. Banks become cautious to whom they lend money. It appears to be more difficult and additionally expensive to serve already existing debt. The need for liquidity leads the economy into discredit, and a state of panic may prevail in the market. If the economy decreases sufficiently it sinks below the trend growth rate and enters a state of financial crisis. The economy continues to fall until investors again consider prices to be attractive enough to resume investment activities or when a "lender of last resort" convinces the market that liquidity is adequate to meet demand.

As market liquidity declines, access to finance contracts and expectations regarding lower future prices reduce demand. The IS-curve shifts to the left and output falls, illustrated in figure 2.9 below. Reduced pressure in the economy pushes the interest rates down. The AD-curve shifts to the right as demand drops and consequently, prices and GDP fall.

Figure 2.9 Discredit
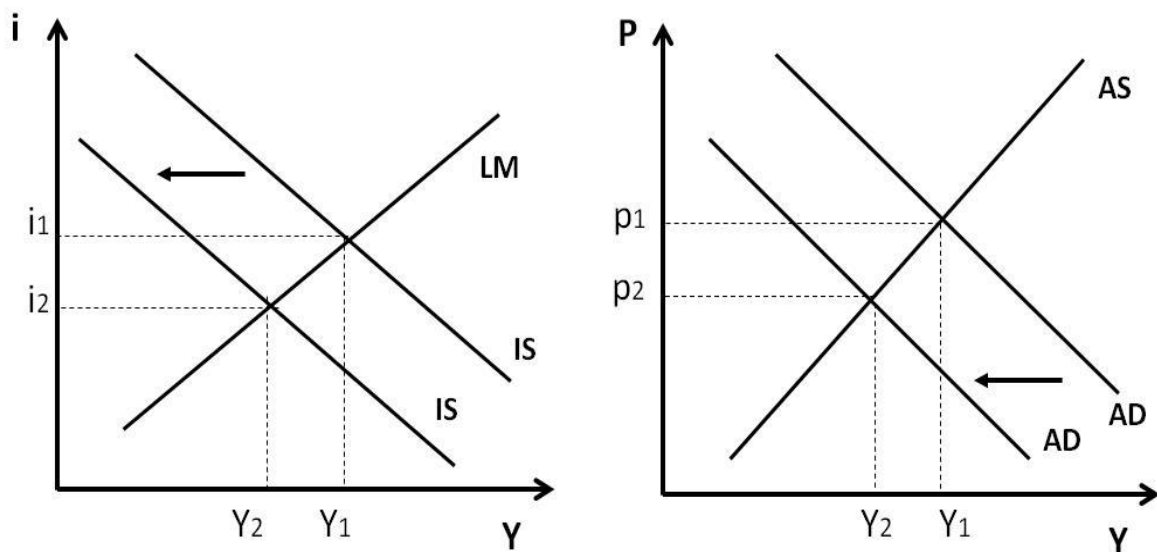
Model criticism

Minsky's model is highly deterministic and requires the economy to go through all five stages in order to be recognized as a financial crisis.

The model builds on monetary policy and represents all weaknesses associated with the liability of this set of economic tools.

2.4 Bubble theory

As stated in section 2.1, house prices are determined by market supply and demand. Since supply is relatively rigid in the short run, prices mainly fluctuate as a result of changes in demand. Demand is determined by fundamental factors like interest rate, disposable income, unemployment and costs related to owning a house, in addition to non fundamental factors. Some economists consider the existence of financial bubbles to be controversial (Garber, 2001). However, the following section presents financial bubble theory, which the further analysis is based on.

2.4.1 Financial bubble definition

According to Joseph Stiglitz (1990), a bubble can be defined as: *"If the reason the price is high today is only because investors believe that the selling price will be high tomorrow – when 'fundamental' factors do not seem to justify such a price – then a bubble exists."*

Ola Grytten (2009) defines a bubble as: *"the trade in objects at large quantity, where prices deviate significantly from fundamental value"*. He further states that: *"Bubbles appear when prices rise continually, because investors believe they can realize a gain from resale as a result of further growth in asset prices. Bubbles can in principle appear in all tradable assets where it is possible to speculate in future price direction and profit."*

2.4.2 Mathematical description

To better understand the scope of a financial bubble, it can be expressed as a mathematical equation (Grytten, 2009):

(2.11) $b_t = \frac{1}{1+r} \times E_t \times b_{t+1}$

where

b_t = *bubbles value*
E_t = *expected value*
r = *required return*
t = *period in time*

The required return, r, is the normal annual rise in house prices. In a financial market the equilibrium can be written as:

(2.12) $p_t = \frac{1}{1+r} \times E_t \times (d_t + p_{t+1})$

where

p = *price*
d = *return*

The price in period t equals expected return in period t plus expected price level in period t+1, discounted with the required return. This equation can be expanded in order to find an expression for price over time:

(2.13) $p_t = \sum_{j=1}^{n} \frac{1}{1+r}^j \times E_t(d_{t+j}) + \frac{1}{1+r}^n \times E_t(d_{t+n})$

Equation (2.13) shows that price in period t equals the aggregated discounted expected returns over the period plus the discounted expected price at the end of the period. The present value of price can be written as:

(2.14) $p_t = \sum_{j=1}^{\infty} \frac{1}{1+r}^j \times E_t(d_{t+j}) + b_t$

An expression for the bubble value can be obtained by rewriting the equation:

(2.15) $b_t = p_t - \sum_{j=1}^{\infty} \frac{1}{1+r}^j \times E_t(d_{t+j})$

The bubble value depends on the price in period t in addition to the aggregated discounted return expectations over the period.

2.4.3   Identifying housing bubbles

Equations for demand in the housing market can be used to identify housing bubbles, according to Jacobsen and Naug,. Equation (2.4) and (2.5) are solved for PH:

(2.14) $\ln PH_t = \varphi_1 \ln P_t + \varphi_2 \ln HL_t + \varphi_3 \ln YN_t + \varphi_4 \ln BK_t + \varphi_5 \ln H_t + \varphi_1 \ln g(X_t) + \varepsilon_t,$

where

$\varphi_1 = (\beta_1 - \beta_2 \alpha_1)/\gamma$
$\varphi_2 = (1 - \beta_1 - \beta_2 \alpha_2)/\gamma$
$\varphi_3 = \beta_2/\gamma$
$\varphi_4 = \beta_3/\gamma$
$\varphi_5 = \beta_4/\gamma$
$\varphi_6 = \beta_5/\gamma$
$\gamma = (1 - \beta_2 \alpha_3)$

T represents the period and ε_t is a stochastic variable that captures noise from non-fundamental factors. Variable BK_t represents expectations regarding changes in house prices from period t to period t+1. As this is an unobservable variable, price expectations depend on; observable fundamental factors on the right hand side of the equation, real rise in prices in period t-1 and a factor v_t that represents psychological and other non-fundamental factors. Furthermore, a new relationship for house prices can be formulated as:

(2.15) $\ln(PH)_t = \text{h(fundamentals)}_t + \theta \ (\text{real rise in prices})_{t-1} + v_t + \varepsilon_t$

$$= \text{h(fundamentals)}_t + (\text{deviation from fundamental values})_t$$

$$= (\text{fundamental value})_t + (\text{deviation from fundamental value})_t$$

Equation (2.15) shows that house prices deviate from fundamental factors if θ, v or ε deviates from zero. In case of a deviation, there might exist a housing bubble. A rise in fundamental factors may cause higher house prices that can influence expectations regarding further price increase, hence, housing demand will rise further. Expectations related to future income growth, development in labor markets and unemployment, will affect demand for owner-occupied housing.

2.4.4   Different types of bubbles

Financial bubbles can be divided into two categories:

1. Speculative bubbles
2. Rational bubbles

Most economists agree on the existence of speculative bubbles, however, rational bubbles on the other hand, are greatly debated (Grytten, 2010).

Speculative bubbles are related to irrational behavior and people's belief in continuously increasing asset prices. The underlying theories are linked to psychological theory and behavioral finance. Especially among Post-Keynesian economists, have the belief in speculative bubbles a strong position. Bubble growth is facilitated by extensive credit supply and risk taking (Shiller, 2008).

Rational bubbles are closer related to structural premises. Changes in financial regulations, financial innovations, easier access to credit and other technological innovations might

contribute to changes in demand for assets. Low interest rate levels can also facilitate a sharp increase in asset prices, hence, growth of bubbles (Salge, 1997).

2.4.5 Methods for measuring bubbles

The deviation between fundamental factors and asset prices can be estimated by using various methods, for example (Klovland, 2010:B):

The price-to-rent method compares house price growth with rental cost growth.

The price-to-income method compares growth in house prices with growth in income.

The HP-filter method is a statistical method that investigates whether prices deviate from long-term growth trend.

The Tobin's q method investigates the relationship between house prices in the secondary market and cost of building a new house. If q > 1, house prices are higher than building costs, and demand for new houses increases (Corder & Roberts, 2008).

House price models estimate price growth based on various factors. This method has not yet been adequately predictable. Examples are "fat dash" and "slim dash" (Mishkin, 2007).

2.5 Monetary transmission mechanism theory

The economy can be influenced by the government either through fiscal or monetary policy. Fiscal policy has long-term effects on the economy, as a result of time lags. Monetary policy on the other hand, has turned out to affect the economy shortly after execution (Thøgersen, 2010). Hence, monetary policy theory is applied when analyzing causes behind the crisis.

2.5.1 Money supply and demand

Money supply is set by the central bank and equals money demand (Krugman and Obstfeldt, 2011).

(2.15) $M_s = M_d = P \cdot L\,(\,i,\,Y),$

where

M_s = Money supply
M_d = Money demanded
P = price level
I = interest rate
Y = production output

Equation (2.15) shows that money demand relies on changes in prices, interest rate and economic output. If prices rise, interest rate falls or output increases. This affects demand, hence, desire for money rise.

The equation can also be written as:

(2.16) $\dfrac{M^*}{P} = L\,(i,Y)$

2.5.2 American interest rates

The American central bank, Federal Reserve, announces the desired interest rate, Federal funds target rate, which equals the key interest rate. The most important interest rate, federal funds effective rate, is a market rate set each day based on deposits in the Federal Reserve System (Santomero and Babbel, 2001). Deposits are required reserves to ensure market liquidity. The market decides at all times the federal funds effective rate, through supply and demand for money (Santomero and Babbel, 2001).

Federal Reserve affects market interest rates through market operations, by adjusting market liquidity. The federal funds target rate influences the federal funds effective rate through the primary credit rate, at which banks can borrow directly from the central bank. Hence, the

central bank has efficient ways to affect the short-term federal funds effective rate. However, this becomes harder as one moves along the yield curve policy (Santomero and Babbel, 2001). The long-term interest rate is determined by adding up expected future market interest rates, an inflation risk premium and a maturity premium that increases with time. Therefore, by influencing short-term market rates, the Federal Reserve is able to influence long-term rates or expectations regarding future monetary policy (Santomero and Babbel, 2001).

2.5.3   Monetary transmission channels

Historically, two types of beliefs have dominated practices related to correction of economic fluctuations; fiscal policy and monetary policy. Fiscal policy is not considered optimal as a consequence of long time lags in the real economy. Pure monetary policy has also turned out to be less successful, especially in the U.S. (Thøgersen, 2010). Today, there is a broad consensus that monetary policy should primary be a tool when correcting economic deviations in the short run, while fiscal policy should be used to influence long-term adjustments (Thøgersen, 2010).

Monetary policy affects the real economy through several channels. When the central bank sets the target interest rate, it affects companies and individuals through; interest rates, asset prices, income and wealth expectations in addition to credit access. Mishkin (2007) described nine of these channels:

1. The traditional interest rate channel

2. Exchange rate effect on export

3. Tobin's q theory

4. Wealth effects

5. Bank lending channel

6. Balance-sheet channel

7. Cash flow channel

8. Price level channel

9. Liquidity effect

Bank of England published in 2001 an example of how monetary policy impacts price levels and economic growth, as shown in figure 2.10.

Figure 2.10 The monetary transmission mechanism
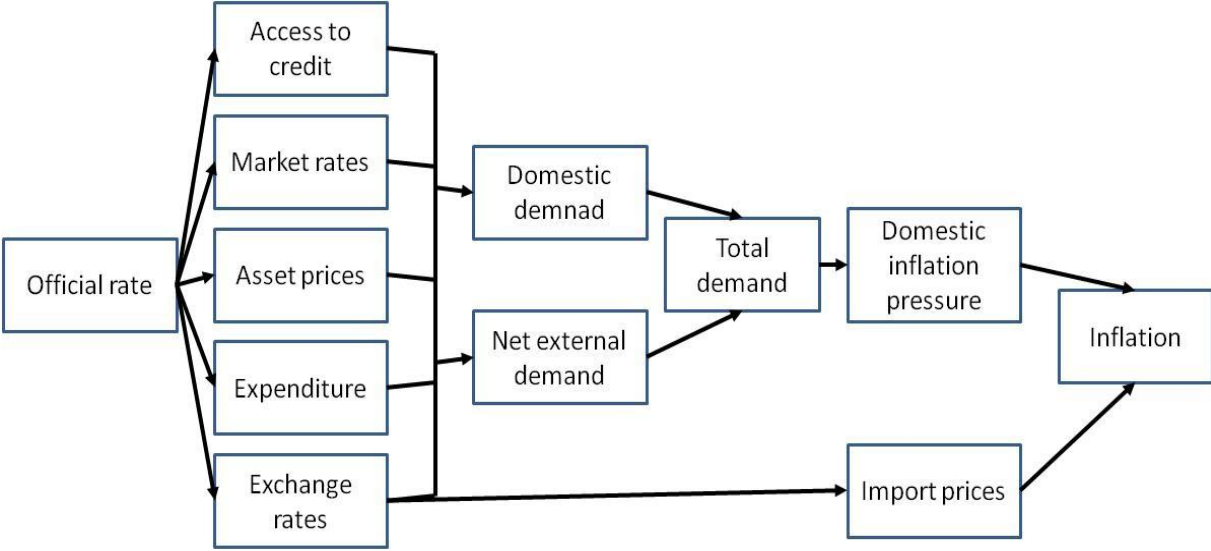
The traditional interest rate channel

As the government lowers the policy rate, the nominal interest rate affects the real interest rate directly. The real interest rate declines and it becomes relatively less profitable to place money in the bank, hence, investments go up. As investments increase, production and the economy grows. The fall in nominal interest rate also leads to increased price expectations, higher inflation and a further decline in real interest rate, which stimulate additional investments and production (Mishkin, 2007).

Nominal interest rate: $r\downarrow \rightarrow i_r\downarrow \rightarrow I\uparrow \rightarrow Y\uparrow$

Price expectations: $r\downarrow \rightarrow P^e\uparrow \rightarrow \pi\uparrow \rightarrow i_r\downarrow \rightarrow I\uparrow \rightarrow Y\uparrow$

Exchange rate effect on export

The theory of uncovered interest parity, UIP, shows the relationship between the difference in interest rate with a foreign country and an appreciation or depreciation of the currency. A reduced interest rate makes it less attractive for foreign investors to place money in the currency, hence, it depreciates. The depreciated currency enhances competitiveness and

makes export relatively cheaper. In consequence, export rises and the economy grows (Mishkin, 2007).

$$r\downarrow \to i_r\downarrow \to E\downarrow \to NX\uparrow \to Y\uparrow$$

Tobin's q theory

Stock prices rise as the interest rate falls, since demand for these investment objects augments due to higher expected return. When prices rise, Tobin's q, the relationship between market value and replacement cost for assets, increases. When Tobin's q is high, companies can issue new stocks, hence, conduct additional investments, which boost production and the economy. It is profitable to invest when q > 1 (Mishkin, 2007). Tobin's q can also be used for the housing market, where q represents the relationship between price for constructing new dwellings and buying property in the secondary market (Bank of England, 2001).

$$r\downarrow \to P_s\uparrow \to q\uparrow \to I\uparrow \to Y\uparrow$$

Wealth effects

Since a lower interest rate leads to higher stock prices, people's experienced wealth increases and they aspire to consume more. Higher consumption elevates production and the economy grows. This effect can also be applied to the housing market (Mishkin, 2007).

$$r\downarrow \to P_s\uparrow \to \text{wealth}\uparrow \to \text{consumption}\uparrow \to Y\uparrow$$

The credit channels exist as a result of asymmetric information in the market (Hall, 2002).

Bank lending channel

Companies and individuals most important source of financing is bank loans. As the interest rate falls, money supply rise. As liquidity increases, it becomes easier for banks to finance themselves in the interbank market, hence, they appear to take on additional risk and loosen lending practices. The opposite follows a monetary tightening, where constraints in liquidity

access, might cause a credit crunch. A credit crunch can spread quickly to banks' lending policy, through higher interest rates and more restrictive lending.

$$r\downarrow \rightarrow \text{bank reserves} \uparrow \rightarrow \text{lending} \uparrow \rightarrow I\uparrow \rightarrow Y\uparrow$$

Balance sheet channel

As the interest rate decreases, looser monetary policy causes stock prices to rise. Firms expected wealth increases, and they become more applicable to acquire additional debt. Higher net worth leads to lower adverse selection in the market, hence, moral hazard diminishes. The default risk declines and refinancing might reduce lending rate. In consequence, investments will increase, hence, production grows.

$$r\downarrow \rightarrow P_S\uparrow \rightarrow \text{moral hazard}\downarrow \rightarrow \text{lending}\uparrow \rightarrow I\uparrow \rightarrow Y\uparrow$$

Cash flow channel

As the interest rate decreases, looser monetary policy leads to increased cash flows for companies and individuals, they obtain more liquidity. As borrowers know they are in a better position to serve debt, moral hazard diminishes and they become applicable to acquire additional credit. A higher debt ratio gives them the opportunity to increase investments, hence, the output grows.

$$r\downarrow \rightarrow \text{cash flow}\uparrow \rightarrow \text{moral hazard}\downarrow \rightarrow \text{lending}\uparrow \rightarrow I\uparrow \rightarrow Y\uparrow$$

Price level channel

The third credit channel influences the general price level. As the interest rate falls, price level declines and lowers expected future costs. When an unanticipated price rise occurs, firms exciting liabilities in real terms decrease, and moral hazard issues diminish. In consequence, companies can take on additional debt. The higher price level also reduces already existing debt, in line with Irving Fisher's debt deflation. Hence, investments rise. This channel mainly applies for firms.

$$r\downarrow \rightarrow P^e\uparrow \rightarrow \text{moral hazard}\downarrow \rightarrow \text{lending}\uparrow \rightarrow I\uparrow \rightarrow Y\uparrow$$

Liquidity effect

As the interest rate decreases, looser monetary policy leads to a rise in stock prices. Peoples expected wealth increases, and they become applicable to acquire additional debt. As liquidity increases, financial distress reduces. Companies and individuals have the possibility to invest in durable goods and other assets. A rise in demand increases production and the economy grows. A rise in house prices would create a similar effect.

$$r\downarrow \rightarrow P_S \uparrow \rightarrow \text{financial distress} \downarrow \rightarrow \text{lending} \uparrow \rightarrow I\uparrow \rightarrow Y \uparrow$$

2.6 Conclusions

The price setting theory shows that house prices are determined by demand in the short run. As a result of time lags in construction, supply in the short run is close to inelastic. Hence, a increase in demand will cause a sharp rise in house prices.

