IS NORWAY EXPERIENCING A HOUSING BUBBLE?

A Review of the Norwegian Housing Market

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Abstract

Over the last decades, Norwegian housing prices have experienced substantial growth. The price level is higher than ever before, and the price growth of housing have shown few signs of slowing down. The state of the Norwegian housing market has been widely discussed in media, both nationally and internationally, making it an interesting topic to investigate.

This dissertation seeks to investigate whether the increasing price level can be explained by underlying fundamental factors, or if it is caused by expectations of continuous growth. The latter would mean that Norway is experiencing a housing bubble.

The historical development of the Norwegian housing market is analyzed, highlighting historical bubbles. This analysis is followed by an explanation of underlying bubble theory and Case and Shiller's bubble criteria. Further, various Norwegian house price models are assessed in order to identify the exploratory factors affecting the development of housing prices. This assessment is followed by empirical studies applying several established theories; the Hodrick-Prescott filter, the P/R ratio, and Tobin's Q. The empirical study is followed by an analysis of the underlying fundamentals of the housing market, based on the earlier identified exploratory factors. An assessment of the psychological aspect is further on conducted, before Case and Shiller's criteria are revisited.

The empirical studies presented contradicting results on whether the Norwegian housing market is currently overvalued. The results suggest that some of the existing theories are not adequately suited for identifying housing bubbles.

The fundamental analysis illustrated how most exploratory factors support the price growth, making it clear that housing prices in Norway are not solely driven by expectations. The assessment of the psychological aspect revealed how the majority of Norwegian households expect housing prices to continue rising. It is argued that all of Case and Shiller's criteria are met, but it is concluded that several of these criteria are fulfilled due to fundamental factors, and, therefore, not indicators of a housing bubble.

Conclusively, this dissertation states that Norway is not currently experiencing a housing bubble as it is defined in this paper. However, there are several aspects of the Norwegian economy indicating that the current house price level may not be sustainable in the long run.

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1 Introduction

1.1 Motivation

For the last twenty-five years, Norway has experienced an almost uninterrupted growth in the price level of housing. This has fueled numerous debates among experts and economists regarding what is the correct level of house prices and whether the Norwegian housing market is heading for a collapse.

The housing bubbles witnessed in the United States and several European nations in recent years have resulted in a great deal of media attention on the Norwegian housing market. However, the general perception among the Norwegian people is that the house prices will continue to grow. Is Norway, as a nation, being overly optimistic and naïve?

As business students about to graduate and move back to Norway, we will soon be faced with the decision of whether to buy housing. Due to the major financial implications of an overvalued housing market, both on a personal level and for the Norwegian economy, understanding the Norwegian housing market is of great interest and importance to us. Therefore, writing a master thesis on the subject represents an excellent opportunity to develop a comprehensive understanding of the housing market and the mechanisms influencing the housing prices.

The importance of improving the knowledge of the housing market is also clear to the Norwegian government. In recent years, they have offered scholarships to graduate students willing to write theses on elements of the Norwegian housing market they believe need further examination.

1.2 Problem Statement

To examine whether the Norwegian housing market is overvalued, we have decided to focus on the fundamental factors believed to influence the housing market. By analyzing these factors, we will attempt to answer the following problem statement:

Is Norway experiencing a housing bubble?

We believe that by analyzing the fundamental factors in light of relevant theoretical frameworks, we will develop a comprehensive understanding of the important housing market mechanisms that influence the house prices. Throughout the thesis, empirical analysis and macroeconomic models will be presented, establishing a solid foundation for a well-grounded conclusion.

1.3 Outline

The thesis will begin with a review of the historical developments in the Norwegian housing market. In this section, we will examine the reasons for housing price declines in the past, and see what developments the experts are expecting in the coming years. This section will be followed by an explanation of bubble theory and the seven criteria of a housing bubble recognized by Case and Shiller, two of the world's leading experts on housing markets.

To establish the drivers of change in the Norwegian housing market, the next sections will review numerous house price models. By examining the supply and demand theory for housing and Norwegian house price theories, we identify the exploratory factors of the price level.

After the theoretical foundation for further analysis is explained, we will perform empirical analyses using statistics from the Norwegian housing market published by Norges Bank and Statistics Norway. In this section, we will use the HP-filter to evaluate the trends of the market, the P/R ratio to compare the housing costs to the cost of renting, and Tobin's Q to analyze whether house prices correspond with the construction costs of similar housing.

In the fundamental analysis, we will investigate the exploratory factors to see whether they support the rapid growth in Norwegian house prices since 1993. In addition to changes in income, demographics, unemployment and construction level, the section will inspect the Norwegian tax laws and the developments in the credit market.

After examining the fundamental factors, we will assess the psychological factor influencing the housing prices, namely the expectations among the Norwegian people. A housing demand that is driven by unrealistic expectations leads to an overvalued housing market that is exposed to a crisis.

Lastly, we will revisit Case and Shiller's seven criteria for housing bubbles to evaluate whether they are met in the Norwegian housing market. Based on the fundamental analysis, empirical evidence, and these criteria, we will present our conclusion and recommendations for policy changes.

1.4 Methodology

To answer the problem statement of the thesis, we have opted for a descriptive approach combining qualitative and quantitative research methodologies. The purpose of the paper it to establish a fundamental analysis of the Norwegian housing market, based on the existing macroeconomic models and theories, and not to develop new theories or models. Throughout the paper, the fundamental

analysis is applied to illustrate what elements that have affected the Norwegian housing prices, and how changes in these factors can contribute to the future developments of the housing market.

Before performing the analyses of the exploratory factors of the housing market, the theoretical foundation for the analyses is explained. In this section, the choice of which fundamental factors to include in the analysis is made clear by macroeconomic theories and Norwegian house price models.

The theoretical foundation and qualitative research are based on research papers, journals, reports and other publications by well-known economists, researchers, institutions, and experts on macroeconomics and the housing market. The quantitative analysis is primarily performed using data and statistics published by Norges Bank and Statistics Norway. In sections where the data published was insufficient for analysis, the missing data have been calculated using information from other sources.

In addition to the analysis based on secondary data, we conducted a short survey to examine the popularity of the Norwegian housing market as a conversation topic.

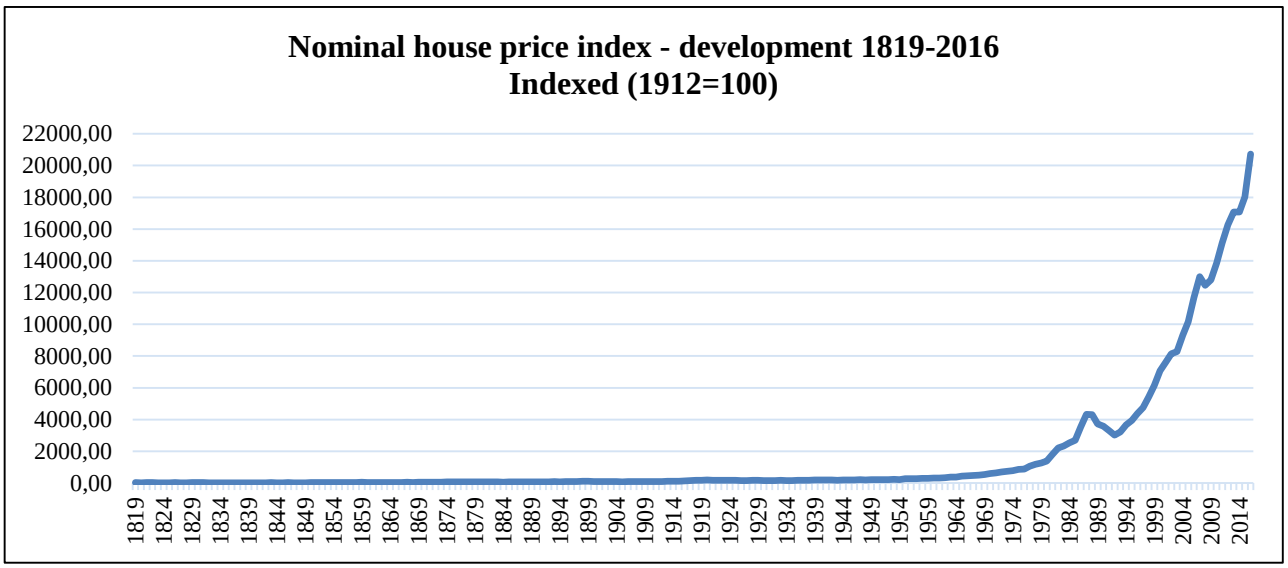
The data was collected on April 10th 2017. Statistics and data published after this date will, therefore, not be included in the thesis.

2 The Norwegian Housing Market

2.1 Historical Developments

In order to provide a deeper insight into the Norwegian house housing market, this section of the paper will examine the historical price development of housing in Norway. Norges Bank, the Central Bank of Norway, publishes historical monetary statistics for Norway going back several decades, and among these data are the house price indices going back to 1819. By studying this information over a longer period of time, it is possible to identify irregularities that stand out relative to the normal development. One can argue that the analysis of these situations will facilitate better-informed conclusions about the current housing market in Norway.

Figure 2.1



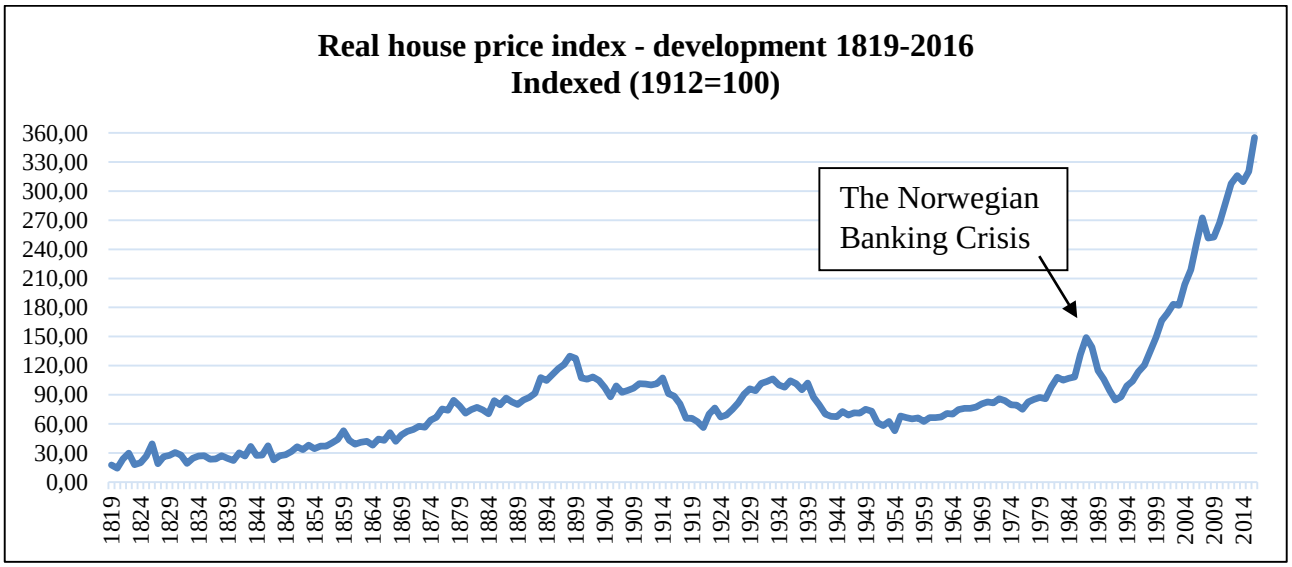
Source: Norges Bank (2017a)

As figure 2.1 illustrates, the house price growth remained relatively stable until it started to accelerate around 1960[1]. However, this graph does not explain how the price of housing developed compared to the price of other goods and services in Norway. The real house price index tells us how the house price growth compares to the inflation, and it is calculated by deflating the nominal house price index with the consumer price index (CPI). The reason why we use the CPI as a deflator is because we see housing as an investment primarily made by the consumer for housing purposes, which is in accordance with Jacobsen and Naug (2004a) who concentrate their theory on those who buy housing

[1] See appendix 1 for a more detailed overview of the development.

for housing purposes. We do not use the gross domestic product (GDP) as a deflator as price changes in the entire Norwegian economy, and not just the consumer's economy, would be included when we deflated the nominal house prices. The real house price index is illustrated in figure 2.2[2]:

Figure 2.2



Sources: Norges Bank (2017a; 2017b)

An upwards slope in the real house price index means that the price of housing is growing stronger than the consumer prices of other goods and services. In the following section, the periods when real house prices have experienced significant fluctuations will be elaborated.

The Kristiania Crash

The first considerable crisis was the Kristiania crash, which took place between 1899 and 1905. During the 1890s, the capital saw the population increase by almost 50 percent. As a result, the demand for housing and commercial buildings increased dramatically. The comprehensive building activities that followed were partially supported by the emergence of new banks and deregulations in the lending market. In the late 1890s, six new commercial banks were established. These banks specialized on lending money with stocks as security and providing loans to construction companies. Towards the end of the 1890s it became increasingly more apparent that assets were priced too high in the market, and in 1899 the bubble burst. Housing prices fell considerably, and the new commercial banks, which were all heavily exposed to the real estate markets, came in severe distress and went bankrupt (Grytten & Hunnes, 2010).

[2] See appendix 2 for calculations.

The post-war depression

The next crash occurred after World War I, and is often referred to as the post-war depression. During the war, there had been a shortage of consumer goods, and the money stock had increased fivefold. This combination of decreased supply and monetary extension resulted in an inward shift in supply and an outward shift in demand for consumer goods (Grytten & Hunnes, 2010). When the supply was released after the war ended, this led to a brief and heated boom. The value of imports increased rapidly and became more than twice as high as exports in 1919 (Grytten, 2004). The nominal aggregate house price index increased by 72 percent from 1914 to 1920. During the same period, however, the CPI rose by 197 percent. As a result, house prices declined in real terms during these years (Eitrheim & Erlandsen, 2004). In order to bring the krone back to its par value in gold, Norges Bank adopted a deflationary monetary policy. Interest rates were increased, and the central bank restricted the money supply. This resulted in record high levels of bankruptcies and unemployment, and bank failures reached seven percent in 1923 and 1925 (Grytten & Hunnes, 2010). Consequently, the central bank put the deflationary monetary policy to a pause in early 1923. After the market situation had improved, a new round of deflationary policy was introduced in late 1924. After having gone through a financial crisis with stagnant gross domestic product (GDP), investments and foreign trade, record high unemployment rates and deflation, the krone finally regained its par value in 1928. The economic distress of the 1920s is arguably the worst financial crisis Norway has seen.

The great depression

After the post-war depression, Norway took part of a powerful international boom in the late 1920s. The boom came to a stop in late 1929, however, as the overheated United States (US) economy collapsed. Between October 1929 and the summer of 1933, the New York Stock Exchange (NYSE) fell by 86 percent, and thousands of US banks either went bankrupt or needed public bailouts. The US banks were unable to renew their credits to Europe, which had lost its liquidity due to war reparations and the inter-allied debt to the US. As a result, the US problems were transmitted to Europe. Although the depression of the 1930s was milder than that of the 1920s, Norway still suffered from the international catastrophe. Exports and manufacturing output fell while unemployment rates rose. Between the late 1920s and 1934, consumer prices dropped by over 50 percent (Grytten & Hunnes, 2010). After having fallen sharply and leveling out at a lower level during the 1920s, nominal house prices recovered during the second half of the 1930s. Real house prices rose during the inter-war period, as figure 2.2 illustrates.

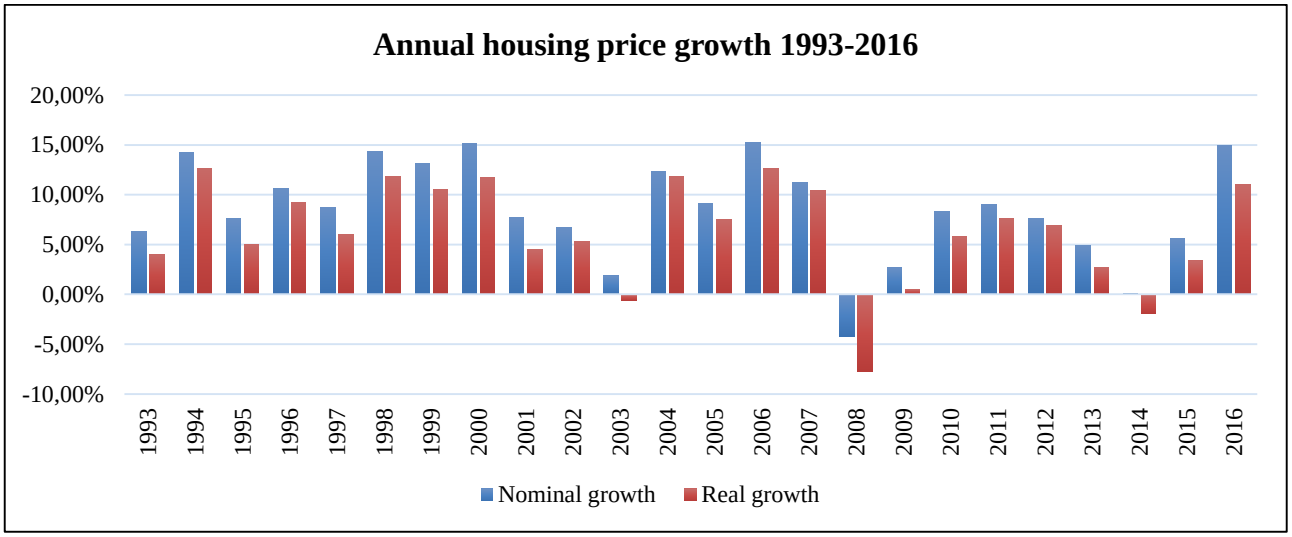
The Norwegian banking crisis

The most recent notable crash was the Norwegian banking crisis which took place in the late 1980s, as illustrated in figure 2.2. After a period with strict credit market regulations during the 1970s, Norway gradually deregulated its markets as a reaction to the deficiency of the regulated economy. The housing market was deregulated in 1982, and the regulations of the credit market were lifted not long after (Anundsen & Jansen, 2013). The combination of these liberalization processes resulted in a credit expansion, which in turn led to significant growth in the real estate market. House prices rose by 211 percent from 1980 to 1987. During the same period, oil prices hit record high levels and capital was flowing into Norway in significant amounts. After having remained high since the late 1970s, oil prices started to decline considerably in 1985. The oil price continued to decline in 1986, and as a result, Norwegian foreign trade turned from great surpluses to large deficits. In order to handle the situation, Norway turned to a tight fiscal and monetary policy (Grytten & Hunnes, 2010). When the bubble finally burst, the banking sector was left facing colossal problems due to their exposure to the real estate market (Vale, 2004). From 1987 to 1992 nominal house prices fell over 30 percent, and Norway experienced the most severe real estate crash in the nation's history (Grytten & Hunnes, 2010).

Strong growth in housing prices since 1993

Since the banking crisis ended in 1993, the house price growth in Norway has been exceptional in both nominal and real terms. Nominal housing prices have experienced growth every year since 1993, with the exception of a short-term decline in 2008. This drop was caused by ripple effects from the financial crisis, which originated from the US subprime mortgage crisis in 2007. The reason that some other years have experienced negative real housing growth is because the CPI has increased more than the house of pricing. The annual housing price growth since 1993 is illustrated in figure 2.3.

Figure 2.3



Sources: Norges Bank (2017a; 2017b)

The question of whether Norway is experiencing a housing bubble or not is an intensely debated subject. Housing prices have been subject to volatile periods historically, but Norway has never experienced a rise as steep as the one seen since the early 1990s. Although the exceptional price growth in itself does not provide any basis for arguing that Norway has a housing bubble, it serves as a good reason for analyzing whether the price level can be supported by fundamental relationships or not. There is no guarantee that the current housing market will perform as it has historically as markets are constantly changing and adapting to shifts in the underlying fundamental factors. Uncertain prospects encourage further analysis of the Norwegian housing prices.