Moreover, the business cycle theory indicates that recessions are natural deviations from long-term growth trend. In this dissertation the classical cycle terminology is employed.

Minsky's five phase theory requires a recession to go through five stages in order to qualify as a financial crisis. Classical macroeconomic frameworks, the IS-LM and the AD-AS model, illustrate how changes in underlying economic factors affect output.

Housing bubbles can be described by financial bubble theory. A bubble exists if asset prices deviate from fundamental factors. The existence can be determined by various methods. The two applied in this dissertation are the price-to-rent and the price-to-income ratios. Furthermore, whether bubbles are caused by speculative or rational behavior is highly debated.

Monetary policy affects the economy through several channels. Mishkin's nine monetary transmission channels theory states that the housing market is affected by interest rates through six out of nine channels.

3 Data

Chapter 3 presents the data, which forms the foundation for the further analysis. The chapter explains strength and weaknesses related to each data set, gives a short description of how the figures are obtained, in addition to evaluate the reliability of the sources.

3.1 House prices

In order to get a good notion of the house price development, a house price index is used when analyzing house price growth. An index indicates price trends in an area. However, it does not show the absolute difference in prices between locations.

The two best known U.S. house price indexes are the S&P Case-Shiller Housing Index and the Federal Housing Financial Agency's HPI. The FHFA has published individual indexes for U.S. cities since 1982, and is the index used in this dissertation. It is a weighted repeat-sale index based on pricing information from the federal housing institutions Fannie Mea and Freddie Mac. The index only collects data from federal housing agencies, which eliminates several housing segments. It only uses single-family property and builds its calculations on data collected from repeated sales, which limits the base further (Raddaport, 2007). In addition, it treats houses as a homogeneous asset, however, real estate is highly heterogeneous. And lastly, it does not adjust for the fact that housing quality declines over time (Raddaport, 2007).

In the further analysis city indexes are used. However, FHFA HPIs for cities also include data from the surrounding metropolitan areas. By using metropolitan area data sets, price information from districts with different characteristics than the city itself is included, which make the analysis results less accurate.

3.2 Population growth

The American Census Bureau conducts the official population census every tenth year. Between each decade, the Census Bureau releases annual estimations for population growth, however, these numbers are dismissed as official new counts are available. By only using data collected every tenth year, information regarding sudden or temporary changes is often lost.

For instance, it is difficult to see immediate consequences of events like natural disasters or recessions. The Census Bureau is a firsthand accurate source, however, the frequency of the measurements reduces the credibility of the analysis.

Population numbers only include data limited to the specific cities, as oppose to house price data, which includes statistics from metropolitan areas.

3.3 Price level

In order to evaluate price levels, a consumption price index (CPI) is employed. CPI measures annual growth in prices for all goods and services, except from energy. Prices for items and services are collected from 87 urban areas in the U.S., and from about 23 000 retail and service companies. In addition, CPI indicates the inflation level.

The index is published in the American Labor Statistics interactive data base, and is obtained either for the U.S. as a whole or for states and metropolitan areas separately. Since there does not exist a CPI index for each city, indexes calculated for metropolitan areas are used instead. The CPI index is the official price level measure, published by a governmental agency, which makes the source reliable. It is considered a good price development indicator, even though it is based on a limited sample. Since it is published for metropolitan areas, it includes price growth for cities including their surrounding areas.

In order to analyze the price-to-rent ratio, the Owner's Equivalent to Rent by residents (CPI-OER) is considered a good measurement for rent, according to Krainer and Wei (2004). The data is collected from the consumption price index published by the American Labor Statistics, and is based on information from around 50 000 tenants, which makes the source reliable. The CPI-OER is intended to represent changes in service flow of owner-occupied housing.

3.4 Unemployment rate

The Local Area Unemployment Statistics (LAUS) program is a Federal State cooperative that publishes monthly estimates on unemployment. The unemployment estimate is an aggregated estimate for each of the two following categories; (1) Those who are currently receiving benefits and (2) those that have finished their benefits. Those who are currently receiving

benefits are obtained directly from a count of claimants for the reference week. The estimate of people who have finished their benefits is based on the number actually exhausting benefits in previous periods. The data is calculated for a limited number of cities and is published by the Bureau of Labor Statistics. These numbers are official governmental statistics, which makes this a reliable source. However, since the data is based on estimates, it is not accurate and objected to later revision.

3.5   Income per capita

Income per capita is collected by the Bureau of Economic Analysis (BEA). It is calculated from total income of residents in a given area, divided by the number of inhabitants in that area. In computing per capita personal income, BEA uses the Census Bureau's annual population estimates. The statistics are based on data collected from metropolitan areas. Hence, it is based on estimated numbers and might therefore deviate from actual numbers. The BEA is a government agency, which makes the source reliable.

3.6   GDP per capita

The gross domestic product (GDP) is also published by the Bureau of Economic Analysis. They calculate output by using aggregated income and costs earned by individuals and businesses in a certain area, in addition to the Census Bureau's annual population estimates. GDP by metropolitan area estimates are computed by applying GDP by state estimates for earnings by place-of-work to metropolitan area estimates for earnings by place-of-work. The data has been available for metropolitan areas since 2001. Since the data is calculated from data based on estimates, it is not accurate, and might be objected to later revision. However, it is published by a reliable source and is considered the most accurate production statistics there is.

3.7   Interest rates

The Federal funds target rate, U.S. government security Treasury bills and LIBOR figures are collected from the Board of Governors of the Federal Reserve Systems database.

The Federal funds target rate is an intention rate set by the Federal Reserve Board. The actual Federal funds rate is the overnight interest rate institutions receive on their liquidity deposited in the central bank. The real rate changes daily, however, it is usually close to the target rate desired by the Federal Reserve Board. The dissertation uses the target rate to investigate monetary policy set by the central bank.

The Treasury bill is an interest rate noted daily in the secondary market, and LIBOR is the daily interbank offer rate, the rate banks can refinance themselves at in the market. The Treasury bill and LIBOR are used to calculate the TED-spread, an indicator for interbank market risk.

The Federal Reserve is a reliable and accurate information source. However, when calculating market risk, the Treasury bill and LIBOR is only one of many options, hence, the risk might vary, if other interest rates are applied.

3.8   The subprime market

The subprime statistics are collected from a working paper published by Commission of growth and Development in 2008 for the World Bank. They have used data from Inside Mortgage Finance. These are not official governmental statistics, but published by a secondary source. However, the dissertation treats the data as reliable.

3.9   Foreclosure statistics

The foreclosure data is published by the Census Bureau and covers one to four family residential nonfarm mortgage loans. It is based on the National Delinquency Survey which covers 45 million loans, representing between 80 to 85 percent of all "first-lien" residential mortgage loans outstanding. Even though the data is obtained from a limited selection, the data is considered reliable.

3.10 Metropolitan areas

Several data sets used in this dissertation; CPI, CPI-OER, unemployment, GDP per capita and Income per capita, are calculated based on statistics from metropolitan areas. Each

metropolitan area must have a minimum of 100 000 individuals and consist of one or more central counties. Metropolitan areas were introduced for calculation and analysis purposes conducted by federal agencies. As a result, official data is often only available for metropolitan areas as oppose to cities. In the further analysis, data from metropolitan areas are employed in cases where data for cities are not available. By including the cities' surrounding districts, areas with different trends might be included in the data, which can influence the analysis.

3.11 Conclusions

All data is collected from official governmental sources, except from the subprime market statistics. However, official demographic data is only published every tenth year in the Census rapport or obtained by conducting smaller surveys given to a random selection. Hence, annual figures are found through estimation.

In light of the further analysis, emphasis is put on the difference between population growth data, which is based on specific city information, and governmental statistics, which are based on metropolitan area information.

4   Historical description

The purpose of this historical description is to put housing market development in a historical context. Firstly, the American real estate market is described briefly. Secondly, the chapter presents U.S. population growth and how it has differentiated among 15 chosen cities. Thirdly, a short background description is given in order to identify what characterizes the 15 cities and common features among those with similar population development.

4.1   The American housing market

Each country has its own real estate rules and regulations. With the purpose of gaining knowledge on how the American housing market functions, chapter 4 gives a short description of the mortgage lending and the foreclosure process. To better understand market mechanisms, the federal housing institutions and their role, are briefly presented. Finally, the real estate market evolution during the 2000's is described.

4.1.1   The mortgage lending process

A mortgage is a loan where the collateral is real property. The mortgage granter is known as the mortgager, usually a bank or an equivalent lender. The mortgage holder is known as the mortgagee or the borrower. A mortgage is the most common approach when financing real estate (Thøgersen, 2010). It is typically structured as a long-term loan, with periodic payments. The mortgagee pays the mortgager an interest rate that reflects lending risk. Historically fixed interest rates, as oppose to floating interest rates, have been the preferred borrowing option (Thøgersen, 2010).

An investor, who wants to obtain a bank mortgage, is obliged to submit a loan application, called mortgage origination. A mortgage origination includes all documentation regarding borrower's financial records. Mortgage originations are regulated by law; the Truth of Lending Act, the Real Estate Settlement Procedures Act, the Fair Credit Reporting Act, in addition to individual state laws. Occasionally, a third party is involved in the lending process, a loan broker. The loan broker can either represent borrower or lender. The broker gathers borrower's information and compares lenders in order to find the best match (About).

The underwriter receives documents and evaluate whether the information provided is sufficient. The mortgagee must submit to an "underwriting process", where the borrower has to present; credibility, debt to income ratio, repayment schedule and value of other assets (Federal Reserve Board). The purpose of this procedure is to identify personal credit risk related to granting a loan. The mortgage interest rate is a combination of personal credit risk and a general interest rate risk. "Automated underwriting" is an alternative statistical underwriting process, which aims to reduce the required amount of documentation (Freddie Mac). Based on the documentation and credit scores, borrowers are divided into risk groups; high-quality "A-paper", "Alt-A" and "subprime". An alternative categorization is; full documentation, alternative documentation, little or no documentation or "no income no job asset" (About).

For most mortgages, an initial down payment is required. Down payment relative to the mortgage size, gives the loan-to-value ratio (LTV). The ratio indicates the risk associated with the mortgage. To reduce risk related to high LTV, lender can demand loan insurance. This insurance protects lender against losses if borrower should default on their payments (Federal Reserve Board). All loans backed by federal institutions, Federal Housing Administration (FHA) and Veterans Administration (VA), require loan insurance regardless of loan-to-value ratio . Jumbo and subprime loans are not backed by the authorities and therefore have higher interest rates (FHFA).

4.1.2 The foreclosure process

Foreclosure is a process where mortgager has the right to terminate borrower's equitable right of redemption, either by a court order or law. Redemption value is the price at which lender can choose to repurchase the security. If borrower fails to comply with payment deadlines, lender has the right to repurchase the property. However, the court of equity might grant borrower the equitable right of redemption, if borrower is able to repay the debt before the property's sales date. Acceleration gives lender the right to demand immediate repayment of the loan, if borrower fails to comply with payment deadlines according to the loan agreement. The majority of mortgage agreements contain acceleration clauses (Department of Housing and Urban Development, [HUD]).

The U.S. operates with two types of foreclosures. The most common is the judicial foreclosure, where parties meet in court according to article 9 of the Uniform Commercial

Code. If the court find in favor of the lender, the property will be sold at an auction by an officer of court. The second type of foreclosure is the non judicial/statutory foreclosure, where lender gives borrower a notice of default (NOD) to announce execution of a public auction of the property. Anyone is allowed to bid on the property, including the lien holder. The highest bidder becomes the new property owner, but may be responsible for any pending liens associated with the property. A lender who conducts a foreclosure must report to the IRS no later than 25 days before the sale, in order to prevent association of tax liens with the property (HUD).

In an illiquid market, properties may be sold at prices lower than remaining mortgage value. If the property is not insured to cover such losses, the court may obtain a "Deficiency Judgment" against the borrower. The deficiency judgment allows mortgager to take charge in other assets, hence, borrower is still held accountable for the difference. The two parties may discuss other options in order to find a common solution that is mutual beneficial. These options might be; refinancing, short sale, alternative financing, temporary agreements with the lender or bankruptcy (Adelino et al, 2009).

Short sales may occur when property selling price is lower than the remaining mortgage value. Lender and borrower agree that lender will receive a lower amount than what borrower owes at the current time. However, borrower is required to repay the remaining amount at a future point in time (HUD).

Bankruptcy in the U.S. is a matter placed under federal jurisdiction by the United States Constitution. Federal law is however, complimented by state law, which makes it hard to generalize bankruptcy laws. The most common types of personal bankruptcy for individuals are Chapter 7 and 13. Bankruptcy is helpful as a means to delay foreclosures (HUD).

4.1.3 Federal housing institutions

The federal government supports certain corporations that facilitate a liquid housing market by providing credit to targeted groups in the society. These corporations are called government-sponsored enterprises (GSEs) and are private corporations created by the government. While their main objective is to create profit for their owners, they are supported and regulated by the government. Today, there are 14 GSEs within the housing segment; Fannie Mae, Freddie Mac and twelve Federal Home Loan Banks (Kosar, 2007).

The Federal National Mortgages Association (Fannie Mae) was founded in 1938 as part of the "New Deal", with the purpose of increasing liquidity in the secondary housing market by buying Federal Housing Administration (FHA) insured mortgages. The first thirty years, Fannie Mae obtained market monopoly, however, in 1954 it got converted into a "mixed-ownership corporation". The U.S. government continued to hold the preferred stock, while the public held the common stock. In 1968, Fannie Mae became a public traded company and was removed from the federal budget. Same year, Fannie Mae got split in two; Fannie Mae as it is known today, and the Government National Association Mortgages also known as "Ginnie Mea". Ginnie Mea continued as a government sponsored enterprise that supported FHA, VA and FmHA (Farmers Home Administration) insured mortgages, and is today the only agency that receives full government support (Fannie Mea).

In 1970, the government allowed Fannie Mae to purchase private mortgages, those not insured by FHA, VA or FmHA. Same year, they founded the Federal Home Loan Mortgages Corporation (FHLMC), also known as "Freddie Mac", to ensure market competition. Freddie Mac issued its first private mortgage in 1971, called Participation Certificate, while Fannie Mae issued its first mortgage pass-through called mortgage-backed security in 1981 (Fannies Mea).

Today, Fannie Mae buys loans from approved mortgage sellers, either for cash or in exchange for mortgage-backed securities, which for an additional fee carries Fannie Mae's guarantee of timely payment of interest and principal (Fannie Mea). Fannie Mae may also securitize mortgages from its own loan portfolio and sell the mortgage-backed security to investors in the secondary mortgage market. By purchasing mortgages, Fannie Mae and Freddie Mac provide banks with fresh money to grant new loans. Mortgages that meet requirements for purchase are identified through an automatic underwriting process called "conforming" loans, while those that do not meet requirements are known as "nonconforming" (FHFA).

The Federal Home Loan Banks are twelve U.S. government-sponsored banks that only provide low-cost funding to American financial institutions and not individuals (Kosar, 2007).

4.1.4   The real estate market evolution during the 2000's

In 1999 the Congress passed an act, which made mortgages accessible for low and moderate income households, proposed by The Clinton Administration. An objective carried out by the Housing and Urban Development (HUD).

In 2003 and 2004 a shift in the securitization process occurred. The mortgage-backed securities went from being supported by regulated GSE mortgages, to being backed by private mortgages, typically issued by investment banks. The competition from private securitization institutions reduced GSE's position and requirements related to the underwriting process became easier. Investment banks bought mortgages from private banks and packaged them together into collateralized debt obligations, CDOs. Then, these packages were divided into three categories; safe, okay, and uncertain, and resold to financial institutions with different risk profiles. To compensate for the differentiation in risk, investors paid a higher rate of return on the bonds. In order to reduce risk further CDOs got insured by Credit Default Swaps, CDS, before credit agencies rated the papers as; aaa, bbb, unrated (Gorton, 2010). During the same period, the market shifted from fixed-rate loans to floating rate, which is associated with higher risk and uncertainty (Klovland, 2010:A).

As a result of mortgage defaults, foreclosure rates rose rapidly in 2006 (Census Bureau). CDO packages were losing their input, furthermore, demand for these bonds vanished. Fannie Mae and Freddie Mac owned or guaranteed in 2008 mortgages for twelve trillion dollars (The Economist, 2008). The bonds they had issued were owned by a broad range of institutions like government pension funds, investment banks and other financial institutions. As the financial crisis hit in 2008, bond value fell with 90 percent compared to the value from the previous year. Moreover, September 7, same year, the government announced that Fannie Mae and Freddie Mac were placed in conservatorship by the FHFA (The Economist, 2008).

After the financial crisis, the interest for renegotiation, refinancing or modifications of loans increased significantly. Treasury's initiative Hope Now in 2009, "the making homes affordable plan", promoted renegotiation of existing mortgages. In addition, the Congress voted the Housing and Economic Recovery Act of 2008 with the aim of supporting homeowners in a difficult financial situation (Adelino et al, 2009).

4.2 Population growth

According to the Census Bureau, the American population increased by 52 percent over the past four decades.