2.2 Experts' Review of the Norwegian Housing Market

The discussion of whether the Norwegian housing market is overvalued and experiencing a bubble has been going on for a while, with both Norwegian and international experts taking a stand. In 2013, OECD proposed that Norway's price level for housing is approximately 40 percent over the natural level, while the International Monetary Fund (IMF) argued that Norway was experiencing one of the biggest housing bubbles in the world (Milne, 2013; Karaian, 2013)

In 2017, the burst of the bubble has yet to happen, and many argue that it never will. While experts agree that the tremendous growth cannot continue forever, some argue that the level of housing prices have yet to reach its natural level. In this section, we will examine the arguments for and against a housing bubble that the experts have contributed to the discussion.

2.2.1 Arguments for an Overvalued Housing Market

Robert Shiller, Nobel Laureate and an expert on housing markets, is one of the international experts supporting the statement that the Norwegian housing market is overvalued. Shiller, who is a professor of economics at Yale, argues that the fundamental factors in the Norwegian market do not support the rapid growth experienced over the last 20 years. He claims that there are similarities between the Norwegian market and the US market leading up to the housing bubble responsible for the financial crisis in 2007 (Schmidt, 2012). Since his comments in 2012, the housing prices have continued to grow, and many experts agree that Norway should expect a decline in housing prices.

One of the experts who is expecting a decline is Ola Grytten, a professor at the Norwegian School of Economics (NHH). He argues that the fundamental factors that have led to the massive increase in housing prices will not always be there. Low interest rates, low unemployment levels and high growth in disposable income are some of the factors leading to increased housing prices, that cannot be expected to last eternally (Torvund, 2013). Scientists predict that by 2030, one third of Norwegian jobs will be automated and that the creation of new jobs will not be able to keep up (Pajarinen et al., 2015). According to Grytten, this would lead to a significant decrease in the price level of the Norwegian housing market. Norges Bank argues that a one-percent increase in unemployment will lead to a decline in housing prices of 10 percent. The expected decline is credited mostly to the high debt ratio among Norwegian home-owners (Haugen, 2015). The high debt level among homeowners is also making them vulnerable to increased interest rates and could result in severe consequences when the potential bubble bursts. Grytten also argues that the new regulations on construction have increased the construction costs so much that new housing will not be able to influence the housing price effectively (Torvund, 2013). Harald Magnus Andreassen, chief economist at Swedbank, argues that even though the real price of housing in Norway has increased significantly, this will level out in the long run. This can happen either by a long period without growth in prices, or more likely, a decline in prices of 20-40 percent (Andreassen, 2015). Andreassen also argues that the growth in prices can largely be credited to unrealistic expectations of the future and that the high growth in Norway compared to other countries is difficult to explain using fundamental factors (Norli, 2013).

Vernon Smith, another Nobel Prize-winning economist, argues that the rapid growth in housing prices compared to the income level in the country suggests an overvalued housing market. In 2013, he said:

"Housing prices in Norway have grown much faster than inflation and wages. Unless people have suddenly become willing to spend much more of their income on housing, this is a bubble […] This

is not likely at all, but that is the kind of excuses you are always told before the bubble bursts. Over time, the development in income and housing prices will correspond."

Vernon Smith (2013)

The table below summarizes the arguments supporting the assertion of an overvalued housing market.

Arguments implying an overvalued housing market:
Unrealistic expectations regarding the future economic situations among people.
The growth is not sufficiently explained by fundamental factors.
The high growth in real housing prices Norway has experienced is highly unlikely to be maintained in the future.
Growth in housing prices is significantly higher than the growth in income level
High construction costs are leading to high housing prices for new constructions.
The high debt ratio makes the Norwegian housing market sensitive to increases in unemployment and interest rates, which are likely to happen at some point.

2.2.2 Arguments Supporting the Current Level of Housing Prices

Torbjørn Eika, head of research at Statistics Norway (SSB), does not agree with those claiming the price level in the Norwegian housing market is too high. SSB believes that the low interest rates, advantageous tax laws for homeowners, population growth and the growth in income support the current price level in Norway (Langberg, 2013).

Edward Glaeser, a professor at Harvard, argues that Norway is not experiencing an overvalued housing market. Instead, he believes that the housing price models are making incorrect assumptions, leading to an inaccurate picture of the market. Glaeser disagrees with the models' assumption that consumers are rational, with knowledge of all the factors influencing the housing market. Urbanization and the fact that Norway is a wealthy country are, according to Glaeser, factors that justify the current price level. Another significant difference between Norway and other areas that have experienced bubbles is that labor is expensive and the level of regulation is high. If the housing prices were any lower, then new construction would not be profitable. The lack of construction would cause a market with increasing demand and constant supply (Hegnar, 2015).

Another expert convinced that the pricing level is correct and that Norway is not experiencing a bubble is the CEO of Krogsveen, Leif Laugen. He claims that recent studies by the renowned housing market researcher Andrè Anundsen prove that fundamental factors can explain the growth in housing

prices. Like others defending the current price level, Laugen points to the growth in real income and the low interest rate as fundamental factors explaining the prices. The scarcity of available housing and limited construction possibilities, especially in Oslo, are also arguments supporting the assertion that the market is not overvalued. Lastly, Laugen claims that Anundsen's research shows a very limited effect from people buying houses for investment purposes, and claims that the effect that is often credited to speculations, stems from the delay of the supply in the housing market (Brun, 2016).

There are also experts who believe that even though the current price level is supported by fundamental factors, the market growth has to cease soon to avoid creating a bubble. These experts mainly use the same arguments made by other experts in this section, with minor variations. The table below summarize the arguments made by experts to support the assertion that the current price level of the Norwegian housing market is correct.

Arguments supporting the current housing prices:
Advantageous tax regulations for homeowners
Growth in the Norwegian population
Low interest rates on mortgages
High construction costs due to expensive labor and comprehensive regulations
Urbanization causing increased demand in the major cities
Scarcity of housing and sites for new construction, especially in Oslo

2.2.3 Forecasts for the Norwegian Housing Market

Experts are not the only ones disagreeing over the Norwegian housing market. Banks and institutions vary greatly in their prognoses for housing price developments in Norway until the year 2020. Most institutions agree that Norway will experience significant growth in prices during 2017, but from 2018 and onwards, the predictions differ greatly. This section will examine the prognoses made by Norwegian institutions in March 2017.

SSB believes that the housing prices will grow by approximately 6,5 percent until the end of 2017, but that this will be the final year of increased prices. They expect the price level to be stagnant in 2018, before beginning to decrease by 1-2 percent in 2019 and 2020 (Haugen, 2017).

Forecasts made by Norges Bank do not differ much from those made by SSB. They expect the housing prices to increase by 9 percent in 2017, followed by three years with a moderate growth of 1-2 percent annually (Christensen, 2017).

Two institutions that are more optimistic are Socioeconomic Analysis (SA) and the Norwegian Realtor Association (NEF). Their forecasting model proposed a growth of 22,8 percent from the end of 2016 until the end of 2020. Unlike the institutions mentioned above, SA and NEF do not specify the increase in housing prices they expect on an annual basis (NTB, 2017). DNB Real Estate has made corresponding estimates and predicted that housing prices will increase by close to 20 percent until the end of 2019 (Skorve, 2016).

3 Bubble Theory

This section of the thesis will explain the theoretical foundation for speculative bubbles, and the consequences following a bubble burst. Lastly, it will address the approach required when evaluating whether a market is experiencing a housing bubble or not.

3.1 Definition of a Bubble

In his 1990 paper, *Symposium on Bubbles*, Joseph Stiglitz introduced his definition of a bubble, concluding that:

"If the reason that 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 exist."

(Stiglitz, 1990, p. 13)

There are several other definitions of bubbles, but for the purpose of evaluating the Norwegian housing market in this thesis, we have decided to define bubbles using Stiglitz' definition.

3.2 Economic Bubble

In this dissertation, we will consider housing purchases as purely financial investments with expected returns depending on the conditions within the housing markets. There exist multiple definitions of an economic bubble or a speculative bubble as it is also referred to. In this paper, economic bubbles are defined as temporary situations where the prices of assets are driven beyond the price that is realistic in light of the fundamental factors, due to the public's belief that the prices will continue to rise and that investments will generate positive returns. In other words, the majority of people expect the asset price to rise, despite fundamental factors not supporting this belief. This psychological phenomenon will continue as long as the self-fulfilling conditions exist. Once these circumstances cease to exist, a drastic drop in demand occurs, and the optimistic expectations for the future disappear. These changes lead to a bursting bubble, resulting in a significant, and often rapid, drop in the asset price. These temporary rises and declines in the price of an asset are the defining characteristics of a bubble (Roberts, 2008).

Economic bubbles are usually triggered by exogenous factors that significantly shift the expectations and fuel the bubble. Examples are deregulations, financial innovations, technical innovations and political events (Kindleberger & Aliber, 2011). Evidence can be seen leading up to the financial crisis

of 2007-2008. Due to new government policies, the US banks' standards for mortgage loans had been significantly relaxed. The deregulated mortgage debt market and low interest rates were the main factors for the rapid increase in the housing prices which created the bubble (Holt, 2009).

In the thesis, we present a mathematical expression to provide a greater understanding of what an economic bubble is, and how to calculate the size of the bubble. The relationship is expressed using the equation:

(3.1)

$$\boldsymbol{b_t = \left(\frac{1}{1+r}\right) E_t * b_{t+1}}$$

Where *b* is the bubble value, *E* is the expected return, *r* is the cost of capital and *t* represents the time. The bubble value is the discounted expected bubble value for the following period (Grytten, 2009).