Figure 4.1 U.S. population from 1970 to 2010
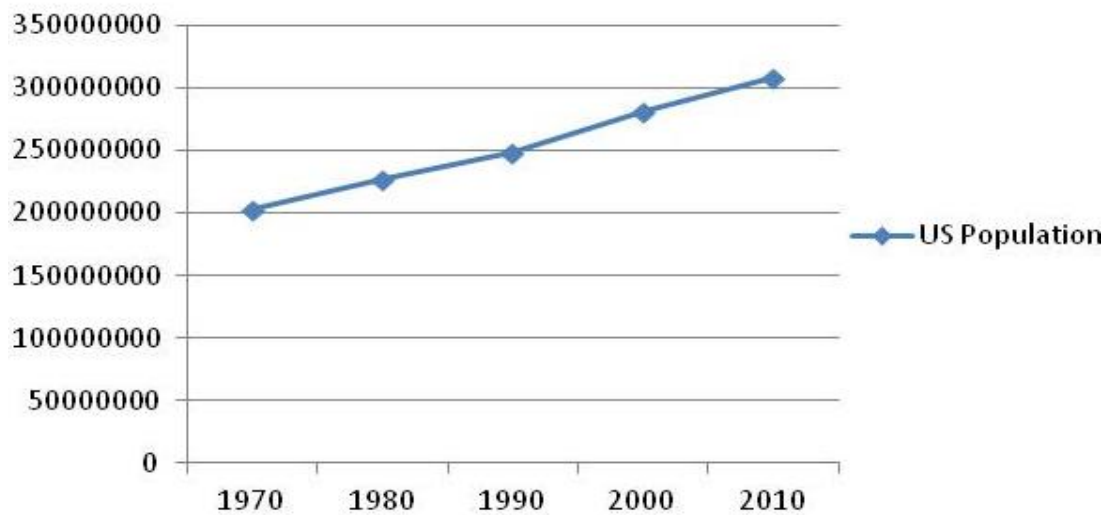
<div align="right">Source: Census Bureau</div>

The current fertility level is 2.1 births per woman, net immigration is around 880 000 persons per year and life expectancy is 78.2 years. The Census Bureau estimates that fertility, life expectancy, and net immigration remain approximately constant in the years to come.

The trend shows that population growth has been higher for cities and suburbs than for rural areas. High internal migration during the past 40 years, has contributed to rural areas flight and urban area growth. However, not all cities experienced population increase. Throughout the period some areas faced great emigration, some stagnated, while others experienced an enormous immigration. Table 4.1 shows how 15 of the biggest U.S. cities were ranked in 1970 compared to 2010, based on population size. The table also indicates the total change in population over the period.

Table 4.1 Population change from 1970 to 2010 in 15 U.S. cities

Rank 1970	Rank 2010	City	State	1970	1980	1990	2000	2010	Change 1970-2010
108	30	**Las Vegas**	NV	126 000	165 000	258 204	478 434	583 756	**363.30**
20	6	**Phoenix**	AZ	581562	789704	983403	1321045	1445632	**148.58**
29	10	**San Jose**	CA	445779	629442	782248	894943	945942	**112.20**
6	4	**Houston**	TX	1232802	1595138	1630553	1953631	2099451	**70.30**
3	2	**Los Angeles**	CA	2816061	2966850	3485398	3694820	3792621	**34.68**
1	1	**New York**	NY	7894862	7071639	7322564	8008278	8175133	**3.55**
16	24	**Boston**	MA	641 071	563 000	575 000	589 141	617 594	**-3.66**
31	48	**Minneapolis**	MN	434 000	371 000	368 383	382 618	382 578	**-11.85**
27	40	**Atlanta**	GA	495 973	425 000	393 929	416 474	420 003	**-15.32**
2	3	**Chicago**	IL	3366957	3005072	2783726	2896016	2695598	**-19.94**
9	26	**Washington**	DC	756510	638333	606900	572059	601723	**-20.46**
23	58	**Pittsburgh**	PA	520 000	424 000	369 879	334 563	305 704	**-41.21**
10	45	**Cleveland**	OH	750903	573822	505616	478403	396815	**-47.15**
18	57	**St. Louis**	MO	622 000	453 000	396 685	348 189	319 294	**-48.67**
5	19	**Detroit**	MI	1511482	1203339	1027974	951270	713777	**-52.78**

Source: The Census Rapport 1970, 1980, 1990, 2000 and 2010

The 15 cities are chosen based on size, magnitude of population change and their appearance in statistical data. In the analysis chapters, five, six and seven, the main focus is on the period prior to and during the financial crisis. Therefore, population change in the most recent decades has been given the highest emphasis in the selection of cities. The city with the steepest population growth is Las Vegas, with a 363 percent increase, while the city with the greatest population loss is Detroit with a 53 percent decline. The cities can be divided into three categories; "increase in population", "small change in population" and "decrease in population".

The "increase in population" category include; Las Vegas, Phoenix, San Jose, Houston and Los Angeles. The "small change in population" category include; New York, Boston, Washington, Atlanta and Minnesota. And finally, the "decrease in population" include; Detroit, Chicago, Pittsburgh, St. Louis and Cleveland.

4.3 Characteristics of 15 U.S. cities

In this section, a brief description of the 15 chosen cities is given with the purpose of identifying key characteristics such as current and historic main sources of income, demographic trends, in addition to some opportunities and challenges.

Firstly, the chapter presents five cities with increased population growth over the past four decades. Then, it gives an introduction to five cities with small changes in population. And finally, five cities with a decline in population size since 1970 is presented.

4.3.1 "Increased" population

Las Vegas

After gambling became legalized in 1931, Las Vegas became the country's gambling capital. In the 1980's, the city created a new main attraction area called the Strip, with resorts, casinos, restaurants and entertainment. The city's main sources of income today are gambling, entertainment, dining, retail and tourism. The city is a world known vacation destination and relays on a continuous external customer base and a low-cost workforce. The population is young and 30 percent is of Hispanic origin (DeNavas-Walt et al, 2011). The city's sources of income make it vulnerable to economic fluctuations.

Phoenix

Phoenix became a commerce hub, connecting trade between east and west, in the late 1880's. The main sources of income were agriculture, cattle, copper, cotton and citrus. The city was a significant military supplier during the Second World War. Today, they are still an important commerce center with many high-tech and communication companies. The city has easy access to cheap labor, as 40 percent of the population has Hispanic origin (DeNavas-Walt et al, 2011). The suburbs grew rapidly and construction augmented until 2008, when the city experienced a severe housing market downturn during the financial crisis.

San Jose

San Jose is the largest city in Silicon Valley. The city is formerly known as an agriculture center, but has transformed into an urban cluster for technology. The city hosts many start-up millionaires and has one of the highest GDP per capita in the country. After the dot-com bust in the beginning of the 2000's, San Jose experienced a severe downturn followed by a fast recovery. The co-location of technology firms creates a platform for innovation, and attracts investors and entrepreneurs form around the world.

Houston

The oil discovery in the beginning of the 20th century made Houston an attractive business location. Many moved from the rust belt to Texas during the 70's, motivated by prosperous work opportunities. Today, the city hosts the second largest cluster of fortune 500 companies in the U.S.. Main sources of income include; energy, manufacturing, aeronautics, health care and research. Since the city is located close to the Mexican border, 44 percent of the population has Hispanic origin, hence, it has easy access to cheap labor (DeNavas-Walt et al, 2011). Houston attracts an international workforce.

Los Angeles

Los Angeles is California's largest city, and the world's third largest city measured in GDP. It is known as the city of dreams and attracts people who desire to work in the film or entertainment industry. Moreover, it has some of the wealthiest areas in the U.S., and hosts many celebrities. Additional sources of income are fashion, media and education. The co-location of entertainment companies attracts talents and investors. However, the city has heavy crime related issues and is highly subjected to earthquake risk.

4.3.2 "Small change" in population

New York

New York is by far the largest U.S. city measured by population size. It is also considered the country's financial center. The city was hit hard after the dot-com bubble bust. It attracts business from all over the globe, and the inhabitants are highly international. Its main sources

of income are financial services, fashion, truism, technology, research, education and entertainment. The area is highly regulated for construction, which makes housing supply limited. The city consists of Manhattan, Brooklyn and Queens, however, in the statistical metropolitan area New Jersey is included with a considerably lower standard of living and average income (BEA).

Boston

Boston is known for its many universities and research institutions, it is also a financial center. The city dominates areas within medicine and health research, in addition to biotechnology. In consequence of its highly educated population, the city is considered a hub for innovation and entrepreneurship. The city is limited in outreach and has one of the highest costs of living the U.S.. The working population typically lives in smaller cities surrounding Boston. Universities and research clusters make the city an attractive destination for researchers from around the world.

Washington, DC

The U.S. capital has the country's highest educated population. Main areas of employment are related to; political activity, government administration, research institutions, organizations, embassies, fortune 500 companies, tourism and media. The city outreach is limited and heavily regulated for housing purposes, construction conducted is often limited to replacement of old buildings. The population has a relative high turnover. Washington mainly consists of office buildings, thus, many employees live in the suburbs. The statistic area includes these suburbs, which are some of U.S.' wealthiest.

Atlanta

Atlanta was established as a consequence of the railroads construction, and quickly became a highly industrialized city. Today, it is a major business center and transportation hub for the southeastern U.S.. It is known as the heart of the civil right movement in the 70's. The city is a center for services, finance, information technology, governmental agencies, and higher education. It hosts many fortune 500 companies. However, the population is relatively poor and the majority lives in the suburbs.

Minnesota

Minnesota is located on the Midwest prairie and the main source of income is agriculture. Previously, it used to be a center for mining and exploration of raw materials. Today, additional sources of income are related to industry and the service sector. The city is closely connected to its neighbor city, Saint Paul, located on the opposite side of the river. The two cities are known as the twin cities. In the statistical metropolitan area, data from both cities are included. The city has a high income per capita and a low unemployment rate. However, it faces challenges attracting new businesses.

4.3.3 "Decreased" population

Detroit

Detroit used to be a highly industrialized city, known as the U.S. automotive center. Car manufacturing was the U.S.' most important industry during the 50's and 60's where Detroit was the leading manufacturer. The city constructed an enormous freeway system, which facilitated the formation of large suburbs. Over the following decades the industry was subjected to outsourcing and competition from low-cost countries, in addition to becoming less labor intensive, which lowered margins and reduced the number of jobs. Detroit is today known as the ghost city, with degraded buildings and empty houses. It has not been successful in establishing alternative sources of income.

Chicago

Chicago is the largest city in the Midwest. It grew rapidly in the 19th century as a result of improved infrastructure. The great fire in 1871 destroyed one third of the city, but resulted in a quick rebuilding and a modern city. During the great migration in the 20's and 30's, the black population five doubled and industry boomed. In the 50's and 60's, most of the white residents moved to the suburbs. Industry structural changes lead to great job losses, and unemployment and crime rates rose. In the most recent years, population growth has been relatively stable. Today, the city has status as a hub for industry, infrastructure and telecommunications. However, it is no longer exclusively dependent on industry, the research and commerce communities attract people from all over the U.S. and abroad.

Pittsburgh

Pittsburgh is known as "the steel city", with its former steel mills. The city had its glorious days during the 50's and 60's, when bridges got constructed and cars manufactured. Pittsburgh was subjected to the industrial downturn and competition from low-cost countries, and during the 80's it lost its manufactory base. Today, the economy is highly related to healthcare, education, technology, robotics, and financial services. The job market was fairly stable throughout the financial recession and during the recovery, house prices have increased by ten percent, as one of few American cities.

St. Louis

The city became an important port along the Mississippi River in the 19th century. The major sources of income today still rely on transportation of goods, in addition to manufacturing and trade. St. Louis expanded rapidly in accordance with the growth of big U.S. industrial companies and as a result of wartime housing shortage until the 1950's. In the following years, a large part of the inhabitants moved to the suburbs and reduced the city's population, reflecting the national trends of urban flight and suburban growth at the time.

Cleveland

Cleveland also belongs to the area known as the rust belt, cities that boomed during the 40's. In post war time, the city experienced a prosperous economy. During the 50's, economy slowed, and the white middleclass moved to the suburbs. The great migration increased the share of unskilled workers, who were hit hard during industrial structural changes. Cleveland faced in 1978 a financial default on their federal loans. Today, the city is still struggling financially, with empty houses and high unemployment and crime rates. The city faces decreasing income per capita, and the abandoned houses seem to have a contagion effect on the real estate market. The city is known for its lack of job opportunities and weak educational system.

4.4 Conclusions

The mortgage market has historically been heavily regulated, however, new law enforcements in the late 1990's, in addition to financial innovations and development of the CDO market, made homeownership available to a larger share of the population. With the subprime segments' market entrance, followed a rise in foreclosures throughout the 2000's.

The historical description shows that the U.S. population grew rapidly over the past four decades, however, population growth has varied extensively among big American cities. The growth pattern can be divided into three categories, cities with "increased", "small change" in and "decreased" population growth. Based on the brief city descriptions, I argue that there seem to be common features among urban areas with similar population growth patterns.

The cities with steep population growth have experienced booming economies in recent years. These economies have their main sources of income related to innovation and technology, in addition to obtaining a strong service sector. They are also characterized by easy access to low-cost labor provided by a large Hispanic inhabitant share.

The "small change" economies are either populous cities considered to be financial or commercial centers, with a strong service sector, or urban areas that seem to have reached a mature economic state, with stable sources of income, price and GDP levels.

A common feature among the cities with negative population growth, relates to their fast expansion during the beginning of the 20th century, when the steel and car industry boomed. They are characterized by de-urbanization and suburbanization in the 50's, 60's and 70's, in addition to the invasion of low skilled labor force during The Great Migration. Recently, these cities have struggled with high unemployment and crime rates, in addition to stagnation in the housing market.

5   Financial crisis analysis

The following section applies Minsky's five stage theory, presented in section 2.3.2, on the most recent recession, and identifies whether the recession meets financial crisis requirements. Moreover, it uses central economic indicators to illustrate the crisis evolution. Before lastly, the conclusion is presented.

5.1   Displacement

The stock market increased rapidly in the period prior to year 2000. Value of technology stocks augmented tremendously and many investors experienced an enormous increase in expected wealth and purchasing power. However, at one point, the market realized that the expansion could not last forever, and that prices were not coherent with fundamental values. When investors acknowledged the peak was reached, all desired to realize gains. In consequence, supply exceeded demand, which made prices contract rapidly. The positive outlook turned to fear of future loss, and the stock market, here represented by Dow Jones, fell in total 32 percent, from 11 750 points in 2000 to 8 000 points in 2002, as seen in Figure 5.1. The stock market drop, from 2000 to 2002, is known as the burst of the dot-com bubble.

Figure 5.1 Fluctuations in Dow Jones during the 2000's

Source: Reuters EcoWin

Al-Qaida's attack on 9/11/2001, shook the American society and prevented the investment desire from picking up (Andreassen, 2010). The stock market run spread to the real economy, followed by three consecutive quarters of downturn in GDP, from March to November 2001, shown in figure 5.2.

Figure 5.2 Decline in GDP during economic recessions from 1967 to 2012
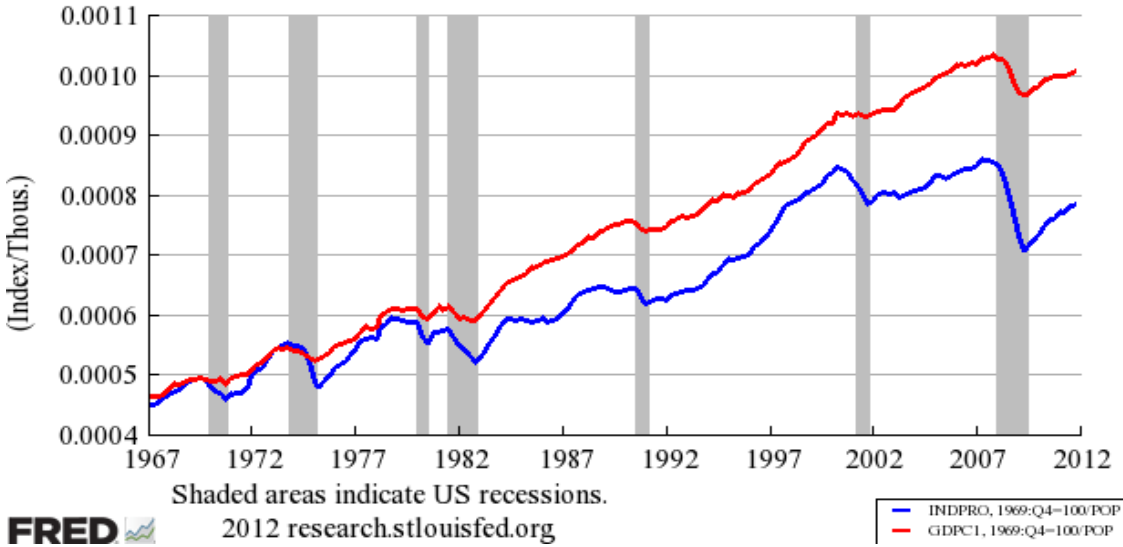
A recession became the reality and the economy left its long-term growth trend. Federal Reserve lowered the target rate in order to boost production (Federal Reserve). While the economy struggled to get back to its pre-crisis level, interest rates remained low.

Figure 5.3 Low short-term interest rates in the beginning of the 2000's
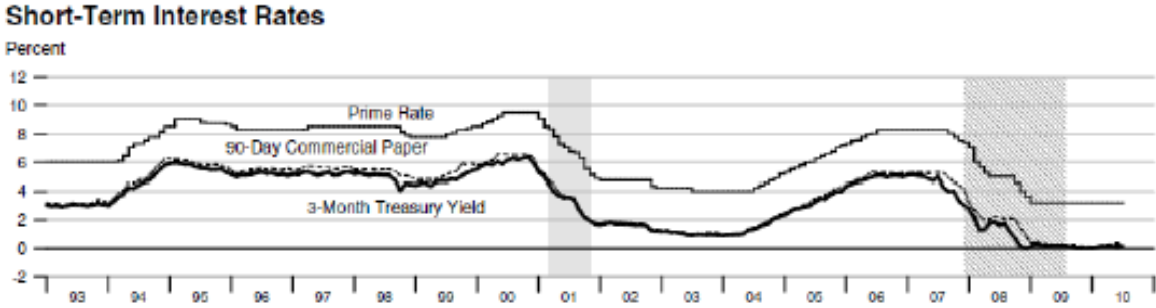
Source: Federal Reserve Bank of St. Louis, Sept 2010

In the middle of the decade, investment appetite recovered. Demand for assets improved as belief in rising prices and prosperous times persisted (Shiller, 2008).

Altered governmental regulations regarding financial instruments and lending requirements, contributed additionally to boost investments and demand for real estate. Intricate financial innovations made lending and securitization activities very profitable. Further, modified housing regulations, with the purpose of making homeownership available to low and middle income households, expanded the credit market.

Low interest rates, increased war activity and modified governmental regulations, equaled a positive exogenous chock that facilitated economic expansion, in line with Minsky's first financial crisis phase. The IS-curve shifted outwards, and additional demand stimulated increased production and economic output.

5.2   Overtrading

Expectations regarding future profit, made people who normally did not participate, join the financial market, in line with theory. Speculations drove demand for assets further, and prices rose.

Figure 5.4 Extensive price fluctuations from 2000 to 2010 illustrated by the CPI
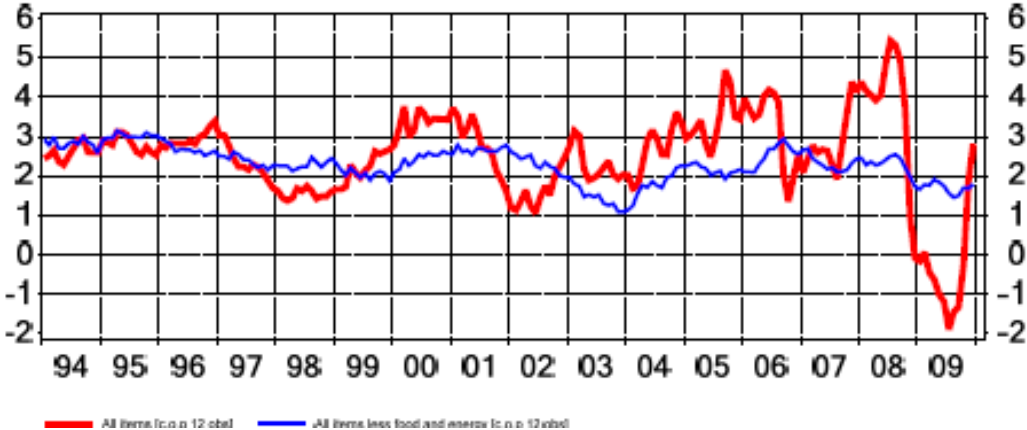
Demand for assets included both stocks and real estate. The new reform, "affordable homes for all" made mortgages available to the subprime market. The real estate market pressure increased and pushed prices higher due to limited short run supply as illustrated in the price setting theory from section 2.1.

Figure 5.5 U.S. house prices illustrated as percentage change in the FHFA HPI

<div align="right">Source: FHFA</div>

The increased asset prices were coherent with an additional shift in the IS-curve as due to higher anticipated prices, which also pushed the AD-curve to the right and caused prices to climb further, an effect illustrated in figure 2.6.

5.3 Monetary expansion

The Federal Reserve increased money supply to keep interest rates from rising, due to higher demand, hence, prevent the currency from appreciating (Berry et al, 2007).

Figure 5.6 Exceptional growth in Federal Reserve's money supply compared to GDP since year 2000
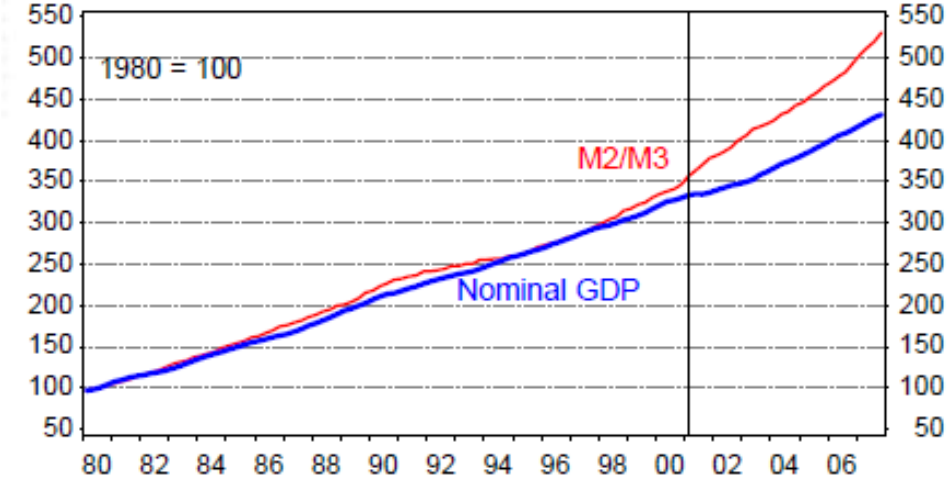
<div align="right">Source: Reuters EcoWin, First Securities</div>

The increased supply of liquidity, in addition to growing prices, allowed banks to loosen their lending practices and take on further risk. In the years prior to the peak, credit supply amplified tremendously, coherent with theory. New financial inventions, as well as high competition for customers, made banks loosen requirements further, which boosted additional lending (Berry et al, 2007). Companies operated with high leverage levels as shown in figure 5.7.

Figure 5.7 A sharp percentage growth in commercial and industrial loans from 2004 to 2008
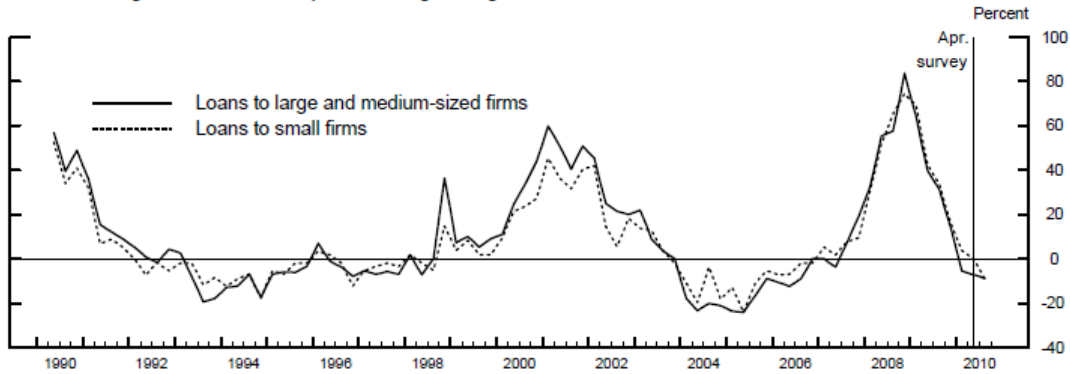
Low short-term interest rates lead to low risk premiums. The lasting low market risk indicated high market confidence, measured by for example the TED spread, see figure 5.8. (Global Financial Stability Report, 2010)

Securitization replaced traditional banking. New financial structures dominated the market. Investment banks bought mortgages from traditional banks and structured them as collateralizes debt obligations, CDOs. Risk was reduced by insuring CDOs through credit default swaps and the bonds were sold with excellent ratings, approved by rating agencies. These assets were very profitable for all stakeholders in the value chain and downstream demand for mortgages grew (Gorton, 2010).

Increased money supply ensured low short-term interest rates, which increased credit supply, lowered lending requirements and risk premiums, and set the stage for further increase in asset demand and pressured prices, in line with shifts in IS-LM and AD-AS-curves, shown in figure 2.7.

5.4 Revulsion

Mortgage demand vanished as real estate prices started to decline. Lack in demand triggered a market equilibrium mismatch for securities, and funding liquidity for financial institutions and companies dried up. These problems caused a complete market credit crunch, which eventually spread to non-financial stakeholders (Mizen, 2008).

The major wakeup call, the Minsky moment, was Lehman Brothers Holding Inc's bankruptcy, September 15th, 2008, and insurance giant AIG's need for financial aid the following day (Fender and Gyntelberg, 2008). Although, neither of them were big global players, they turned out to be heavily involved in the worldwide financial market through intricate financial products and systems. Several other financial institutions suffered great losses due to the bankruptcies (Fender and Gyntelberg, 2008).

The governmental mortgage institutions Fannie Mea and Freddie Mac were also facing great losses. From 2008 to the second quarter 2010, they lost $226 billion, included the capital they received from the U.S. government (Thomas and Order, 2011).

Figure 5.8 Low market risk until Lehman Brothers bankruptcy, illustrated by TED spread
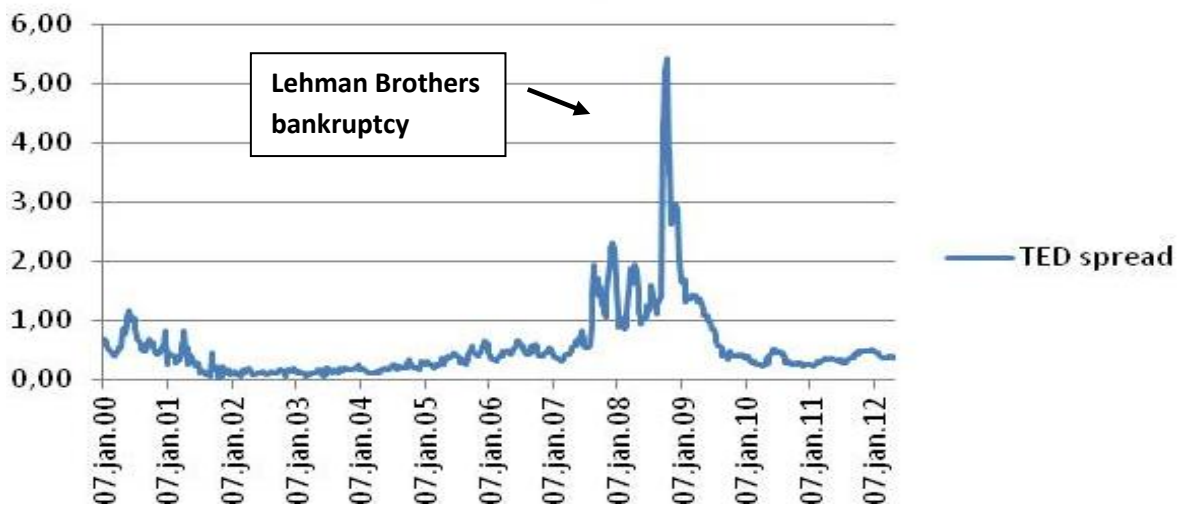
Source: Federal Reserve, author's own calculations

Market risk exploded, as a consequence of the Lehman Brothers bankruptcy, illustrated in figure 5.8. Confidence between banks disappeared and it became difficult to refinance loans. The interbank interest rate rose rapidly due to dried up markets. Banks refused to lend money and nominal interest rates increased. Higher interest rates made it difficult for households and companies to meet down payments obligations (Michaud and Upper, 2008).

Figure 5.9 Tightening standards for Customer Loans after 2008
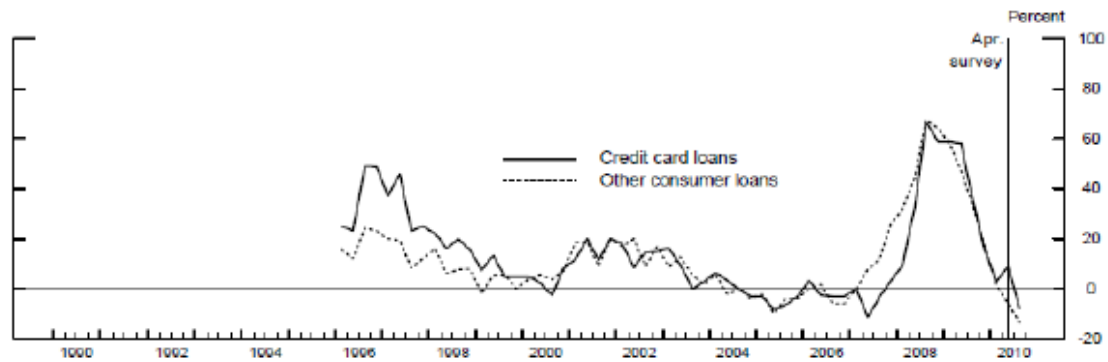
Source: Loan Officer Survey on Bank Lending Services, July 2010

Reduced market liquidity caused higher interest rates and lending hardship, coherent with a shift to the left in the AD-AS model, seen in figure 2.8. Thus, investments declined and GDP contracted.

5.5   Discredit

NBER did not report an official recession until December 2008, even though GDP started to decline in 2007, see figure 5.10.

Figure 5.10 Quarterly percentage change in GDP from 2005 to 2009
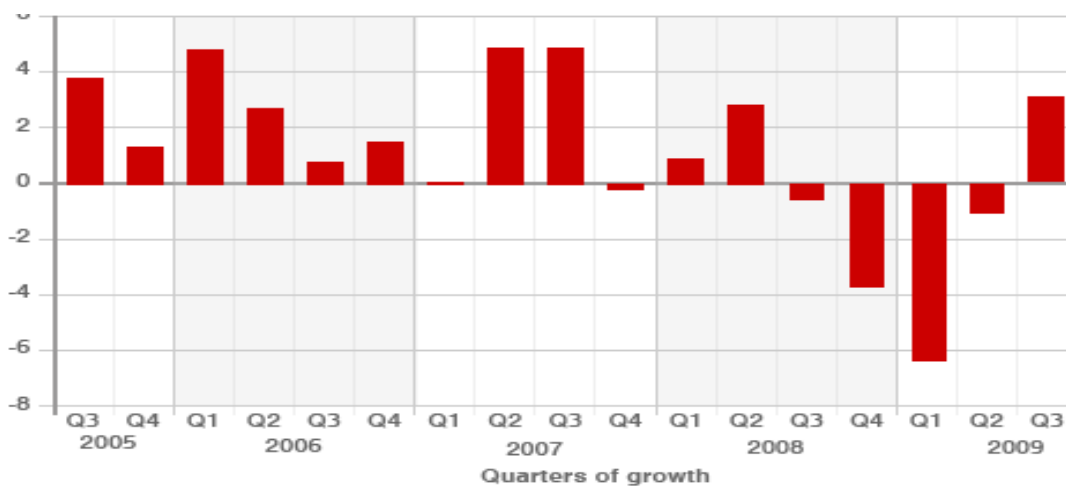
Source: U.S. Department of Commerce

Dow Jones fell from 14 000 points in October 2007 to 6 600 points in March 2009, a decline of 53 percent, illustrated in figure 5.1. Demand for lending disappeared as total consumption contracted. The foundation for employment vanished as companies went out of business.

U.S. house prices declined about 30 percent in total, from 2006 to 2009, shown in figure 5.5. Many households experienced their mortgages exceed the value of their homes. In addition, severe increase in unemployment created a situation where homeowners progressively defaulted on their mortgages. According to the Census Bureau, foreclosure rates grew massively.

Higher market risk and hunger for refinancing created a fear for running out of liquidity. Federal Reserve lowered the target rate in order to stimulate lending. Nevertheless, the interbank rate remained high, as banks avoided to participate in interbank market auctions. Their behavior was motivated by fear of bank runs, similar to what happened during the Great Depression in 1933 (Wheelock, 2010).

Figure 5.11 Percentage change in Federal Reserve's bank reserves from 1993 to 2010
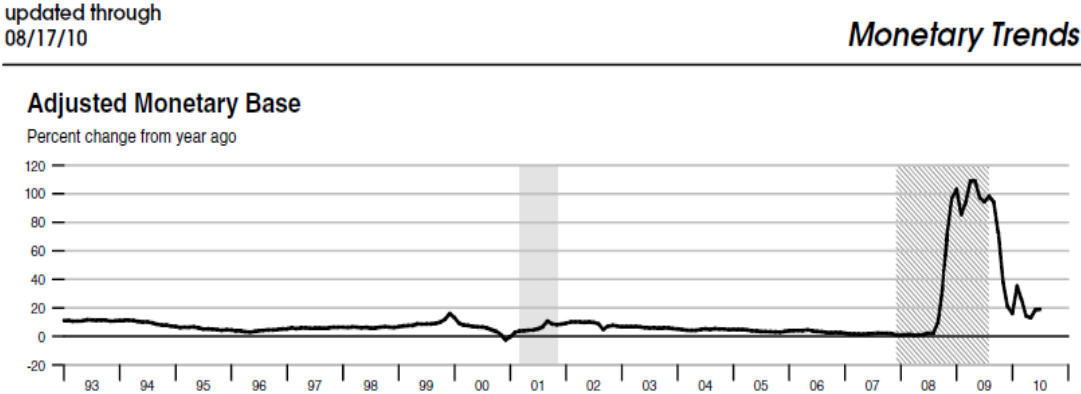
Source: Federal Reserve Bank of St. Louis, Monetary Trends

Banks refused to adapt to Federal Reserve's efforts to regain market trust, even though the target rate was held close to zero. In order to prevent a liquidity squeeze, Federal Reserve started to interfere in the market through quantitative easing (Gavin, 2010). By increasing money supply Federal Reserve was able to demonstrate its strength as lender of last resort. As predicted in Minsky's fifth phase, these efforts were received positively in the market and risk premiums contracted.

The monetary base (currency and deposits in Federal Reserve) doubled from August 2008 to August 2009. The increase was deposited as excess reserves in Federal Reserve, shown in figure 5.12. M2 experienced only a small change, compared to the monetary base, M0, which grew greatly. Quantitative easing was conducted through direct bank lending, buying private securities, selling government securities in addition to sterilization (Gavin, 2010).

Figure 5.12 Aggregate reserves of depositary institutions from October 2008
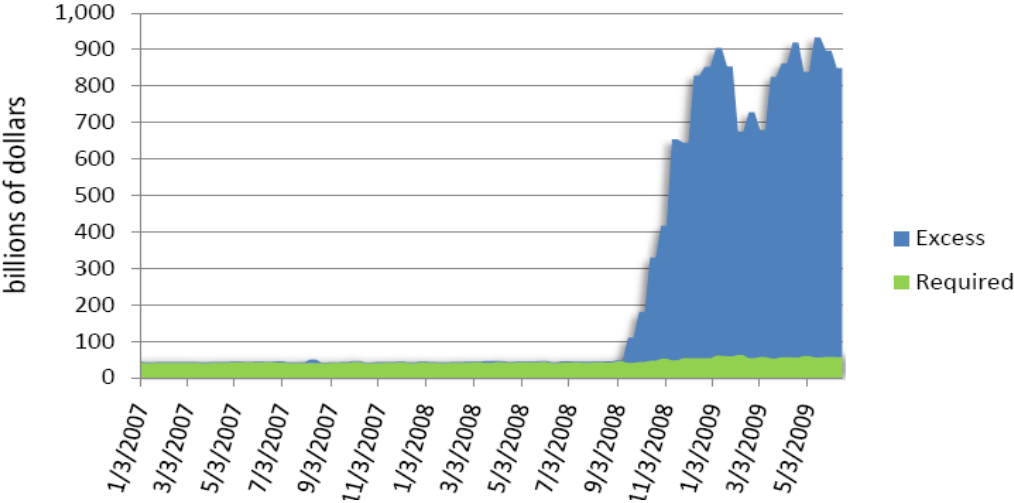
Federal Reserve established in October 2008, a market credit rate, Interest on Excess Reserves (IOER), of 0.25 percent, in order to prevent banks from flooding the market with money during the recovery. This allowed banks to earn a risk free interest rate on their central bank deposits (Keister and McAndrews, 2009). Banks regained market trust after two rounds of quantitative easing, hence, the interbank interest rate and further more banks' lending rates declined (Wheelock, 2010).