For the financial market the equation can be written as:

(3.2)

$$\boldsymbol{p_t = \left(\frac{1}{1+r}\right) E_t(d_{t+1} + p_{t+1})}$$

In the equation, the price *p* for a period *t* is equal to the expected return *E*, multiplied by return *d* plus the price of the financial instrument for the following period after it has been discounted using the cost of capital *r*.

The price of financial instruments will, over time, accumulate in accordance with the expression:

(3.3)

$$\boldsymbol{p_t = \Sigma_{j=1}^{n} \left(\frac{1}{1+r}\right)^j E_t(d_{t+1}) + \left(\frac{1}{1+r}\right)^n E_t(p_{t+n})}$$

In the equation, the first section calculates the discounted expected return for the entire period, while the second section shows the expected price at the end of the period.

The present value of a financial instrument is therefore determined by the following formula:

(3.4)

$$\boldsymbol{p_t = \Sigma_{j=1}^{n} \left(\frac{1}{1+r}\right)^j E_t(d_{t+j}) + b_t}$$

In the formula b_t represents the stochastic process that satisfies equation (3.1). The bubble value b_t can then be derived using the equation:

(3.5)

$$\boldsymbol{b_t = p_t - \Sigma_{j=1}^{\infty} \left(\frac{1}{1+r}\right)^j E_t(d_{t+j})}$$

The bubble value is calculated by subtracting the fundamental value of an asset from its price in the market. If the bubble value is positive, then the market price is higher than the correct value from a fundamental factor analysis, i.e. overpriced. When the bubble value is negative, the analysis suggests that the asset is underpriced.

The formula shows that high prices and rapid increases in prices are not sufficient evidence of an economic bubble. For a situation to be considered a bubble, it requires that the observed market prices of the asset are higher than the value supported by the underlying fundamental factors of the asset.

3.2.1 What Happens When a Bubble Bursts?

The consequences following a bursting bubble vary from each bubble to the next. Some bubbles have no substantial effects on the overall economy, while others result in a massive decrease in demand and a full-scale recession in the economies of the nations affected. Brunnermeier and Schnabel (2016) examined the factors determining the severity of a crisis following a bubble, and concluded that the type of bubble asset did not significantly influence the consequences of the bubble. However, they found that the financing of the bubble usually decided the severity of the crisis, and that debt-financed bubbles resulted in far more severe consequences than equity-financed bubbles.

In bubble situations where the leverage of the market participants is small, the consequences usually only affect those who have invested in the asset, while the overall economy suffers no substantial negative effects. When the leverage is large, the banks and credit systems bears the majority of the loss when the bubble bursts. In turn, the consequences are transferred to the consumers and companies. After banks experience losses, they are forced to raise their interest rates and implement more rigorous policies for lending. When the effects of the burst reach the households, the consumption demand decreases, resulting in harmful consequences for the overall economy.

The burst of a highly debt-financed bubble often results in a rapid decline in asset value, and investors might face a situation where their debt is higher than the value of their asset, i.e. their equity value is negative. After a burst, the bubble asset can become illiquid, making it difficult for an investor to exit the market.

Housing bubbles are an example of a highly debt-financed bubble, usually resulting in a severe crisis once it bursts. Leamer (2007) argues that the business cycles in an economy are driven heavily by the investments in housing and that the burst of a housing bubble could lead to a financial crisis for an economy. A decline in real estate investments will, therefore, have a strong negative effect on a country's GDP. In other words, the effects of a housing bubble bursting will have a significant and harmful impact on a country's economy.

3.3 Identifying a Housing Bubble

When evaluating the existence of a housing bubble, it is important to understand which underlying fundamental factors influence the housing prices. There exist many house price models, some of which are designed specifically for the Norwegian housing market. In these models, the fundamental factors are chosen using evidence and theory specific to the Norwegian market. This thesis will, therefore, focus on the models created by evidence from the Norwegian market, as we believe these will give more accurate results. To determine if a bubble exists, the fundamental factors identified must be analyzed to conclude whether they support the level of pricing that exists in the housing market.

In 2003, Case and Shiller wrote a paper on the housing market in the United States. They wrote that even though the term "housing bubble" was frequently used, there was rarely a precise definition of what the term included. In their paper, they argued that rapid growth alone was not enough evidence to suggest a housing bubble, and that there were other important criteria to evaluate. In their research, they concluded that there were seven important criteria to evaluate when examining if a market is experiencing a housing bubble (Case & Shiller, 2003). The criteria are as follows:

1. Expectations of an increase in housing prices among people, resulting in housing becoming a popular investment
2. The growth in housing prices is greater than the increase in private income
3. House prices receives a lot of attention, both in the media and in private conversations
4. A belief among people that it is profitable to own housing

5. Limited understanding of the risk attached to investments in housing
6. Simplified opinions regarding housing market mechanisms are dominating
7. People are pressured to become homeowners

Throughout this thesis, we will evaluate the fundamental factors of the Norwegian housing market, and examine whether the criteria for a housing bubble are met.

4 Supply and Demand

This section will describe the microeconomic theory behind the pricing mechanisms in a market economy. It will explain the functions of demand and supply, and show how the supply and the demand create a market equilibrium for the housing market. Economics says that the price of a product and the number of units sold is determined by its supply and demand. The manufacturers represent the supply, while the demand for the product is represented by the buyers. The supply curve demonstrates the number of units the manufacturers are willing to supply when receiving a given price, while the demand curve represents the quantity buyers are willing to purchase at a given price. The price of a product will develop toward the market equilibrium where the interests of the suppliers and customers align (Whelan & Msefer, 1996).

4.1 The Supply and Demand in the Housing Market

There are important differences between the housing market and the markets for consumer goods that require recognition. When unexpected changes in demand occur, manufacturers of consumer goods and services are usually able to adapt rapidly and adjust the number of units produced to match the market situation. Due to the timely process of constructing new housing, adjusting to shifts in demand requires significantly longer time for the housing market. The long construction time, together with a limited construction capacity, results in a relatively inelastic supply in the short-run. In short, it takes time before the supply of housing can adjust to increased demand. Therefore, the housing market may experience growth in prices in the short-term while new housing is being constructed.

To explain and predict the price and quantity being sold of a product, it is necessary to understand the drivers behind changes in supply and demand. In the next section, we will, therefore, examine the factors that influence the demand and supply of housing.

4.1.1 Demand for housing

Because the supply of housing adjusts slowly to increases in demand, the demand will determine the housing prices in a market (Dam et al., 2011). In a short-term perspective, housing prices are assumed to be unaffected by supply, due to limited capacity in the construction industry resulting in new housing making up a small part of the market. Price models for housing in the long-run should, however, include construction costs and the price of new housing as exploratory factors. This section will examine short- and long-term developments in housing prices, using the articles by Hendry (1984) and Jacobsen & Naug (2004a) as a theoretical foundation.

Due to the inhomogeneity of housing, demand for housing should ideally be divided into several submarkets based on location and type of housing. However, the difficulty of separating housing into the proper submarkets results in the housing market being addressed as a single market.

Housing demand can be divided into two components (Jacobsen & Naug, 2004a):

1. Demand for housing as a place for living
2. Demand for housing as an investment

Jacobsen and Naug (2004a) work under the assumption that most people buy houses with the intent of living there, and that this component constitutes the largest fraction of buyers. This component is assumed to be proportional to the total housing demand, which is given by the following function:

(4.1)

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

Where:

H^D	= Housing demand
V	= Total housing costs for a typical owner
P	= Consumer price index excluding housing
HL	= Total housing cost for a typical tenant
Y	= Households' real disposable income
X	= A vector of other fundamentals that affect housing demand

With the derivatives:

(4.2)

$$\frac{\partial f}{\partial \frac{V}{P}} < 0, \quad \frac{\partial f}{\partial \frac{V}{HL}} < 0, \quad \frac{\partial f}{\partial Y} > 0$$

The derivatives of the equation reveal that the demand for housing decreases when the total housing costs (V) increase relative to the costs of other goods and services (P) or the housing costs for tenants (HL). An increase in households' real disposable income (Y) will, on the other hand, result in increased housing demand.

The fundamentals captured in vector X are the effects from lending policies, demographic conditions and households' expectations regarding future income and housing costs. Because of the substantial amount of money related to the purchase of housing, the expected levels of income and housing costs are critical. The housing costs for a homeowner measure the value of goods that the owner gives up by owning a house for a period. The real housing costs (V/P) for homeowners is defined as (Jacobsen & Naug, 2004a):

(4.3)

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

Where:

BK	= Housing cost per real Krone (NOK) invested
PH	= Price for an average house
i	= Nominal interest rate
τ	= Marginal tax rate on capital income and expenses
π	= Expected inflation (measured as a rate)
π^{PH}	= Expected change in PH (measured as a rate)

The expression $[i(1-\tau) - \pi]$ represents the real after-tax interest rate. The expression estimates the real interest costs that come with a mortgage loan as well as the real interest income lost when investing the money in housing. Higher interest rates result in greater interest costs and a greater interest income relinquished by investing. Consequently, the housing costs increase when interest rates go up. The expression $[\pi^{PH} - \pi]$ gives the expected real rise in housing prices. When house prices increase, the real housing costs for homeowners decrease, making it more beneficial to own a house than to rent. Thus, housing demand increases.

Equation 4.3 may be simplified to:

(4.4)

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

After the simplification of the function, the variable BK becomes the nominal after-tax interest rate minus the expected increase in nominal housing prices. In the simplified function, maintenance costs

and tax benefits of being a homeowner are disregarded. These factors will, however, still impact the housing prices in accordance with microeconomic theory. Decreases in maintenance costs and increases in tax benefits will lead to higher housing prices, and vice versa. Norwegian tax laws state that a homeowner is exempt from taxation on gains if they fulfill certain conditions. The seller must have lived in the house for at least one of the last two years, and the house must have been purchased more than one year before the date of the sale (The Norwegian Tax Administration, 2017).

The third fraction of equation (4.1) is the households' real disposable income (Y). According to Jacobsen and Naug's (2004a) article, real disposable income is defined as:

(4.5)

$$Y = \frac{YN}{P^{a_1} HL^{a_2} PH^{a_3}}, \qquad a_1 + a_2 + a_3 = 1$$

Where

YN = Nominal disposable income

The equation explains how increases in the general price level (P), the cost of rent (HL) or housing prices (PH) will reduce households' purchasing power, resulting in a decrease in housing demand.