The close relationships between nations made the revival after the financial crisis very demanding. The threat of defaulting European nations with extremely high deficits and debt levels, in addition to the U.S.' enormous trade deficit with China, made markets afraid of a double dip and contributed to a volatile recovery (Andreassen, 2010).

5.6   Conclusion

Based on the previous analysis my conclusion is that the recent recession undergoes all stages in Minsiky's five-stage theory and therefore qualifies as a financial crisis:

1. Persistent low interest rates facilitated by; the dot-com bubble burst, the 9/11 attack, the Iraqi war and moderated governmental regulations, caused a positive economic displacement in the beginning of the 2000's.
2. The belief in higher future asset prices inspired speculation and caused overtrading.

3. Federal Reserve held the target rate low and the market confidence and liquidity grew. High market liquidity and low risk lead to looser lending practices.

4. Eventually, increased mortgage defaults caused higher supply than demand for real estate and prices declined. Market liquidity dried up and revulsion was reached when Lehman Brothers Holdings Inc went bankrupt in 2008.

5. Asset prices dropped, demand for goods and services fell, unemployment rose and GDP contracted. The economy reached a stage of discredit and was not able to turn the negative trend until Federal Reserve demonstrated strength as lender of last resort through two rounds of quantitative easing.

6 Housing bubble analysis

The following chapter investigates the existence of housing market bubbles in American cities with similar population growth. It applies two theoretical methods introduced in section 2.4, in addition to conduct a descriptive discussion, with the purpose of investigating whether population growth influenced bubble formations in the housing market during the 2000's. The analysis is conducted on the three city categories; "increased population", "small change in population" and "decreased population", defined in section 4.2.

The bubble theory states; a bubble exists if there is a deviation between asset prices and fundamental values. The two methods applied to investigate the relationship between house prices and fundamental values for each category are the price-to-rent ratio and the price-to-income ratio.

6.1 Price-to-rent ratio

In the price-to-rent ratio analysis, the method is presented in the first part and the analysis is conducted in the second part.

6.1.1 Method

The price-to-rent ratio (P/R-rate) is based on the Price-Earnings model (P/E-rate) for stocks. This model was first described by Gordon and Shapiro in 1956, but was further developed by Miller and Modigliani in 1961. The earnings (E) are the sum of all future discounted dividends an owner receives when holding a stock, and price (P) is the stock price determined in the market. The P/E ratio is used in stock valuation to see whether actual price reflects future earnings, hence, fundamental values. If fundamental values exceed stock price, stocks are considered a good investment (Miller and Modigliani, 1961).

Rent in the P/R ratio corresponds to earnings in the P/E ratio. All future possible discounted rent revenue, or cost of homeownership, should reflect the house selling price. Cost of homeownership is an aggregated alternative cost of holding a dwelling, where tax, mortgage interest rates, property tax, depreciation, maintenance and renovations costs are deducted from increase in value (Poterba, 1992). This can be expressed as;

(6.1)   Cost of Homeownership $= P[i(1-\tau) - \pi^e + \delta - \pi_P^e]$

where

P = *house price index*

i = *nominal interest rate*

τ = *tax rate*

π^e = *expected inflation*

δ = *depreciation rate*

π_P^e = *expected rise in house prices*

Equation (6.1) shows that cost of homeownership depends on expected values for inflation and house prices.

In a perfect market, revenue from renting out property will equal cost of homeownership in the long run. The rationale behind this relationship states that; if renting is relatively cheaper than home owning, homeowners will want to sell their property and become renters. Whereas, if cost of homeownership is lower than rent, tenants will prefer to buy a dwelling instead of renting. This requires several assumptions like; no transaction costs, equal opportunities for all to obtain a mortgage, and that utility from owning a home equals utility from renting. Rent, R, in the long run can therefore be expressed as:

(6.2)   R = Cost of Homeownership $= P[i(1-\tau) - \pi^e + \delta - \pi_P^e]$

where

R = *Cost of Renting*

The equation can also be written as:

(6.3) $\frac{R}{P} = i(1-\tau) - \pi^e + \delta - \pi_P^e$

or

(6.4) $\frac{P}{R} = \frac{1}{i(1-\tau) - \pi^e + \delta - \pi_P^e}$

Equations (6.3) and (6.4), express a long-term relationship between house prices and rent.

The P/R ratio will for periods of various length, deviate from the fundamental P/R ratio as a result of fluctuations in both house prices and rent. These periods of deviation can be caused by changes in interest rate, tax regulations or maintenance costs, which lead to alterations in house prices. In consequence of altered house prices, expectations regarding future prices also changes. Higher expected prices could by investors be considered as a profit opportunity, hence, speculations would cause demand for property to rise and pressure house prices further. If prices increase significantly over a short period of time it could indicate that the economy is facing a housing bubble.

The actual P/R ratio can be calculated by using a house price index for house prices, P, and a rent index for rent, R. In order to find the relationship between price and rent, it is necessary to obtain the actual value for house price and rent in a concurrent period.

As stated earlier, FHFA HPI is used as the house price index. For the rent variable, the applied index should reflect the market renting cost. Therefore, the Owner Equivalent to Rent for Residence is used as an acceptable equivalent to cost of rent in accordance with Krainer and Wei (2004).

To examine the P/R ratio development for the population growth categories separately, weighted house price indexes and weighted rent indexes for each of the three population growth groups, are calculated

A baseline give a reference value, hence, it indicates whether the ratios are relatively high or low. The baseline is the average P/R ratio based on average house prices and rent costs from 1991 to 2011, for the U.S. as a whole.

6.1.2 Analysis

In order to investigate the difference in house price development between cities with similar population growth, a weighted average and a weighted index based on cities' population in 1980 are calculated. The base year for the weighted index is 1982.

Figure 6.1 Weighted average HPI and weighted index HPI
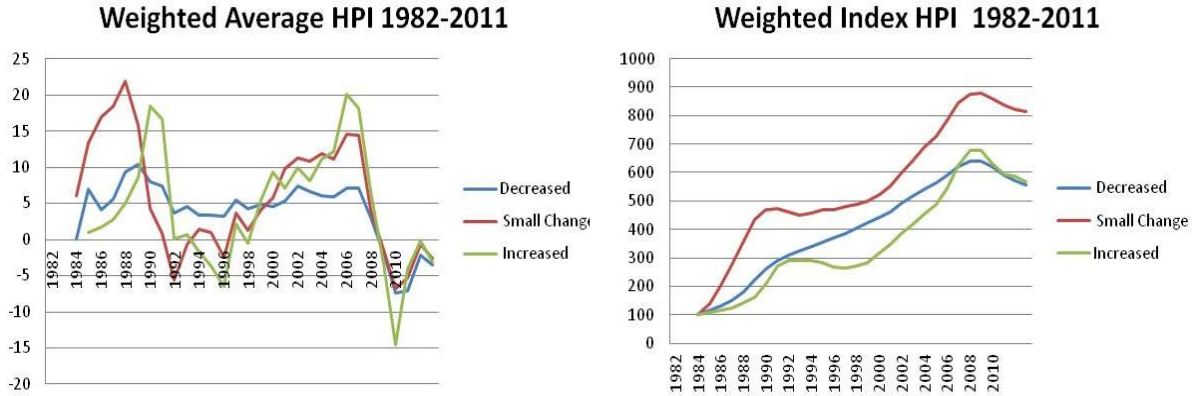
Source: FHFA and author's own calculations

Figure 6.1 shows that peaks and troughs have been higher for cities with "increased" or "small change" in population. Prior to the financial crisis, cities with high population growth experienced an extensive house price augmentation. However, after the peak, these cities also faced the most severe price decline. Urban areas with a population loss, on the other hand, were in short of a great price development. Nevertheless, they did not escape the price plunge during the financial crisis. Hence, the analysis indicates that cities with both steep increase and decline in population prior to a financial crisis, will suffer a severe downturn in house prices during a recession.

Based on results from both the weighted average and the weighted index, prices in the cities with a "small change" in population, seem to rise sharply in the beginning of the period. I emphasize that this is mainly due to the New York and Boston housing market, which together counts for 80 percent of the population in the category. These cities faced a tremendous house price growth from 1982 to 1987.

The CPI-OER for the three population growth categories are calculated in the same manner to obtain a weighted index with a base year in 1982.

Figure 6.2 CPI-OER weighted indexes 1982 to 2011

Figure 6.2 illustrates a much smoother development in rental prices than seen from the house price index in figure 6.1. The graph shows that the cost of renting was highest in the cities with a "small change" in population. However, it grew fastest in the cities with a population increase.

The analysis uses the HPI, CPI-OER and prices from one specific year to find absolute house prices and rent during the period and then calculate the P/R ratios. The reference year is 2009. Table 6.1 shows median single-home house prices for each of the 15 cities, with the corresponding median rents. House prices are collected from realator.org, which publishes house price data for 160 metropolitan areas. Since, the price from Detroit was not available for 2009, only for 2011, the 2009 value is calculated using the FHFA HPI. Rent costs are gathered from city-data.com, which publishes geographical facts for the U.S..

Table 6.1 Rent, house prices and P/R ratios for 15 cities in 2009

CITY	Population (2010)	Rent ($) (2009)	Price($) (2009)	P/R ratio
Chicago	2695598	886	199200	18.74
Cleveland	396815	605	106800	14.71
Detroit	713777	749	63800[1]	7.10
St. Louis	319 294	655	127100	16.17
Pittsburgh	305 704	706	100000[2]	11.80
Weighted average "decrease"	**4431188**	**810**	**157076**	**16.17**
Atlanta	420 003	886	123500	11.62
Minneapolis	382 578	776	177700	19.08
New York	8175133	1086	381400	29.27
Boston	617 594	1196	332600	23.17
Washington	601723	1059	308600	24.28
Weighted average "small change"	**10 197 031**	**1071**	**355883**	**27.69**
Los Angeles	3792621	1094	333920	25.44
San Jose	945942	1367	530000	32.31
Houston	2099451	809	153100	15.77
Las Vegas	583 756	1025	142900	11.62
Phoenix	1445632	836	137000	13.66
Weighted average "increase"	**8 867 402**	**1009**	**267347**	**22.08**

[1] Price 2011, [2] Estimated from graph

Source: FHFA, BLS, realator.org, city-data.com and author's own calculations

The actual P/R ratio for each of the three categories is illustrated in figure 6.3.

Figure 6.3 Actual price-to-rent ratios 1982 to 2010
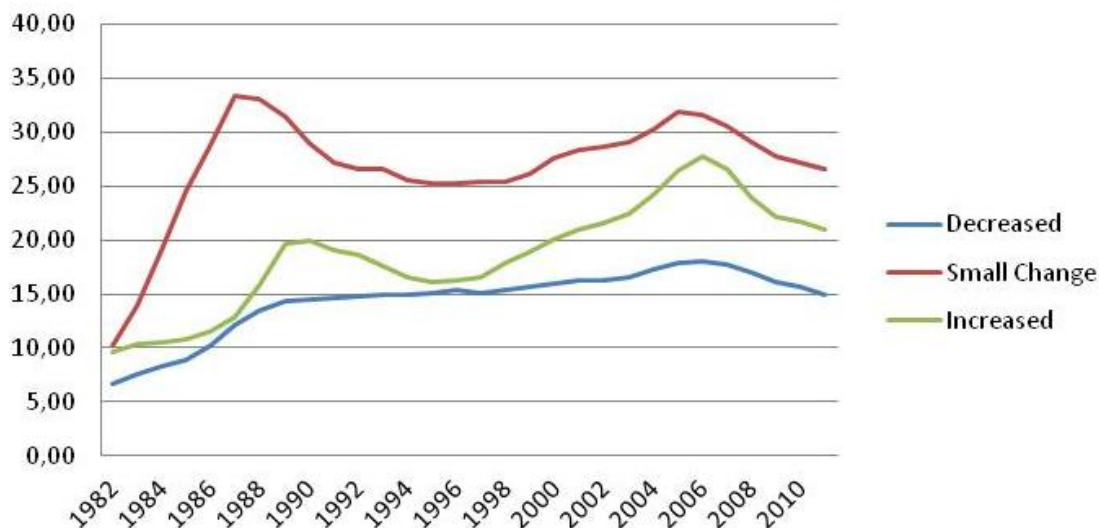
Source: FHFA, BLS, realator.org, city-data.com and author's own calculations

The figure shows that the price-to-rent relationship is highest in the cities with a "small change" in population. I emphasize that New York and Boston represent almost 80 percent of

the ratio value. From the middle of 1990's until the housing market peaked in 2008, the greatest deviation between price and rent occurred in those cities where population growth was highest. The P/R ratio rose by 71 percent from the lowest pre-crisis level in 1995, when price was 16 times the cost of rent, to 27 times at the highest level in 2006.

For "small change" metropolis, the rise was 26 percent from 1996 to 2005, while it was only 19 percent in the "decrease" category from 1997 to 2006. The P/R ratio has been higher for the cities with a "small change" in population over the period, as a result of the great price increase in the 1980's, which have remained high relative to rent since. The fast and steep increase in actual price-to-rent ratio indicates a housing bubble in these cities. Mismatch in the price-to-rent relationship, was most severe where pressure on the housing market from population growth was highest. Hence, this analysis indicates that a steep increasing population contributes to a price growth that deviates from fundamental values.

Figure 6.4 Price-to-rent ratios with baseline
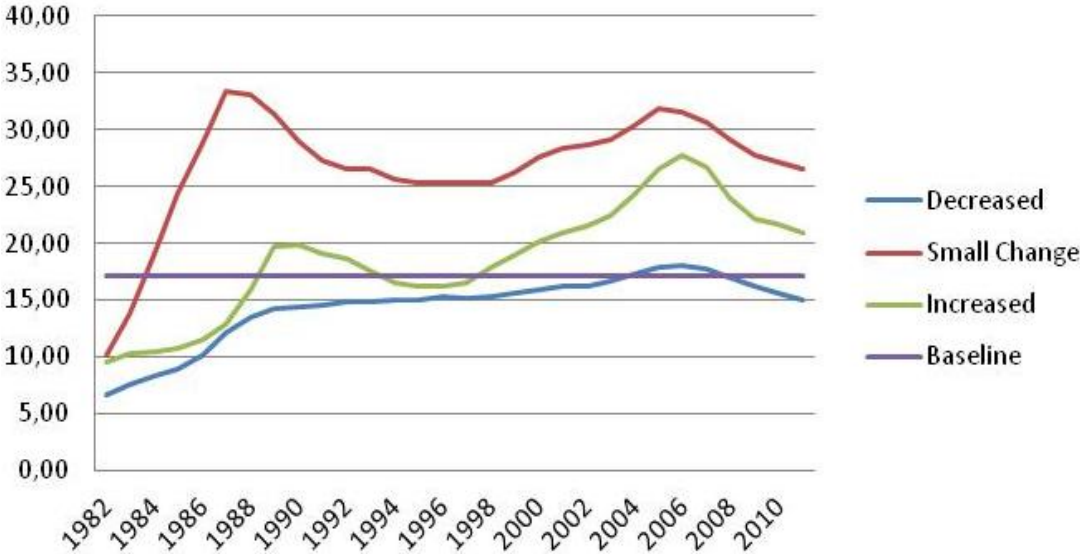
Figure 6.4 shows how the P/R ratios for the three categories preformed compared to the U.S. average. The baseline is obtained by calculating average house price and rent in the period for the U.S. as a whole, using the FAFH HPI and CPI-OER. After dividing the average house price with the average rent for the U.S., the baseline is calculated to be 17.09. At the peak in 2006, the cities with a "small change" in population lies 86.7 percent over the national average, while cities with "increased" population rose to 62.3 percent above the baseline in 2007. This comparison only gives an indication of how the ratios developed over the period compared to the national average, and does not take trend growth rate into consideration.

6.2 Price-to-income ratio

In the price-to-income ratio analysis, the method is presented in the first part and the analysis is conducted in the second part.

6.2.1 Method

Income growth has a great significance for house price development. As stated in section 2.1, equation (2.1) shows that demand for housing depends on a households' disposable income. Higher income strengthens purchasing power, which makes demand for dwellings rise and prices augment. Hence, higher house prices do not necessarily mean an overpriced market, if income grows proportionally. On the other hand, if prices rise faster than income, it might indicate that the economy is facing a housing bubble. The price-to-income ratio measures housing affordability. Usually, a household uses two to three times the size of their annual income when buying house (FHFA). As the ratio falls, it indicates improved affordability and relatively lower house prices (Case and Shiller, 2003).

The price-to-income ratio indicates whether there has been a corresponding development between the two variables. If the ratio is high, there might have existed a bubble.

A baseline give a reference value, hence, it indicates whether the ratios are relatively high or low. The baseline is the average price-to-income ratio based on average house prices and income per capita from 1991 to 2011, for the U.S. as a whole.

6.2.2 Analysis

Similar to the price-to-rent ratio analysis, house prices from 1982 to 2010 are calculated by using FHFA's House Price Index, which forms the statistical data for house price development, in addition to average 2009 house prices collected from realator.org.

As income variable, average personal income for American cities, published by the Bureau of Labor Statistics is applied. In order to compare income development for cities with similar population growth, a weighted average income data series is constructed for each of the three categories. The income development in the three categories can be seen in figure 6.5.