As explained in this section, housing demand is dependent on several exploratory factors. Due to the lack of substitutes, the price elasticity of housing demand is likely to be highly inelastic. This inelasticity would over time force the market price upward, as the transactions in the market continue (Andrews et al., 2011). However, for some buyers, especially first time buyers with limited funds, the price elasticity would be much higher. Therefore, the demand for housing will differ across the price range, due to differences in the availability of substitutes and the price sensitivity among buyers.

4.1.2 Supply of Housing

There are two elements that cause changes in the supply of housing (NOU, 2002):

1. New constructions
2. The depreciation of the housing stock through demolition or renovations either merging or divided existing houses

As mentioned earlier in this section, housing supply through new constructions responds slowly to increased demand in the short-run, making housing supply perfectly inelastic in the short-run (Hendry, 1984). Therefore, it is advantageous to distinguish between short- and long-term supply of

housing. Hendry's (1984) model can be used to explain the development of housing supply over time. In his model, housing supply is given by:

(4.6)

$$H_t = (1 - \delta_t)H_{t-1} + c_t$$

Where:

H_t	= Housing stock, period t
δ	= Depreciation rate of present housing stock
H_{t-1}	= Housing stock, previous period
c_t	= Number of new houses completed, period t

The supply of housing is calculated by subtracting the depreciated housing stock from the previous period and adding the new constructions that were finalized in the period. Both new constructions completed and depreciation is considered to have a very limited impact in the short-run, resulting in an inelastic and constant housing supply in the short-term. Jacobsen and Naug (2004a) define short-term in the housing market as time periods shorter than three years.

In the medium-term, the supply of housing increases when the value of new constructions completed is higher than the depreciation of the housing stock in a given period. How long it takes for supply to respond to demand and start increasing is dependent on the availability of sites and labor, as well as business cycles and government regulations (Larsen, 2005).

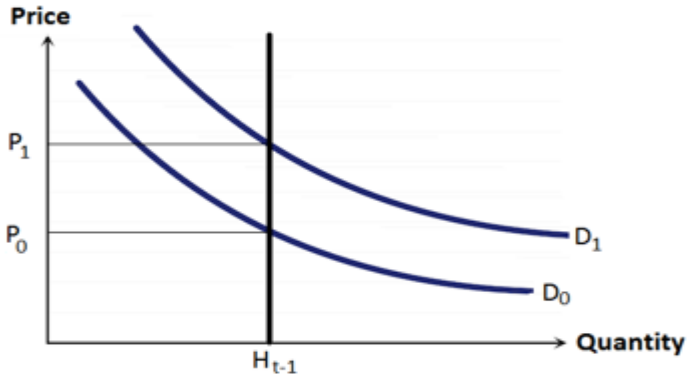
According to microeconomic theory, housing supply will, in the long-run, adapt to the demand, resulting in a perfectly elastic supply curve. However, the probability of that happening in a housing market is small, as resources and building sites are limited regardless of time frame (Larsen & Sommervoll, 2003).

4.1.3 Short-Term Equilibrium

Due to the inelasticity of the short-term housing supply, all developments in price should be explained by changes in the demand for housing. Jacobsen and Naug's equation (4.1) showed that there were several underlying components that influenced housing demand. In the short-run, housing demand will grow when there is a decrease in housing costs relative to the costs of other goods and services, or the cost of renting. Demand can also grow due to an increase in households' disposable income or

as a result of changes in vector X. Increased demand causes an outright shift in the demand curve. Since the housing supply is constant, this causes the equilibrium price for housing to increase.

Figure 4.1



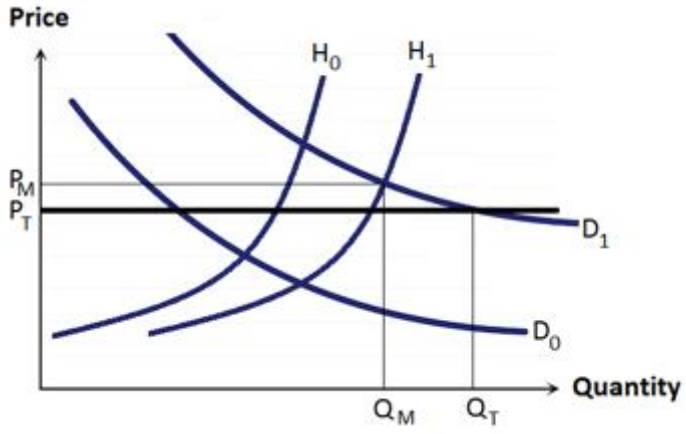
Source: Own creation

The graph shows the short-term adjustment in equilibrium for the housing market that happens when demand increases while the supply is constant. Since it is not possible for supply to quickly respond to the increased demand, the equilibrium will stay at the same number, but at a higher price. The change in equilibrium price shows that changes in demand can have significant consequences for the housing prices in the short-run.

4.1.4 Long-Term Equilibrium

When the housing prices are high compared to other goods and services, the construction industry will start supplying more housing in the long-run. Construction firms will capitalize on the extraordinary profits possible due to the high demand. The growth in housing supply will last as long as the housing prices are higher than the long-run equilibrium level. In theory, the price elasticity of supply becomes perfectly elastic in the long-run, resulting in a constant price level for housing. The theoretical long-term price level (P_T) when housing supply is able to respond perfectly to housing demand is illustrated in figure 4.2 below.

Figure 4.2



Source: Own creation

When the demand for housing increases in the short- and medium-term, the demand curve will move from D_0 to D_1, and the price level will increase. In the long-run, however, the supply curve will move in response to the developments in demand. The supply curve will move from H_0 towards a perfectly elastic supply curve. Still, this is an unlikely scenario in real markets, as it would require unlimited resources. An increased housing stock will decrease the prices to some extent, but unlikely as far as it would with perfect elasticity. The supply curve is therefore more likely to shift outwards on the graph as illustrated in the figure above. Realistically, the housing supply in the long-run would shift from H_0 to H_1, creating a market equilibrium with housing stock Q_M and price level P_M.

4.1.5 Critique of Jacobsen and Naug's Model

Jacobsen and Naug's (2004a) housing price model is considered an effective tool for analyzing developments in the Norwegian housing market. Despite the widespread use of the model, there are weaknesses and limitations that are necessary to consider.

As they mention in their paper, they have simplified the functions and excluded several fundamental factors that influence the demand for housing. Tax benefits from being a homeowner and maintenance costs are some of the factors that are not accounted for in the model. Since Norway have significant tax benefits for homeowners that contribute to increased demand, the model may lead to an inaccurate level of demand for housing.

In her 2007 master thesis, "A critical review of Jacobsen & Naug's model for drivers of housing prices", Heidi Fredriksen argued that the systematic residuals in the model will result in wrong standard deviations. In turn, this will lead to invalid inference tests which could lead to mistakes when

deciding which variables to include. Fredriksen (2007) is also skeptical about the omission of a trend in the model, which could improve the model's ability to forecast developments.

Another criticism against Jacobsen and Naug's model is the limited data set, which only includes data from 1993-2004. In that period, Norway did not experience any significant decline in housing prices. During the banking crisis, the Norwegian housing market experienced a significant drop in housing prices, but unfortunately there exists limited data available from this period as SSB did not begin publishing housing price statistics until the first quarter of 1992.

5 House Price Models

In this section, we will present a set of the most recognized housing price models specifically created for the Norwegian market, to identify the fundamental factors that influence Norwegian housing prices. These models are created by national institutions such as SSB, Norges Bank, and the Norwegian Building Research Institute. At the end of the section, the exploratory variables from the housing price models will be summarized and compared. They will be evaluated in order to figure out if there are other exploratory factors that should be included.

5.1 Jacobsen and Naug's Housing Market Model

Because Jacobsen and Naug's (2004a) model for the housing market was elaborated in section 4.1, this section will only include a brief summary of the exploratory variables identified in the model. The model's factors for change in demand include lending policies and household's level of income. Households' expectations for their economic situation in the future are also included, underlining the influence that the unemployment rate, expected income and expected costs of being a homeowner have on housing demand. The model also includes changes in demographic conditions and the price of goods other than housing as factors that cause changes in housing demand.

5.2 MODAG/KVARTS

MODAG, short for *model of aggregate type*, is a macroeconomic model developed by SSB. The Ministry of Finance and SSB use the model as a forecasting tool for key macroeconomic developments in a short- and medium-term perspective (NOU, 2003). For the model to be aligned with the national income accounts' description of the economy, the parameters have to be adjusted regularly. The presentation below is based on Boug and Dyvi's (2008) elaboration of MODAG.

MODAG uses an advanced method when determining housing investments and existing owner-occupied housing prices. The model also uses this method for modeling demand and supply for housing capital and thus also housing prices. Prices of existing housing are based on demand, while the aggregated supply determines the changes in housing capital. Owner-occupied housing prices, adjusted for new constructions and inflation, is forecasted based on changes in the explanatory factors of the function:

(5.1)

$$pbs - pc = \beta_P + \beta_{P,Y} * (y - pc) + \beta_{P,r} * i + \beta_{P,K} * h$$

And commissioning of new construction is found using the following equation:

(5.2)

$$j_{new\ construction} = \beta_K + \beta_{H,PBS} * (pbs - pc) + \beta_{H,PJ} * (PJKS_{83} - pc)$$

Where:

$j_{new\ construction}$	= Commissioning of new construction
pbs	= Nominal price of existing owner-occupied housing
pc	= The national income accounts' price index for private consumption
Y	= Households' disposable income
i	= Real interest rate after tax
h	= Total housing capital in constant prices
$PJKS_{83}$	= Price index for new construction, excluding land

The price of existing owner-occupied housing is explained by the developments in real interest rate (*i*), disposable income (*Y*) and total housing capital (*H*). The β-indicators describe the price sensitivity of the components in the equation. The price of existing owner-occupied housing (*PBS*) and the price of new construction ($PJKS_{83}$) determines the commissioning of new construction.

The price relationship for existing housing is given by the following equation (Hungnes, 2008):

(5.3)

$$\Delta(pbs - pc) = \alpha - 0{,}35 * \Delta(h) + 0{,}30 * \Delta(h)_{-1} + 0{,}65 * \Delta(y - pc)$$
$$+0{,}03 * \Delta i - 0{,}07 * \Delta i_{-1} - 0{,}37 * \Delta i + 0{,}33 * \Delta i_{-1} + 0{,}20 * ((pbs - pc)$$
$$-(y - pc) + i)_{-1} - 2{,}07 * (H - 0{,}5 * (y - pc) + i)_{-1}$$

The long-term equilibrium for the price relationship is defined by Boug and Dyvi (2008):

(5.4)

$$(pbs - pc) = (Y - pc) - i$$

MODAG considers the CPI, tax rate on capital gains, nominal interest rate, and disposable income to be exploratory factors when understanding short-term developments in housing prices. In the long run, however, MODAG identifies three fundamental factors for price change: real after-tax interest rate, real disposable income, and total housing capital.

The long-term equilibrium for the commissioning of new construction is given by:

(5.5)

$$j_{new\ construction} = \alpha + (pbs - PJKS_{83})$$

The equation shows that an increase in existing housing prices will result in an increase in the commissioning of new construction while growing costs of construction lead to a decrease in new constructions being commissioned.

KVARTS is another macroeconomic model created by SSB. The only significant difference between the two models is that the KVARTS model is based on quarterly data instead of annual data. Forecasts from MODAG will correspond with the forecasts made using KVARTS.

5.3 RIMINI/NEMO

RIMINI is a macroeconomic model created by Norges Bank. It was developed by their research department and is designed to make accurate predictions for developments in the Norwegian economy. The development of the exploratory economic variables depends on numerous mutually dependent mechanisms that are often difficult to quantify (Olsen & Wulfsberg, 2001). The RIMINI model is based on quarterly estimates attempts and to examine the impact that fluctuations in the real economy have on the housing prices. The econometric house price relation is based on data from 1983-1992 and examines both short-term and long-term effects on Norwegian house prices. Eitrheim (1993), one of the developers of the model, introduced the following equation for aggregated price relationship for housing:

(5.6)

$$PH = f(Y, P, R(1-T) - \pi, H, L, U)$$

Where:

PH	= Nominal house price
Y	= Real disposable income
P	= Consumer price
I	= Nominal borrowing rate
T	= Tax rate
π	= Inflation

H	= Housing Capital
L	= Real value of gross debt
U	= Unemployment rate

Estimates made by the Ministry of Finance suggest that the housing price relationship can be written as follows (Kongsrud, 2000):

(5.7)

$$\Delta ph_t = 0{,}11 + 1{,}12(\Delta p_t + \Delta p_{t-1}) + 0{,}28(\Delta ph_{t-1} - \Delta p_{t-1} - \Delta y_{t-1} - \Delta U_{t-1})$$
$$-1{,}90(\Delta I_t - \Delta T_t) + 1{,}14\Delta l_{t-1} + 0{,}069(y_{t-1} + p_{t-1} - ph_{t-1} - h_{t-1})$$
$$+(l_{t-1} + p_{t-1} - ph_{t-1} - h_{t-1}) - 0{,}04(S1_t + S2_t)$$

Lagged values are included to explain short-term developments in housing prices, accounting for the previous development of households' financial expectations. All the variables in function 5.6 influence housing prices in the short-run, while only real disposable income, the real value of gross debt and level of housing capital determine house prices in the long-run. The estimated function for long-run real housing prices can, therefore, be written as (Eitrheim & Gulbrandsen, 2001):

(5.8)

$$(ph - p) = 0{,}83y + 0{,}67h_t - 0{,}17p_t - 0{,}33(I * L_t(1 - T) - \Delta_4 p_t)$$

RIMINI has received criticism due to the model's numerous exogenous variables, and the uncertain development of the variables. When there is an element of uncertainty associated with each variable, interactions among the variables will decrease the accuracy of all involved variables (Jore, 2000). RIMINI is no longer the economic model being used at Norges Bank, as its forecasting became increasingly unreliable and uncertain. Today, Norges Bank uses NEMO, a similar model based on newer data that are being continuously updated. NEMO is, as RIMINI was in its lifetime, a model that is adapting to accommodate new evidence. There is a model group at Norges Bank making sure that relevant changes and improvements in research, economic theories, observations, and methods are incorporated to improve the model (Berg & Kleivset, 2014).

5.4 BUMOD

BUMOD is a dynamic equilibrium model used to simulate the developments of the Norwegian housing market in a medium- and long-term perspective (Kongsrud, 2000). It was developed in a

collaboration between Norges Byggforskningsinstitutt and Sosialøkonomisk Institutt and is being used by the Ministry of Finance in the process of preparing the annual Norwegian state budgets. Because the specifications of the model have not been released to the public, this section will be limited to the model's main features, which are included in the Ministry of Finance's presentation of developments in housing prices (Kongsrud, 2000).

The BUMOD model treats the Norwegian housing model at a significantly less aggregated level than the other housing price models presented in this paper. The supply of housing is divided into six categories. Changes in the housing stock come from new constructions and houses that are demolished or retired. Retired houses are divided into houses that leave the market and existing houses that are divided or merged into a new number of units. The demand for houses is forecasted using projections for population growth, where consumers are divided into categories based on their relationship status, the probability of moving, and whether they are looking for permanent or temporary housing.

At the end of every year, BUMOD is used to forecast housing prices for each of the different categories based on the number of people who demand that category of houses. The model's exploratory variables for short-term changes are disposable income after tax, housing cost, and savings. These factors influence the demand for housing, which is the driver of change in BUMOD, as it is in MODAG and RIMINI. In BUMOD, long-term developments in the housing market are determined by the changes in construction costs (Kongsrud, 2000).

BUMOD differs from the other housing price models in some important ways. The model is not based on actual historical numbers. All model simulations are full simulations starting at the basis year 1980, resulting in a different basis for annual predictions than the basis for MODAG, which use historical data. BUMOD is also more heavily designed to fit established economic theories, rather than empirical relationships.

5.5 Summary of Housing-Price Models

From the housing price models, it is evident that the institutions agree on some exploratory factors but disagree on others. This section will summarize the exploratory factors included in the model, and assess whether there exist other exploratory factors that have not been included in any of the models.

All the models include interest rate as the factor that has the greatest impact on housing prices. Another exploratory factor included in all models is the disposable income. Although not included, both the unemployment rate and the housing stock is considered to have a significant effect on the development of housing prices.

There are several factors only being considered relevant by one model, e.g. households' expectation of future income and cost level, which is only included in Jacobsen and Naug's model.

In 2003, Larsen and Sommervoll wrote a research paper for SSB, in which they assessed the factors that determine housing prices in Norway. They concluded that besides the factors included in the housing price models reviewed in this paper, there are several other factors influencing housing prices. Their research identified exploratory factors such as media coverage, the level of education and inheritance (Larsen & Sommervoll, 2003).

Summary of fundamental factors influencing housing prices:
Real disposable income
Interest rate
Unemployment rate
Economic growth
Housing stock
Lending policies
Taxation
Expectations regarding income and cost level
Demographics
Urbanization
Construction costs and regulations
Education-level
Inheritance
Media coverage

There also exist national variations as to what factors are recognized as exploratory for housing price developments. In several nations, e.g. the US, the uncertainty related to a change in the regime has been shown to have a significant effect on housing prices (Kahn, 2008). The Danish house price

model MONA includes the first-year payments after buying a house, while other international models include population as an exploratory factor (Dam et al., 2011; Mikhed & Zemcik, 2009).

In this thesis, we will analyze the fundamental factors believed to have contributed to the growing housing prices in recent years. By analyzing the fundamental factors for Norwegian housing prices, we will examine whether there is evidence of a bubble in the Norwegian housing market. The main focus will lie on the factors driving the demand for housing, as these lead to increased prices in the short-run. However, we will also address the housing stock development to conclude whether supply and demand are at equilibrium levels.

6 Empirical Analysis

The following section will introduce and apply different theoretical house price models in order to perform an empirical analysis of the Norwegian housing market. The respective models are the HP-filter, the P/R ratio (price to rent) and Tobin's Q. These models have been chosen based on their different perspectives on the underlying factors driving housing prices. Consequently, the models will contribute to a thorough understanding of the Norwegian housing market and facilitate an empirical conclusion based on a variety of factors.

6.1 Hodrick-Prescott Filter

Over the long term, Lucas (1980) argues that aggregate economic variables in capitalist economies will face fluctuations. The Hodrick-Prescott-filter (HP-filter) is a widely used method for calculating the trends of these economic variables. In the housing market, the HP-filter will determine the underlying growth rate of the housing prices based on a given weighting parameter. By separating the cyclical components from the underlying trend in the observed time series, the method allows one to identify major deviations.

After having first been proposed in the 1920s (Whittaker, 1923), the method was popularized by Robert J. Hodrick and Edward C. Prescott in the 1990s. The HP-filter assumes that an observed time series (y_t) is composed of a trend component (g_t) and a cyclical component (c_t), where the trend component varies smoothly over time (Hodrick & Prescott, 1997):

(6.1)

$$y_t = g_t + c_t \ , \ t = 1,2,3 \dots T$$

The cyclical component c_t represents fluctuations from the growth component G_t, which Hodrick and Prescott's (1997) in their conceptual framework assume averages to zero over long time periods. The cyclical component is estimated as the difference between the observed variable and the and the trend component, as illustrated in equation 6.2:

(6.2)

$$c_t = y_t - g_t$$

In their 1997 article, Hodrick and Prescott formulated the programming problem as:

(6.3)

$$HP = min\left\{\sum_{t=1}^{T} c_t^2 + \lambda \sum_{t=1}^{T} [(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2\right\}$$

Here, $c_t = y_t - g_t$, and λ is a positive number (Hodrick & Prescott, 1997). More recently, Sørensen and Whitta-Jacobsen (2010) formulated the problem as shown in equation 6.4:

(6.4)

$$HP = min\left\{\sum_{t=1}^{T} (y_t - g_t)^2 + \lambda \sum_{t=1}^{T} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2\right\}$$

The first part of the equation is the squared cycle component, i.e. the squared deviation between the observed variable and the trend. As both positive and negative bubbles can occur, the equation is squared, so that the negative and positive deviations are weighted equally. When minimizing the equation, it is desirable that the trend follows the observed variable as close as possible. A cycle effect of $c_i \neq 0$ can be an indicator of possible bubbles or crashes.