Figure 6.5 Weighted average personal income 1982 to 2010
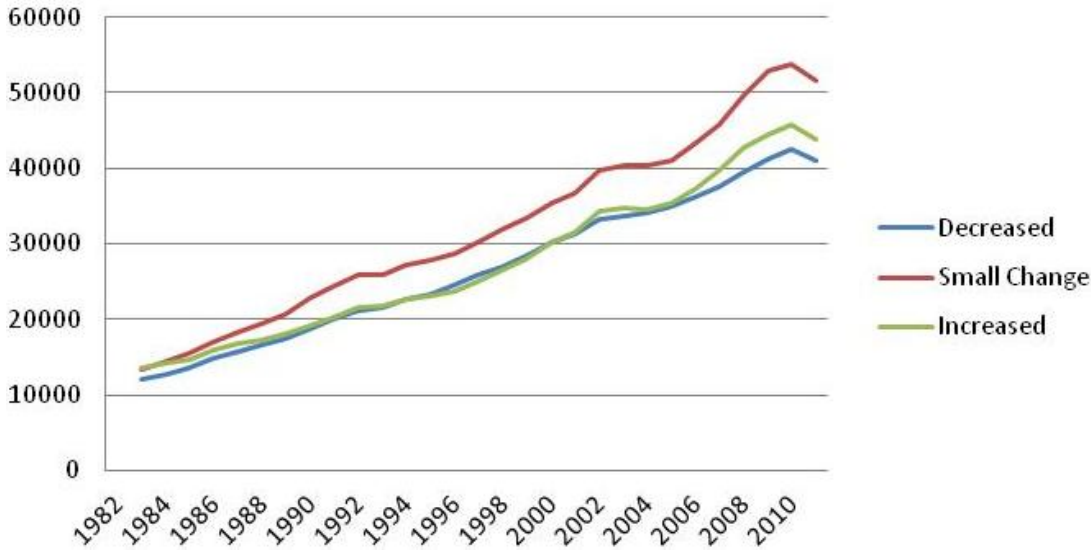
Figure 6.5 above, shows that income growth has been strongest in the cities where population increased extensively and where population changes were minimal. The cities characterized by population loss, on the other hand, experienced the slowest income growth during the same period.

The price-to-income ratios are obtained by dividing weighted average house price index for each of the three categories with corresponding weighted average income per capita.

Figure 6.6 Price-to-income ratios 1982 to 2010
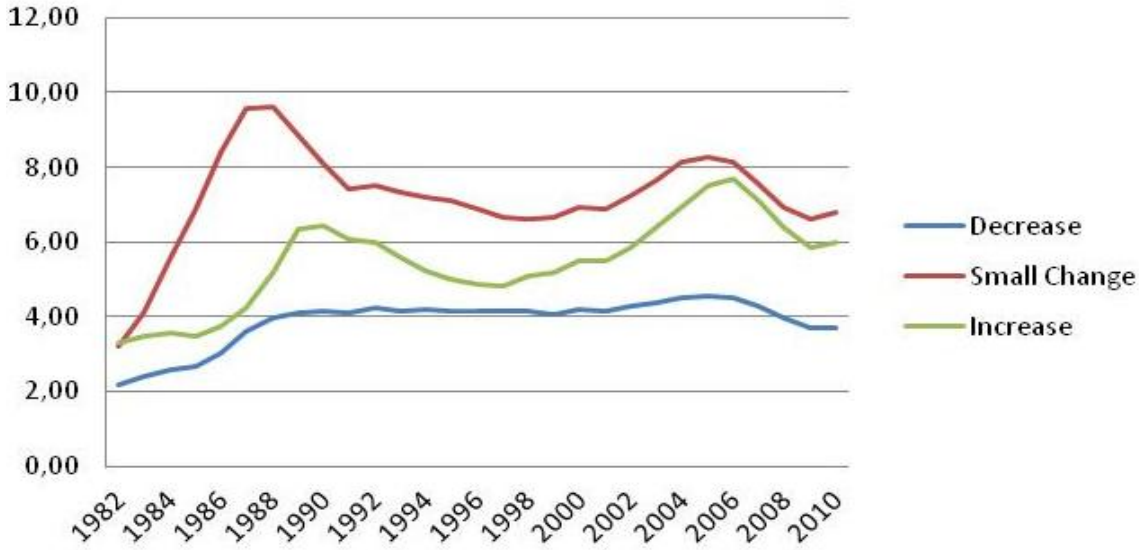
Figure 6.6 shows that the price-to-income spread is highest for cities with a "small change" in population, equivalent to the price-to-rent ratio analysis. However, the steepest ratio growth occurred in the cities with fast population increase, also similar to the price-to-rent results. The price-to-income ratio rose 58 percent from its lowest pre-crisis level, 4.8 in 1997 to 7.7 in 2006, in the "small change" category, it rose by 25 percent from 1998 to 2005, and for the "decreased" category, it increased only twelve percent from 1999 to 2005.

The price-to-income ratio was highest for the "small changes" in population cities throughout the entire period. These cities have had high stable house prices since a great price increase during the 1980's. Furthermore, I emphasize once more that the category is dominated especially by New York and Boston's development, due to population weighting.

The sharpest rise in price-to-income occurred for cities with fast population growth. The extensive gap between house prices and income indicates that there existed housing bubbles in these cities prior to the financial crisis. However, as seen for the price-to-rent analysis, the ratio was higher for metropolis with a close to constant population size throughout the period. Thus, it appears to be a maintained high deviation between price and income in the cities with a stable large population size. An explanation might be that a large stable population base provides constant housing demand.

Figure 6.7 Price-to-income ratios with baseline
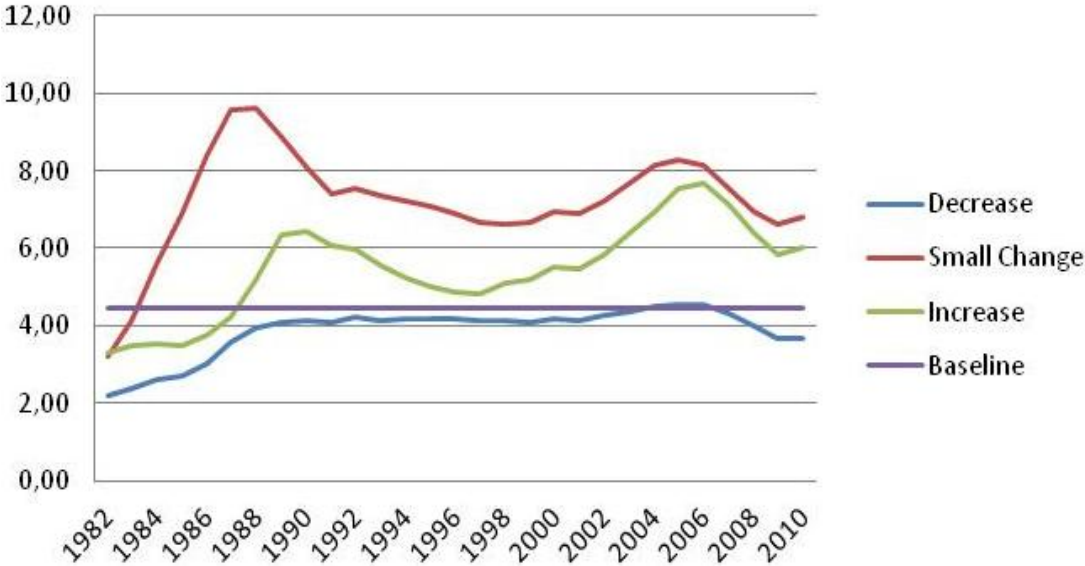
Figure 6.7 illustrates the price-to-income ratios together with a baseline equal to the average national ratio. The baseline is calculated by dividing the U.S. average house price, based on the FAFH HPI and the average 2009 price, with the U.S. average personal income. The baseline calculated to be 4.7. At the peak in 2005, the ratio for the cities with a small population change was 84.2 percent above national average, while for the cities with "increased" population, it was 76.2 percent higher than the baseline in 2006.

6.3   Conclusions

Combining the results from the price-to-rent and price-to-income ratio analyses, I conclude that there existed housing bubbles in the cities with steep population growth, due to high deviation in price to fundamental values. Nevertheless, the ratio has been higher, before, during and after the crisis for the cities with a "small change" in population. Therefore, a large deviation in itself does not necessarily need to equal a housing bubble as there seem to be constant high price-to-rent and price-to-income ratios in the most populous cities. Hence, the emphasis is put on the importance of growth rate, rather than actual population size, which seem to be a better indicator for volatile house prices.

Nevertheless, this way of analyzing the existence of housing bubbles would be indicative, as it does not indicate whether the price increase is caused by changes in fundamental values or speculation.

7 Monetary policy's influence on housing market analysis

The following chapter, firstly, analyzes how monetary policy has affected house prices before the financial crisis by applying the transmission channel theory presented in section 2.5.3. Secondly, it discusses shortly how monetary policy influenced the housing market during the recession. Finally, it presents the findings and conclusions.

7.1 Monetary effects prior to the financial crisis

This section uses the monetary transmission mechanism theory in order to analyze if monetary policy influenced the housing market prior to the financial crisis. The analysis is based on Mishkin's nine channel theory presented in section 2.5.3. Only the six channels that are considered applicable to the housing market are applied in the analysis.

The traditional interest channel

The Federal Reserve conducted expansionary monetary policy in the years after the dot-com bubble burst to stimulate investment desire (Gavin, 2009). In consequence of low short-term interest rates, average long-term interest rates declined and raised expectations towards a price increase. Therefore, higher inflation expectations caused real interest rates to decline and boosted investment activity.

The low real interest rates did not only cause investors to increase spending, it also encouraged investments in residential housing and other durable goods. In addition, as a result of financial innovations related to granting of consumer loans, credit supply and general consumption rose. Increased demand for goods and services stimulated the economy further and contributed to job creation and innovation. Consequently, households' disposable income and companies' cash flows improved, thus, they were able to refinance loans and furthermore, replace current properties with bigger and more expensive ones.

On the basis of the traditional interest channel mechanisms, I argue that a low federal fund target rate seems to have facilitated increased investments and consumption in the period prior to the business cycle peak by affecting demand for real estate, goods and services.

The Tobin's q channel

The findings from the traditional interest rate channel analysis indicate that demand for housing increased during the period, as a result of expansionary policy. Since housing supply is limited in the short run, stated in section 2.1, real estate prices rose. The steep increase in house prices made it relatively more expensive to buy properties in the secondary market compared to constructing new dwellings. The effect can be measured by Tobin's q, which compares the cost of building to the cost of buying property. If buying is more expensive than constructing, it is considered more profitable to construct new dwellings. Hence, construction activity will pick up. Figure 7.1 shows the increase in construction permits and completed units increase in the beginning of the 2000's.

Figure 7.1 New residential construction permits and units completed 2002 to2011
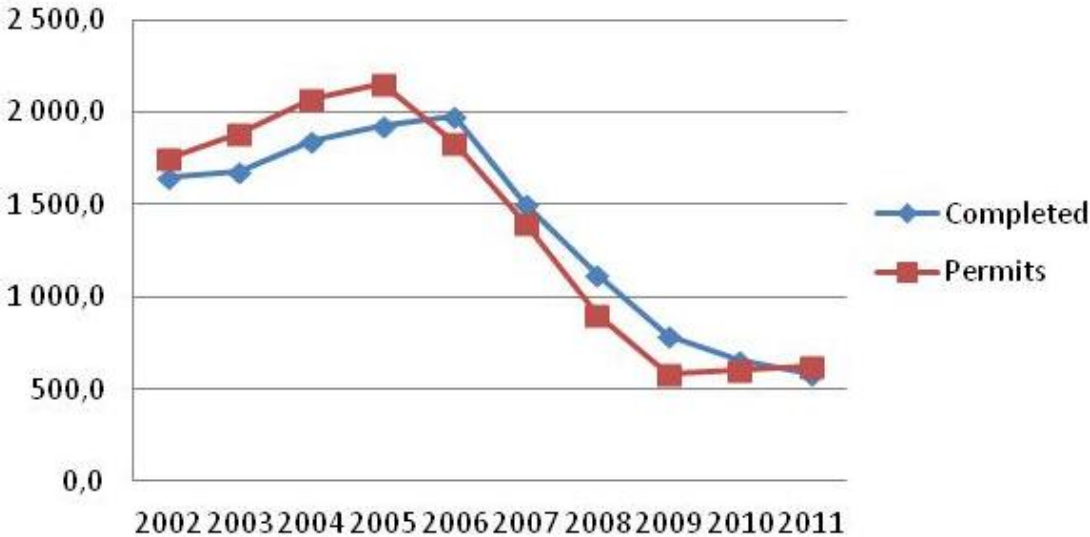
Source: Census Bureau, Building Permit Survey

Not only those buying houses for residential purposes, but also investors considered terms to be in favor of investing in construction related assets. The rise in building activity stimulated the economy by adding new jobs related to the construction sector.

On the other hand, the additional new dwellings improved housing supply, hence, counteracted a housing bubble formation. However, construction takes time, and a time lag exists from when a building permit is approved until it is completed. Thus, when house prices fell and demand for property contracted, supply continued to grow. According to the Building Permit Survey, completed dwellings exceeded construction permits from 2008 to 2010, illustrated in figure 7.1. Moreover, many investors were left with properties worth less than

construction costs, which were difficult to sell. The time lag from investment to profit realization might have worsened the housing bubble bust. However, construction permits contracted the same year as real estate prices started to decline, in accordance with the Tobin's q theory. In conclusion, monetary policy affected the housing market through the Tobin's q channel.

The wealth channel

In consequence of higher house prices, people's experienced and expected wealth increased during the 2000's. Since 80 percent of the least wealthy in the U.S. owns four percent of all stocks and 30 percent of all properties, the middle and low income households appear to have their wealth associated to residential housing. This is in contrast to the high income households, who have their wealth mainly invested in financial assets (Poterba, 2000). In consequence, increased property prices would equal higher purchasing power for most Americans, since the middle and lower classes compose the majority of residents (Case et al, 2005). As the value of people's assets grew during the 2000's, they were able to undertake additional debt and consume more. Moreover, increased demand for goods and services contributed to GDP growth. One the basis of this reasoning, I argue that that monetary policy affected the housing market through the wealth channel.

The bank lending channel

As interest rates fell, it became easier for banks to refinance themselves in the interbank market. The low and stable risk premium, seen in figure 5.8, indicates that market confidence was high during the early 2000's. Hence, it was unproblematic for banks to access credit in the interbank market at a relatively low cost. As risk and expenses remained minimal, banks acquired additional debt and increased lending while obtaining lower reserves (Mizen, 2008). In consequence of banks' loosened lending practices, investors borrowed additional money intended for investment purposes, and it became easier for people to serve debt, which increased demand for residential housing.

The cash flow channel

People's and firms' expenses related to serving old debt declined during the pre-crisis period due to low interest rates. This information was well known to banks who knew that people and firms had surplus liquidity they could use to serve additional debt. Hence, moral hazard in the market weakened and banks were able to increase lending. In consequence, investments in real estate augmented and contributed to a price increase.

The liquidity effect channel

From the borrower's perspective, improved liquidity, due to lower expenses related to serving loans, made acquiring additional debt more desiring, in line with the liquidity effect channel. Higher liquidity reduced moral hazard and risk for financial distress, which motivated consumers to increase investments in real estate and other durable goods.

Combining results from the credit channels; bank lending, cash flow and liquidity effect, I conclude that expansionary monetary policies seem to have improved lending conditions prior to the crisis, which further affected the housing market through higher demand.

7.2   Monetary effects during the financial crisis

The most important lesson learned from the great depression is the importance of liquidity in the credit market (Wheelock, 2010). What separates a financial crisis from other recessions is the extensive accumulation of credit prior to the peak, where the period from 2004 to 2007 was no exception (IMF, 2009).

As interest rates started to increase, it eventually caused bank lending to decline, with a reference to the credit channels theory (Hall, 2000). As a consequence of monetary tightening in 2008, banks realized that they faced problems obtaining external funds. A situation referred to as a credit crunch occurred when banks refused to participate in interbank lending (Hall, 2000). As lending became harder and more expensive, interbank market risk rose. Consequently, it became harder for banks to refinance themselves, and interest rates increased further. Even thought the central bank executed expansionary policy, by reducing the federal funds target rate close to zero, interest rates remained high. A reason for the lack in efficiency

could be explained by the relatively low federal funds target rate prior to the peak. Thus, the effort was not adequately to boost the economy.

In order to reduce interbank market stress, Ben Bernanke and the central bank committee implemented a different method. As mentioned in section 5.5, by increasing the monetary base, floating the market with liquidity, they were able to reduce market risk, hence, lower the interbank rate and stimulate lending for investment purposes. The central bank conducted two rounds of quantitative easing, QE1 and QE2, which improved interbank conditions considerably (Wheelock, 2010). While the monetary expansion efforts have had positive impacts on interest rates and the economy, the slow house price recovery indicates that the effect on the housing market has been less successful.

As seen in section 2.5.3, monetary policy does not impact real economy in the long run. However, Federal Reserve can stimulate the economy in the short run. Monetary policy can reduce business cycle magnitude and length, but not affect the trend itself. Hence, stabilizing the economy, smoothing peaks and troughs in output and employment around long-run growth trend, is a key short-term objective for the Federal Reserve (Meyer, 2004).

7.3 Conclusions

On the basis of the analysis I conclude that monetary policy affected the housing market both prior to and during the financial crisis through several transmission channels.

Low interest rates encouraged investments in real property through the traditional interest channel. In addition, it raised inflation expectations, which lowered long-term real interest rates and real estate investments became attractive.

The expansionary monetary policy made it favorable, both for lenders and borrowers, to grant and obtain additional debt as moral hazard and financial distress diminished. Thus, higher demand caused house prices to rise.

Increased house prices made construction of new dwellings relatively cheaper, which boosted the construction sector. However, time lags in supply might have contributed to a worsening of the housing market downturn. Hence, monetary policy effects also have time lags.

On the basis of the analysis on the period prior to the financial crisis, when Federal Reserve conducted expansionary monetary policy, monetary expansion seems to have contributed to

the house price increase. On the other hand, after the revulsion, monetary expansion was employed yet again in order to boost demand for assets. However, the slow real estate market recovery indicates that monetary policy was less efficient.

Combining these two results, I conclude that looser monetary policy is more effective in an expansionary phase than in a recovery phase.