The second part of the equation measures the squared value of the change in the trend from one period to the next and is weighted by the smoothing parameter λ. The λ determines to what extent variations in the trend should be allowed, and is a value between 0 and infinity. The value of λ is chosen outside of the model. When λ = 0, the deviation between the observed variable and the trend will be as small as possible. The second part of the equation disappears, and the deviation between the observed variable and the trend is equal to zero (Bjørnland et al., 2004). In essence, this implies that there are no business cycles, which is unrealistic. In the opposite case, where the λ is infinite, the trend will vary as little as possible, and the result is a linear trend curve with constant growth (Bjørnland et al., 2004). This is not realistic either.

6.1.1 Limitations of the HP-filter

Although the HP-filter has stood the test of time and is widely used, the model has a number of limitations due to its simplicity. One of the main criticisms revolves around the smoothing parameter, λ. The parameter has to be set subjectively, which can be problematic as one can choose values that substantiate the desired result. λ significantly affects the results of the model, which further underlines the importance of using a reasonable value. Different guidelines on how to determine the value of λ have earlier been suggested (Frøyland & Nymoen, 2000).

Another drawback is that the trend level at the beginning and at the end of the period is more influenced by fluctuations in the observed variable than the case is for the rest of the period. These end-point errors arise because the HP-filter uses previous, current and future observations in order to calculate the trend of the time-series. This is evident from the second part of equation 6.4. The two-sided filtration means that data will be missing at both the beginning and at the end of the time series. The consequence is that the model turns unilateral at both end-points. However, the problem can be reduced by using longer time series (Bjørnland et al., 2004).

Criticism has also been aimed at the model's real-time issues. In the HP-filter, the most recent observations are assigned highest weight. Because the most recent observations in a time series are often the most uncertain ones, this can lead to a pro-cyclical bias in the end-of-sample trend estimates (Mohr, 2005). The issue is further enhanced by the end-point errors previously mentioned.

The HP-filter has also been criticized for weighing cyclical up- and downturns equally. This assumption implies that economic expansions and recessions last for an equal amount of time. However, this assumption is not necessarily true. In her 1999 paper, "Changes in Business Cycles: Evidence and Explanations", Christina D. Romer explains how expansions have been noticeably longer than recessions since World War II. Consequently, using equal weights might produce inaccurate results.

It has also been argued that the model is determined by the length of cyclical fluctuations. This is because the HP-filter will adjust the trend during cyclical periods, which may result in a wrong conclusion if the fluctuation is long-lasting (Grytten, 2011). This is very relevant to Norway, where the price of housing has been growing significantly since the early 1990s. In this case, the HP-filter may adjust the trend upwards and conclude that this is the new trend rather than a long-lasting fluctuation.

Lastly, the HP-filter has been criticized for lacking fundamental strength. The model is purely based upon a number of observations without any form of economic rationale behind the trend. In the case of significant fundamental changes in the market, the model will not be able to take this into account (Furuseth, 2012).

6.1.2 Determining the Value of λ

The smoothing parameter is set to different values depending on the frequency of the observations. Most applications of the HP-filter have been to variables with quarterly observations (Ravn & Uhlig,

2002). However, this analysis is based on annual observations as quarterly data prior to 1980 is unavailable. This raises the question of how the model can be adjusted in order conserve results across alternative sampling frequencies. Hodrick and Prescott (1997) suggested that the value of the smoothing be set to 1.600 when using quarterly data. While most researchers have followed this suggestion, there is less literary agreement on the correct value for analyzing annual data (Ravn & Uhlig, 2002). As a result, the smoothing parameter is a matter of discussion.

Backus and Kehoe (1992) uses a smoothing parameter value of 100 for annual data, while Ravn and Uhlig (2002) recommend that it should be set to 6,25. Others have suggested even higher values (Correia, Neves, & Rebelo, 1992; Cooley & Ohanian, 1991). It can be argued that a λ-value of 100 for annual observations is too low for the following analysis. Given the significant growth of the Norwegian housing prices in recent years, there is a chance that applying a low λ will result in considerable end-point errors. The HP-filter trend curve will emphasize the extreme values at the end of the time series if λ is too low, which may cause misinterpretation of a potential bubble. SSB have suggested that including a substantially higher λ-value in the analysis will provide a better description of business cycles (Johansen & Eika, 2000). Hence, the analysis will also include a higher λ-value in order to get a smoother trend that puts greater emphasis on earlier observations. Accordingly, the HP-filter will be calculated based on two different smoothing parameters; one with a λ-value of 100, and one with a 50 times greater λ-value of 5.000.

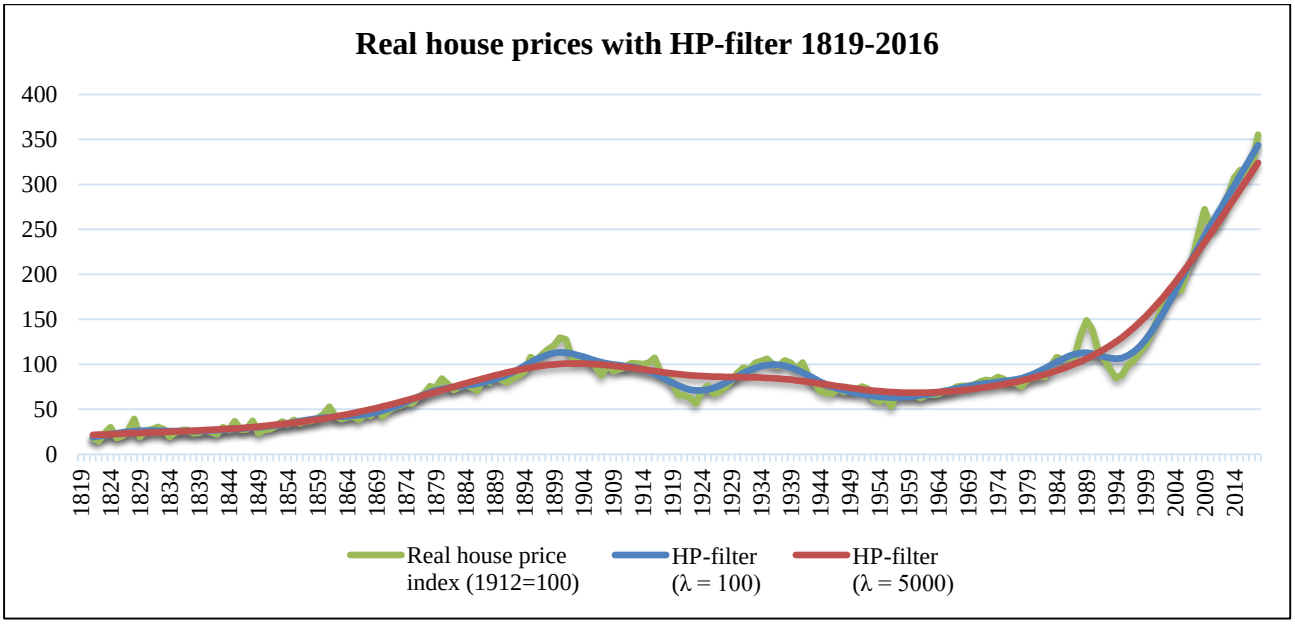
6.1.3 Real House Prices with HP-filter

In order to identify whether historical bubbles in Norway are captured by the model, an HP-filter has been added to a graph demonstrating the real housing price developments in Norway from 1819 to 2016. Figure 6.1 illustrates that the HP-filter trend line behaves pretty similar to the real housing prices overall when the λ-value is set to 100. There are only minor deviations between the trend lines, and it can be argued that the model struggles to capture some of the historical bubbles explained in section 2.1. The banking crisis in the late 1980s, however, is illustrated clearly. The model implies that housing was overpriced during the period from 1986 to 1989. The deviation between the two trend lines peaked in 1987, right before the real housing prices plunged. Due to the price corrections following the banking crisis, housing seems to have been undervalued from 1990 to 1998.

The financial crisis is also demonstrated to some extent. According to the HP-filter, housing was overvalued from 2005 to 2007, with the deviation between the trend lines growing rapidly. In 2008 and 2009 real housing prices fell significantly, and the correction led to undervalued housing from

2008 to 2011. Since then, real housing prices have fluctuated around the trend line of the HP-filter. According to the HP-filter, housing is overpriced in 2016, implying that there is an overpricing in the Norwegian housing market. However, the rapid growth in housing prices since the early 1990s might contribute to end-point errors in the HP-filter trend line. As a result, the deviations between the trend lines might actually be more significant than what the trend line with a λ-value of 100 illustrates.