8 Discussion

The results from the financial crisis analysis indicate that the most recent recession was triggered by several events, which made the economy exceed its long-term growth trend. Furthermore, the bubble analysis argues that terms were favorable for housing bubble formations in the cities with steep population growth. Hence, there seem to be corresponding patterns between population growth and house price development. The monetary policy investigation also concludes that the expansionary policy affected the housing market through several channels.

The present chapter discusses how the fundamental factors, low interest rates and expanded credit access, might have contributed to bubble formations. Furthermore, it looks at events that occurred prior to the crisis, related to changes in housing market regulations, which created favorable terms for housing market expansion, and see how they affected the housing market throughout the crisis. Even though these terms were identical throughout the U.S., house prices developed differently among American cities. In the last part of the chapter, features that seem to characterize cities with similar population growth and corresponding house market pattern are investigated.

8.1 Fundamental factors

This section discusses how fundamental factors affected housing bubble formations prior to the financial crisis, and comment on whether higher house prices were caused by speculation or rational behavior.

8.1.1 Changes in fundamental factors

As concluded in chapter 7, monetary expansion, followed by low interest rates, seems to have facilitated rise in house prices. Hence, monetary policy affects house price development through various channels. As a result of high liquidity and a low federal funds target rate, banks' lending rates remained low during the beginning of the 2000's. The TED spread indicated minimal market risk throughout the period, hence, moral hazard declined, which caused a widespread credit expansion.

Figure 8.1 illustrates that while the federal funds target rate and market risk remained low from 2001 to 2004, house prices augmented. Moreover, after the target rate rose, it remained high and market risk low, while house prices declined from 2006 to 2007. As market risk became volatile in 2007, target rate was reduced rapidly by Federal Reserve. However, the housing market was facing negative price growth.

Figure 8.1 Parallel development in target rate, market risk and house price 2000 to 2011
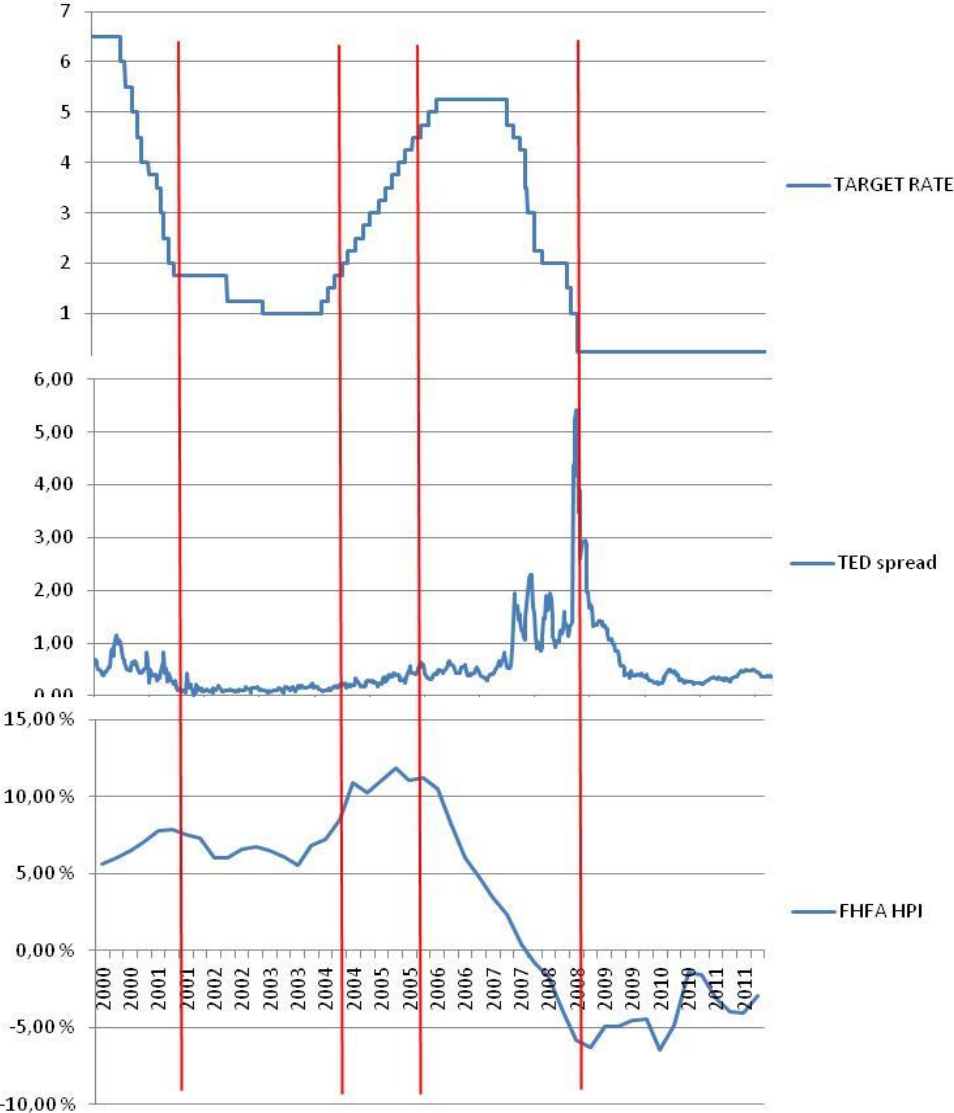
Source: FHFA, Federal Reserve and author's own calculations

The target rate started to increase in 2006, credit access diminished as a result of reduced market liquidity, simultaneously as the housing market contracted, illustrated in figure 8.1. In the following months it became clear that supply had exceeded demand, thus, prices declined. Figure 8.1 indicates a clear connection between changes in interest rates and house prices.

This is consistent with the results obtained from the monetary transmission channel analysis in chapter 7, which also indicated that lower interest rates affected demand for property directly, and through increased credit supply.

James Kahn (2009) argues that a change in the fundamental factor, labor productivity, output per hour of work, had a significant impact on house prices. While a continually technology improvement created a belief in sustained strong growth, a revision of productivity indicate a change from 2004. Therefore, the decline in house prices might be an effect of people's realization of a permanent negative shift in productivity, and lower future income. However, this argument indicates that the population realized at a certain point that their future revenue would decline while asset prices were still increasing, a reasoning which is conflicting with the wealth effects channel theory in section 2.5.3.

Nevertheless, the findings from the interest rate, credit supply and productivity discussion, indicate that the development in fundamental factors contributed to housing bubble formations.

8.1.2   Speculative and rational bubbles

The theory in section 2.4.4 classifies bubbles into two groups, speculative and rational bubbles. The type of bubble that has broadest consensus among economists is the speculative bubble related to irrational behavior.

As seen in earlier sections, changes in fundamental factors facilitated speculative behavior. Low interest rates made it affordable to obtain higher leverage levels, and looser access to credit facilitated extensive investments. Price growth nourished a prosperous housing market outlook. A positive belief regarding continuous price increase, higher future wealth and disposable income reigned among the public. The fact that a growing number of people wanted to take part in anticipated profitable investments, in itself signified a belief in a continuous positive development, and pushed prices higher.

On the basis of the high aggregated U.S. leverage level, investments conducted in housing projects and housing related bonds, in addition to the rise in construction of new dwellings, it appears as if house price growth to some extent was speculation motivated. Therefore, speculative behavior was clearly present during the period prior to the peak, which increased demand and pressured prices further.

Moreover, the dissertation explores the possible existence of rational bubbles. Even though this theory is highly contested, it takes a closer look at whether conditions for this type of bubble were present prior to the financial crisis.

Lower interest rates and access to credit did not only encourage speculators to invest in real estate, it also made home owning affordable to a larger share of U.S. inhabitants. As fundamentals made home owning accessible to a supplementary market, increased demand put pressure on house prices. Changes in regulations, related to who was eligible to obtain a mortgage in the late 1990's, also contributed to make home owning available to additional borrowers, the subprime market.

However, when the bubble bursted in 2007, lending requirements tightened yet again, as a result of high foreclosure rates and price elevation that occurred in the wake of regulation modifications. In consequence, a large part of the demand base that contributed to the bubble's expansionary phase, was excluded from the housing market reconstruction.

Based on previous arguments it appears as if bubbles did not only occur as a consequence of speculative irrational behavior, but also as a result of additional demand from a larger population base. Therefore, by investigating the existence of speculative and rational bubbles prior to the financial crisis arguments that support the presence of both types of housing bubbles are identified. To a broader extent, higher demand, as a result of the subprime market's credit access, can be compared to additional demand from a population increase. Hence, house prices can either be affected by higher individual purchasing power due to low interest rates or additional individuals in the demand base, due to broader market access or population growth.

8.2 The subprime market

New housing regulations enforced in 1999, stated that home owning should be available to medium and low income households (HUD). These modifications made requirements regarding mortgage granting less strict. Previously, mortgages were restricted to those in the prime market who were able to meet comprehensive underwriting requirements set by banks (HUD). However, new regulations made mortgages accessible to the subprime market.

The high profitability associated with investing in CDOs increased during the beginning of the 2000's, which lead securitization activity to rise. The securitization process conducted by

investment banks relied on access to mortgages. As stated in former sections, low interest rates and favorable credit terms, made it easier for the subprime segment to enter the housing market and obtain mortgages. In addition investment banks' need for securitization input, appears to have increased commercial banks' lending granting. Commercial banks made a profit from attracting new mortgagees and reselling their loans to investment banks (Almås, 2010). As long as house prices continued to rise, banks were always able to regain their money, thanks to foreclosure regulations, which give lien holder the right to the collateral in cases of a mortgage default.

Figure 8.2 Subprime originations 1994 to 2007
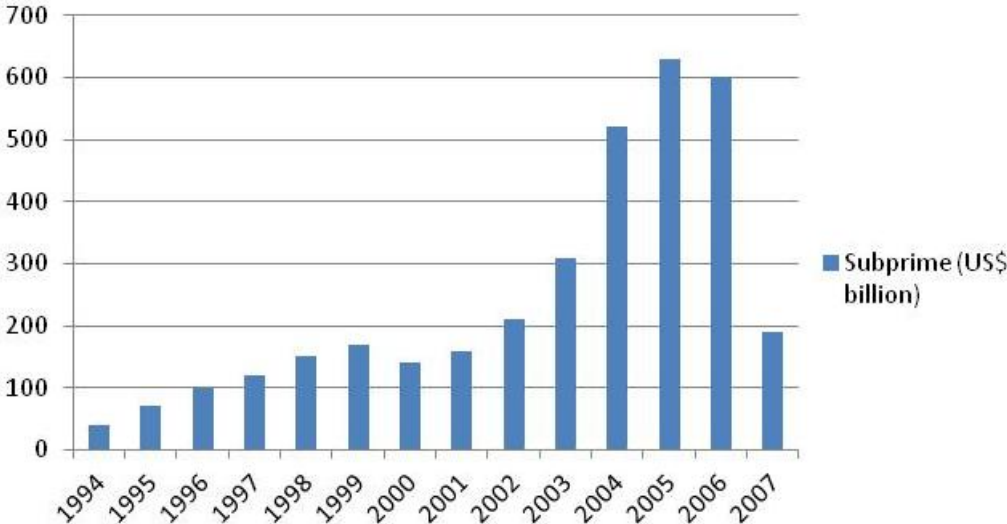
Source: Commission for growth and development

As the default rate started to accelerate around 2006, dwelling supply eventually exceeded dwelling demand, and real estate prices dropped drastically (Case, 2008). Consequently, investors who required a return on their assets, put their properties for sale to secure profit. When the crisis hit, a large part of the population obtained large mortgages. Thus, a substantial part of the American inhabitants faced a situation where their mortgage exceeded the value of their home (Acharya, 2009).

For the low or middle classes, wealth and savings are mainly tied up to their properties. Hence, a housing market downturn will cause severe budget restrictions. As seen in previous sections, pessimistic wealth and income expectations might result in lower consumption and higher financial distress. Private consumption accounts for 70 percent of GDP (BEA). Earlier recessions indicate that fast recoveries relay on a boost in private demand (Thøgersen, 2010).

In a recession where mainly the stock market is affected, private wealth expectations are influenced to a limited degree, hence, private consumption is still in place to boost the recovery. However, after the recent financial crisis, a boost from private consumption has been close to absent and recovery has been slow (Thøgersen, 2010). Based on these observations, I argue that the lack in private consumption might be a result of the severe housing market decline, the main American wealth indicator.

The subprime segment's housing market entrance in addition to favorable monetary conditions, increased demand for dwellings during the expansionary phase. Furthermore, increasing prices and higher price expectations, stimulated the demand further. The advantageous interest rate conditions in addition to the securitization expansion, made banks loosen lending requirements towards the subprime market. As subprime originations rose, mortgage defaults and foreclosure rates augmented simultaneously, due to higher risk associated with the subprime market (Shiller, 2008). Eventually, supply exceeded demand, which caused prices to decline. In consequence, several economists have accused the subprime market of triggering the financial crisis (e.g Acharya, 2010 and Case, 2008). However, based on my analysis it seems like underlying explanations related to changes in regulations and monetary conditions appears to be more justified explanations.

8.3   Foreclosures

Foreclosures rose considerably during the financial crisis, illustrated in figure 8.3. More and more homeowners faced the risk of conviction and banks taking over their property, due to lack in ability to meet required mortgage payments, as an increasing share of homeowners belonged to the subprime market. The greatest increase in the foreclosure rate occurred simultaneously as the housing market peaked from 2006 to 2007. In neighborhoods where sales rates accelerated, expectations regarding future profit diminished (Shiller, 2008). Real estate prices dropped when supply exceeded demand. Consequently, many households held mortgages that exceeded the value of their homes.

Figure 8.3 Foreclosure rates 1999 to 2009
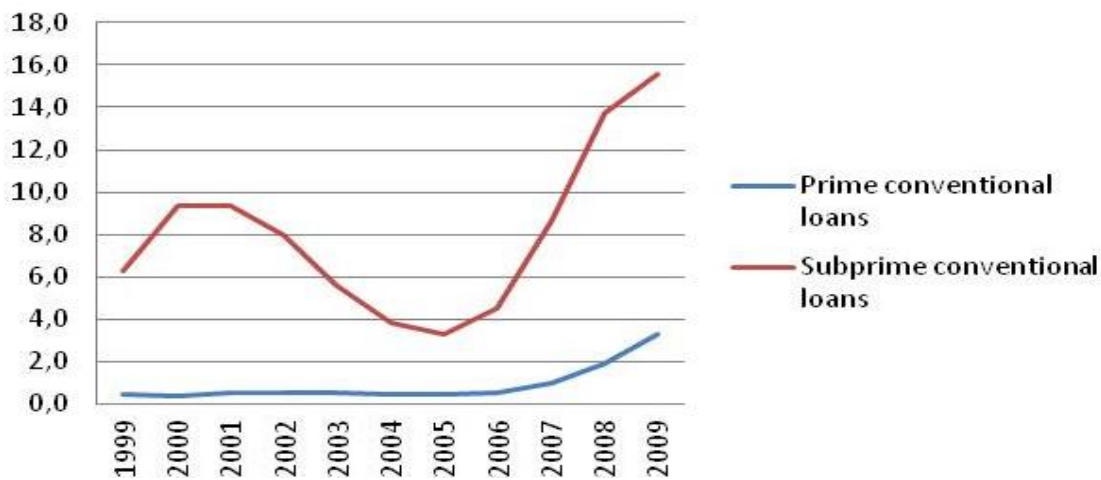
Source: Census Bureau, author's own calculations

In general, foreclosure regulations give households the opportunity to walk away from their mortgage and leave the responsibility with the bank. Figure 8.3 shows that foreclosures rates continued to rise during the financial crisis. However, according to the Census Bureau mobility statistics state that total migration was declining for homeowners during the same period, which indicate that higher foreclosure rates do not equal higher mobility. Based on these findings, I draw the conclusion that foreclosures exclude homeowners from the housing market and force them to become rentals, as homeowner mobility only measures "owner-occupied to owner-occupied" movements. Hence, people do not seem to use foreclosure regulations as an easy way out of the mortgage responsibility in order to start over at a different location. This finding can be backed by the following three arguments;

In the U.S., as in most countries borrowers aspire to honor their commitments. The moral aspect of conducting down payments, as long as it is possible, would assumedly be the preferred option for most Americans.

The American dream includes the right to property. When settlers came to America 200 years ago, their main motivation was to find and cultivate their own land. This ambition remains a central aspect with the American society. Furthermore, during the expansion phase this dream became accessible to a larger share of U.S. inhabitants. However, the post-crisis lending tightening, have yet again excluded this segment form the housing market. Hence, those who already obtain mortgages want to keep it, even though it exceeds the value of their property.

For the prime market, a foreclosure would mean the loss of savings, hence, they need to save new equity in order to meet down payment requirements on a new property. However, for the subprime market, a foreclosure does not only represent loss of savings, but also loss of the option of ever owning a home again.

As foreclosures contributed to declining house prices, measures were taken to avoid additional cases from occurring. Banks increased willingness to renegotiate loans, which gave mortgagees additional chances to meet payment obligations. This effort was beneficial for both banks and borrowers as it prevented banks from ending up with illiquid houses and lenders from losing their homes (HUD). The "making homes affordable" act initiated by The Obama Administration and passed by the Congress in 2009, provided economic assistance and financial planning aid to those facing foreclosure prospects (HUD).

To conclude, foreclosure regulations seem to have contributed to both the boom and bust of the housing bubble. Banks benefited from these regulations in the expansionary phase when they after granting a mortgage could repossess the property and sell it with profit in the case of mortgage default. However, foreclosure regulations eventually caused an oversupply of dwellings and prices dropped. Even though these regulations let homeowners walk away from mortgages in case of economic hardship and start over, the previous discussion indicates that homeowners did not choose to make extensive use of this option during the financial crisis.

8.4   Interaction between population growth and economic indicators

This section compares how the development in economic indicators have differentiated among the three population growth categories; "increased", "small change" and "decreased" population.

8.4.1   Income per capita for the three population categories

According to figure 8.4, the income per capita grew fastest in the cities with greatest population increase prior to the crisis, and slowest where population declined. The graphs also indicate that the income level was and still is highest in the most populous cities.

San Jose, where the main source of income is related to technology, experienced a steep rise in income per capita, 90 percent from 1993 to 2000, prior to the dot-com bubble and faced a

17 percent decline during the following recession from 2000 to 2002. However, the income level recoiled and rose by around 30 percent, from 2002 to 2007, until the financial crisis peaked. Looking back, San Jose is not only the city with the steepest income growth, but also the city with the deepest decline during the two recessions.

Based on the observations from figure 8.4, it seems like cities with a steep population growth and rapid increase in house prices, a relationship obtained in chapter 6, also seem to have the strongest growth in income per capita, moreover, the highest risk of income volatility.

Figure 8.4 Growth in income per capita for 15 U.S cities
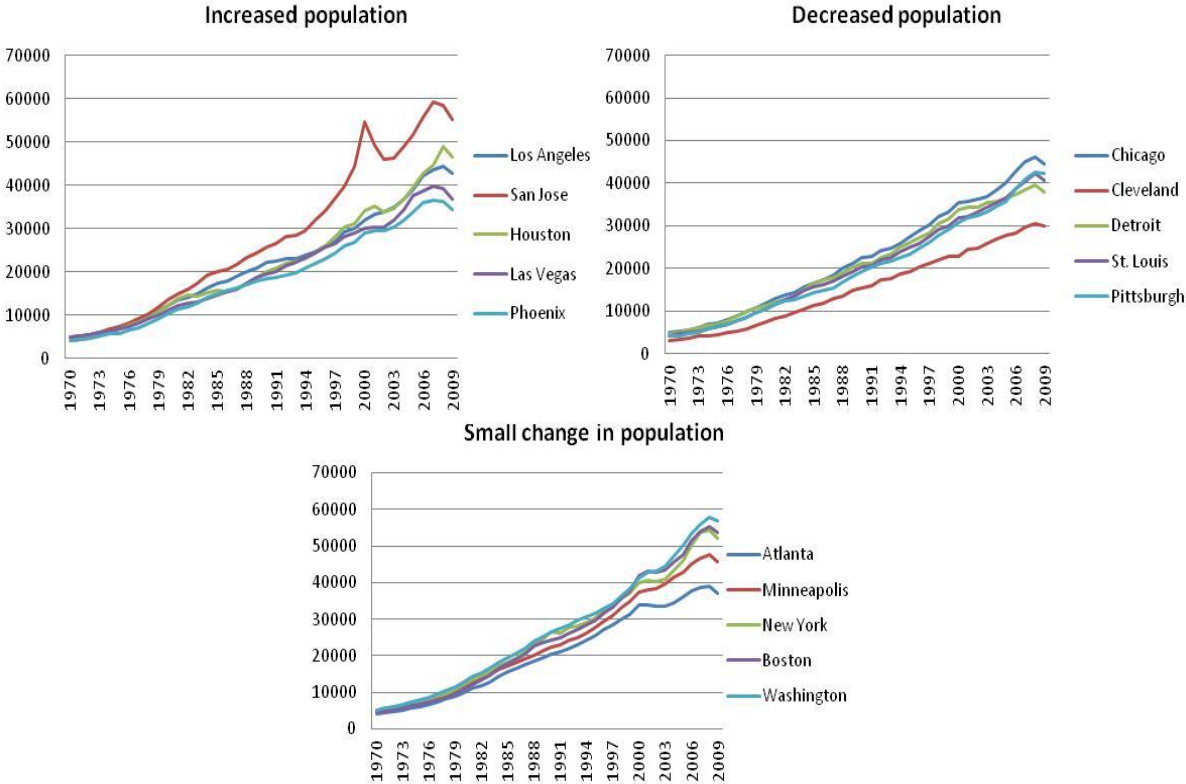
8.4.2 Unemployment for the thee population growth categories

Figure 8.5 shows that the unemployment rate was in average around four percent in the cities with "increased" and "small change" in population prior to the crisis. Those cities with a "decreased" population, on the other hand, had an average joblessness around five percent in 2007. During the financial crisis, unemployment rate peaked on average at twelve percent in the fast growing cities, eight percent in the stable populations and eleven percent where population declined. Thus, the largest unemployment growth occurred in the "increased" cities where unemployment rate tripled. Las Vegas went from four percent unemployment in

2006 to 15 percent in 2011. Even though unemployment rates "only" doubled in average for the cities with "decreased" or "small change" in population, an already weak situation in certain cities went from bad to worse. The most severe example is Detroit, where unemployment rate went from 8.4 percent in 2006 to 16 percent in 2008.

Figure 8.8 indicates that the cities with steep population growth, and the sharpest rise in house prices, also had the lowest joblessness in the pre-crisis years. However, during the recession these cities experienced the strongest rise in unemployment. Based on the findings presented above, cities with rapid population growth appear to face greater unemployment volatility than cities with a stable population size.

Figure 8.5 Growth in unemployment rates for 15 U.S. cities
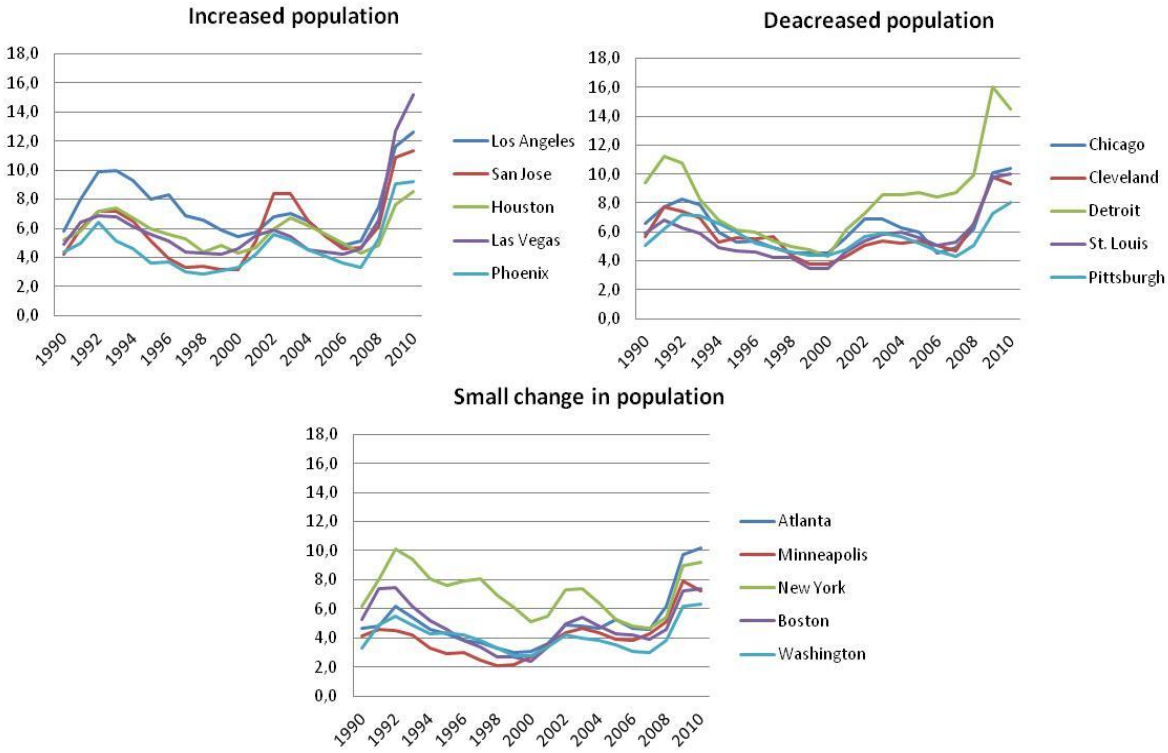
Source: BLS, Census Bureau and author's own calculations

8.4.3   GDP for the three population growth categories

Figure 8.6 shows development in output for the three categories. The graphs indicate that the economy grew most in the cities where population increased, and especially in those with the largest population sizes. Houston is an exception with a moderate growth in GDP. However, as seen in figure 8.4, Houston also had a weaker income development than the other cities.

The cities with a "decreased" population had weak production growth prior to the crisis. Furthermore, these areas did not escape an economic decline during the crisis. The graphs show that the cities with highest population growth experienced the most severe downturn during the crisis.

San Jose experienced the strongest growth in output, with a 35 percent increase from 2002 to 2008, an annual growth rate of nearly 6 percent. During the crisis, GDP dropped four percent. However, in just one year, from 2009 to 2010, the economy regained its pre-crisis level. Atlanta, Detroit and Las Vegas are those cities that have struggled the most to recover from the financial crisis.

Based on observations from figure 8.6, it seems that cities with steep population growth and quickly growing house prices experience a sharper economic growth than cities with a stable or declining population. However, observations from the financial crisis also indicate that economic output seems to be more volatile in these areas.

Figure 8.6 Growth in GDP per capita for 15 U.S cities
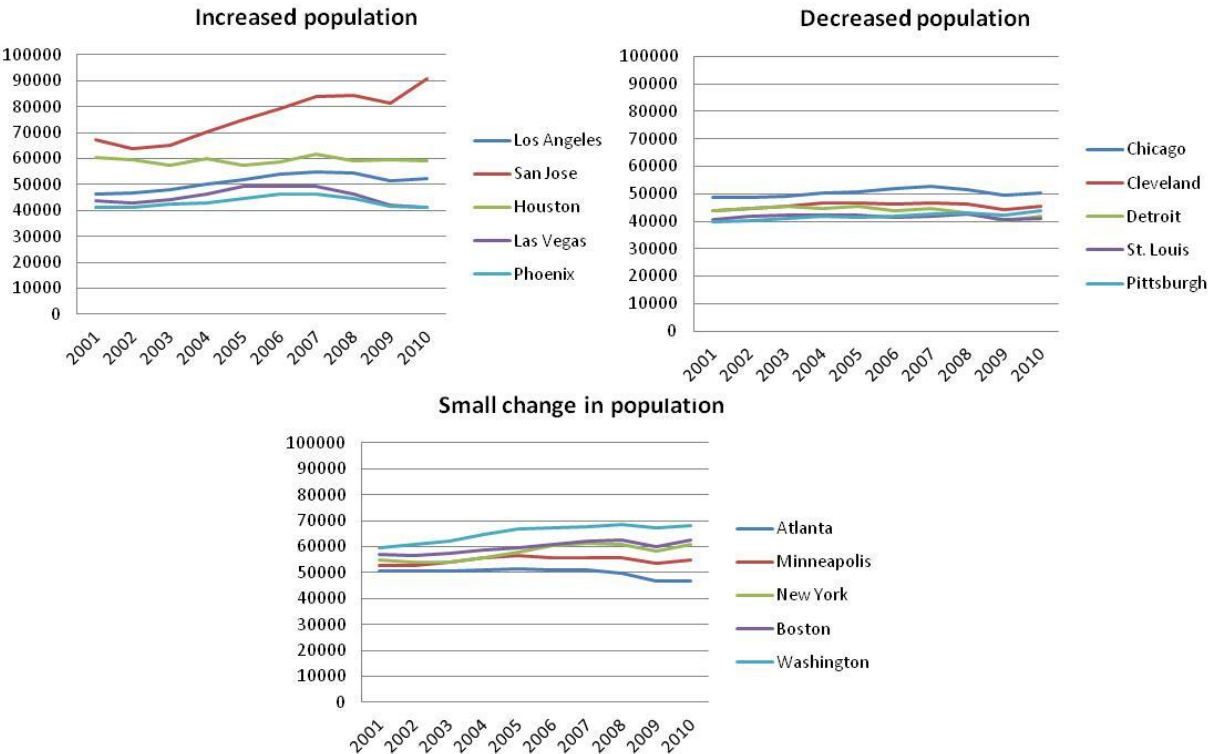
Source: BEA, Census Bureau and author's own calculations

8.5   Conclusions

From the discussion section it appears that both speculative and rational behavior contributed to the housing bubble formations during the financial crisis. Changes in fundamentals made it easier for investors to invest more extensively. Furthermore, a broader part of the population got access to the housing market. The effect of continuous increase in housing demand and prices in itself, contributed to a positive belief in future wealth, income and price levels, and pushed prices further.

Modifications within housing regulations gave the subprime segment access to mortgages, and with their entrance followed greater risk and higher foreclosures rates. As a result of increasing mortgage defaults, house supply eventually exceeded demand, and prices dropped. The discussion argues that regulations related to the subprime market and foreclosures made the housing market boom and bust possible.

The economic indicator analysis indicates that cities with "increased" population growth had a sharp increase in house prices, income and GDP per capita, in addition to low unemployment rates prior to the financial crisis. A positive spiral between population growth, employment, wages and the economy seem to raise demand and price levels, which again attracts additional inhabitants and investments. Furthermore, during the financial crisis, these urban areas experienced the severest decline in house prices, income and output, in addition to the largest augmentation in unemployment. However, throughout the recovery they also showed the quickest revival.

On the other hand, the cities with a "small change" in population also faced high income and production levels and low joblessness prior to the crisis. However, they did not experience an equally economic downturn during the financial crisis. These populous urban areas with mature economies seem to have steady high house prices, income and GDP levels in addition to stable unemployment rates, as oppose to growth cities where development in economic indicators are more volatile.

Moreover, development in income and output per capita was slow and unemployment highest among the three categories for cities with a "decreased" population in the pre-crisis period. Even though economic growth was close to absent prior to the revulsion in 2007, they did not escape the economic downturn. Thus, the crisis made an already weak economic situation

worse. These cities have also struggled to reduce unemployment and regain pre-crisis economic levels, hence a negative spiral.

Combining my findings it seems that population increase stimulates economic growth in general. A city with population growth will attract additional people as a consequence of expectations regarding higher demand for goods and services. Expected higher consumption indicates need for additional labor force, which attract supplementary people searching for employment. A positive population forecast also elevates expectations related to housing demand, which makes the area attractive to real estate investors. Hence, a city with an increasing population, face lower unemployment, higher demand, income and production, which makes it exposed to severe downturns, but also quick recoveries. On the other hand, one can argue that it is economic growth that stimulates populations increase. No matter which way one look at it, my analysis indicate that there exist a mutual relationship between populations and economic growth in the U.S.. Furthermore, the discussion concludes that a population increase fuels both the general economy and house prices. Nevertheless, it makes development volatile.

9 Concluding remarks

The dissertation provides an analysis of whether population growth affects house prices, and more specifically whether housing bubbles existed in the U.S. prior to the financial crisis. The results show that house prices varied greatly among U.S. cities, equivalent to the population growth trends. Furthermore, the findings imply that there is a positive relationship between house prices and population growth.

First and foremost, the results from my analysis conclude that the most recent recession meets the requirements of being classified as a financial crisis in accordance with Minsky's five-stage theory. The housing market was a great contributor to the severity of the economic downturn in the late 2000's.

My conclusions from the price-to-rent and price-to-income ratios analysis give clear indications that there existed bubbles in the housing market for cities with a steep rise in population prior to the financial crisis. I emphasize the importance of growth rate, not population size. The results indicate that, steep population growth leads to higher house price volatility in general. Hence, a sharp population increase equals house price growth that seems to deviate from fundamental values, and consequently raises the risk of housing bubbles.

Furthermore, development in fundamentals seems to have facilitated housing market bubble expansions. I argue that housing market regulations and monetary conditions played an important role as underlying reasons behind the housing market boom and bust.

After investigating how monetary policy affected house prices through several transmission channels during the 2000's, findings indicate that low interest rates made mortgages more affordable, due to reduced interest costs, and more accessible, due to less market risk and moral hazard, which increased banks' willingness to lend and borrowers' eagerness to obtain mortgages. The low federal funds target rate appears to have increased investments and consumption in the period prior to the peak. On the basis of these findings, I conclude that expansionary monetary policy facilitated house price growth, and therefore, contributed to the bubble formations.

However, it was not only interest rate policy that made mortgages accessible. New housing regulations, financial innovations and the expansion of the CDO market, increased accessibility of mortgages. Changed housing regulations in the late 1990's made home

owning available to low and medium income households, the subprime market, which elevated the demand for houses and pressured prices. In consequence of the subprime segment's market entrance, foreclosure rates elevated. Banks profited from the foreclosure regulations during the expansion phase, however, the rise in foreclosures caused house supply to exceed demand, which initiated a decline in house prices. Thus, housing market regulations seems to have made both the housing market boom and bust possible.

The further discussion concludes that both speculative and rational behavior contributed to the bubble expansions. Expectations regarding continuous high house price growth boosted investments, which backs the speculative bubble theory. In addition, prices were pressured additionally as a result of new market entrants, the subprime market, which supports the existence of rational bubbles. Hence, higher demand is either caused by higher individual purchasing power, due to low interest rates and expectations of continues price growth, or as a consequence of additional individuals, due to extended market access. Moreover, increased demand from a new market segment is comparable to higher demand from a growing population. This argument is supported by findings from the bubble analysis; prices rose the most in cities were population grew rapidly. As monetary and regulatory conditions were equivalent throughout the U.S., while population growth and house prices varied greatly among U.S cities, I argue that population growth influenced the housing market.

After analyzing common features for cities with similar population growth trends, findings indicate that cities with steep population growth seem to face a sharp rise in house prices, income and GDP, in addition to low unemployment during a business cycle's expansion phase. However, economic volatility seems to be high in these cities. House prices and GDP declined severely, but recovered quickly, during the financial crisis. Hence, population growth appears to fuel both economic and housing market expansions and recoveries. Furthermore, a city with "increasing" population size will in itself attract additional people. A larger population size equals higher demand for goods and services, which creates investment and job opportunities that attract additional investors and employees. Hence, positive population growth is a reinforcing effect. Other common characteristics for cities with sharp population increase appears to be their sources of income, which are linked to growth sectors such as innovation and technology, in addition to having easy access to low-cost labor.

In comparison, the cites that faced a "small change" in population size during the 2000's also faced high house prices, income and GDP levels, in addition to low unemployment, prior to

the crisis. However, the price and economic development was less volatile. These cities are primarily big populous cites, hence, areas that seem to have reached a "steady state", where deviation between prices and fundamentals remains high and the economy have matured.

On the other hand, cities with a "decreasing" population had feeble economic growth prior to the crisis. Nevertheless, they did not escape the severe downturn as the financial crisis made an already weak economic situation worse. Moreover, these cities have struggled regaining their pre-crisis levels. Hence, I argue that cities with both a great increase and decrease in population seem to suffer great housing market decline during a recession. However, since population growth fuels demand, only the cities with a positive growth trend will face a quick recovery.

To conclude, positive population growth leads to increased demand, which initiates higher asset prices and economic growth. Hence, a sharp rise in demand seems to enhance the risk of housing bubble formations.

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