Figure 6.1



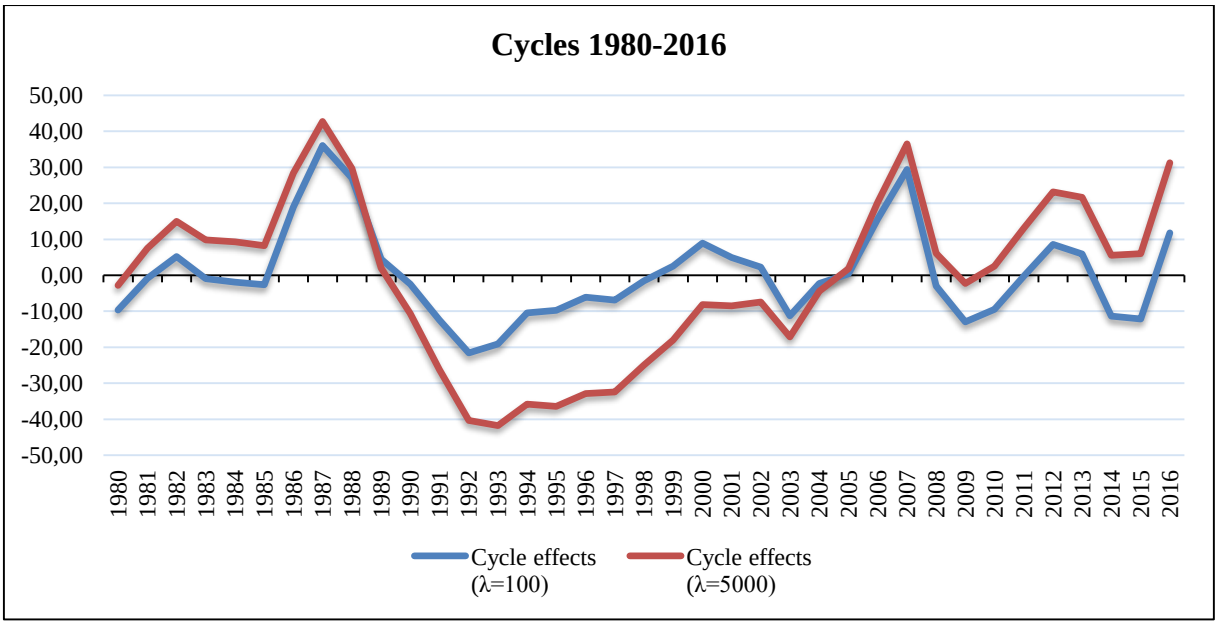
Sources: Norges Bank (2017a), excel add-in (Annen, n.d.)

As explained earlier, the HP-filter trend line with a λ-value of 5.000 provides a smoother trend that puts greater emphasis on earlier observations. Consequently, significant fluctuations in the real housing prices will lead to greater deviations. As figure 6.1 illustrates, this trend line clearly captures both the historical bubbles and the more recent ones. It also shows that using a higher λ-value can restrict the model from interpreting the significant recent growth as a new trend. According to the HP-filter, housing was overvalued from 1981 to 1989, the years leading up to the Norwegian banking crisis. Similar to the trend line with a λ-value of 100, the deviation peaks in 1987. Although real housing prices started to increase after 1993, the HP-filter argues that housing has been undervalued from 1990 to 2004. With the exception of a small correction in 2009 caused by the financial crisis, housing has been overvalued in varying degrees from 2005 to 2016. In 2016, the deviation between the trend lines is almost as big as it was before the financial crisis in 2017. Accordingly, it can be argued that there exist bubble tendencies in the Norwegian housing market when using the HP-filter

with a λ-value of 5.000. However, these results may be somewhat overestimated. Although a high λ-value can reduce end-point errors, it can also provide additional fluctuations.

In order to better demonstrate the cycle deviation from the HP-filter trend lines in recent times, they are presented graphically in figure 6.2. The deviations are calculated by subtracting the two HP-filters from the real house price indices. For the most part, real housing prices have fluctuated around the calculated trends. However, there were significant deviations from the trend lines during the banking crisis of the late 1980s and the more recent financial crisis. The largest positive deviations took place in 1987 and 2007, while the largest negative deviation took place in 1993. It is apparent that the size of the deviation varies with the value of λ. However, as explained, both HP-filter trend lines imply that housing is currently overvalued.

Figure 6.2



Sources: Norges Bank (2017a), excel add-in (Annen, n.d.)

One issue with the analysis is the rising trend since the early 1990s, which makes it difficult for the model to separate cycle from the trend. However, the problem is reduced by using a higher λ-value of 5.000. This clearly helped in illustrating the historical bubbles. The current real housing prices are above that of the estimated HP-filter trend lines for both λ-values of 100 and 5.000. Historically, real housing prices have decreased significantly after experiencing deviations at this level. The results of the model suggest that there are bubble tendencies in the Norwegian housing market. However, due to the limitations of the model, further analysis through other models is necessary before coming to a conclusion about the housing market.

6.2 P/R Ratios

The P/R model is a modification of the P/E model used for evaluating stock values. The model is a ratio between the housing price (P) and the cost of rent (R) and is used for evaluating whether the housing market is overvalued. The ratio compares the house price per square meter with the annual costs of renting housing with equal features and location. Therefore, the price-to-rent ratio represents the annual return going to the homeowners from owning a house instead of renting. The annual return on the housing investments can be compared to returns of other investments, to evaluate whether housing prices are in disequilibrium or not (Dam et al., 2011). This evaluation is possible because the cost of renting is a reasonably good indicator for the developments of the CPI in a market. According to James Poterba (1992), the user cost of owning and living in a house is given by:

(6.5)

$$user\ cost = PH\left(i + r_p + m + \delta - \pi\right)$$

Where:

PH	= Housing price
i	= Nominal after tax interest rate (opportunity cost)
r_p	= Property tax on owner-occupied housing
m	= Maintenance
δ	= Depreciation
π	= Expected appreciation rate (Inflation)

The user costs of being a homeowner should, in the long-run, be equal to the cost of renting, resulting in a net income of zero. The cost of a rental can, therefore, be expressed identically to the user cost of owning:

(6.6)

$$cost\ of\ renting = P\left(i + r_p + m + \delta - \pi\right)$$

When the annual rental cost is lower than the annual cost of owning one, it implies that the housing market is overvalued. Overvaluation results in an increase in people wanting to rent and a decrease in the number of people looking to buy a house. Consequently, rental prices will go up while housing prices will go down. When the annual rental prices exceed the costs related to owning a house, the demand for housing as investment opportunities increases, resulting in the opposite developments in

price levels. Over time, empirical evidence has indicated that the P/R ratio returns to its average. In the short-run, however, the difference between rental cost and the price of renting could influence developments in housing prices (Larsen, 2005).

By rearranging equation 6.6 and isolating house price (P) and rental cost (R), the equation for the fundamental P/R ratio is:

(6.7)

$$\frac{P}{R} = \frac{1}{\left(i + r_p + m + \delta - \pi\right)}$$

The equation explains that the fundamental long-term relationship between housing prices and cost of rent is determined by after-tax interest rate, property tax, maintenance costs, depreciation and expected appreciation. Because none of these components are constants, it is highly unlikely that the fundamental P/R ratio will remain constant over a long period. The occurrence of increases in P/R ratios should, therefore, be seen as an indicator of a housing bubble and support further analysis. However, increased P/R ratios are not sufficient evidence to make any conclusions regarding the state of the housing market.

Dam et al. (2011) suggest that examinations of the actual P/R ratios compared to the ratios found by calculations using fundamental factors, provide the housing prices' real deviations from the equilibrium. The real P/R ratio is calculated by dividing the average market price of housing by the annual cost of rent:

(6.8)

$$\frac{P}{R} = \frac{Average\ housing\ price}{Annual\ cost\ of\ rent}$$

The historical development of the P/R ratio can suggest whether housing prices are too high compared to the cost of renting and if the housing price level is significantly different from its long-term fundamental value. Increasing P/R ratios suggest great optimism among people regarding future housing price developments, which may result in a housing bubble. Later in this chapter, there will be empirical testing of the P/R ratio in the Norwegian market to see whether the model indicates overpriced housing.

6.2.1 Assumptions and Limitations

As for most economic theories, the P/R model is designed based on underlying assumptions often limiting the accuracy of the outcome. The model used by Dam et al. (2011) when applying the P/R model is based on the following assumptions:

a. All houses are homogenous with each unit having a corresponding rental price.

This includes an assumption that location is irrelevant to housing price and rent. The assumption stems from the use of aggregated data to determine housing prices, and due to the CPI representing developments in rent. The use of aggregated data will not be consistent with the buyers' preferences and real observations from the market. Price levels and developments from different Norwegian areas will disprove this assumption, as there are significant differences.

b. Ownership and renting are perfect substitutes.

Assuming that people are indifferent to whether they own or rent housing means that an increase in housing prices would result in higher cost of rent. This assumption contradicts with the observed market conditions, where house buyers usually have strong preferences. Owning housing is generally preferred to renting a home, particularly when there are low interest rates and growing housing prices (Drew & Herbert, 2013). The Norwegian housing market, which is currently experiencing both these factors, will, therefore, be likely to have a relatively small market for rentals.

c. No transaction costs

The assumption that there are no costs related to buying or selling a house is incorrect for the Norwegian housing market. The state requires 2,5 percent of the sales price as stamp duty when housing changes owner (Kartverket, 2017). When housing prices are as high as they currently are in Norway, 2,5 percent of the house price represents a significant cost that would be avoided if deciding to rent.

d. Free and unregulated markets

Unregulated and efficient markets is a prerequisite for the assumption of equal costs related to owning and renting. In Norway, where the rental market is highly regulated, a comparison of the two markets will provide a biased picture of the situation. Another difference is that the housing market is affected more by changes in interest rates than the rental market. A high P/R ratio can, therefore, occur as a result of low interest rates rather than an overvalued housing market.

6.2.2 Data

To calculate the price-to-rent ratio developments of the Norwegian market, data has been collected from various institutions. This section will, therefore, include an explanation and the justification for our choice of data.

Housing Price: Data for housing prices are collected from Norges Bank's annual housing price statistics. In the calculations, the price per square meter for an average house reaching back to 1980 will be applied. See appendix 3.

Annual Rent: There are no institutions that have recorded annual statistics for the cost of renting for long periods. Therefore, the calculation of annual rent will be based on publicly available figures from multiple sources. SSB recorded the annual cost of rent per square meter between 2006-2012, which is the basis for the prices used in our analysis. The annual rent for the years 2000-2005 and 2013-2016 is calculated using the "debt paid"-category from SSB's CPI. For the remaining years going back to 1980, the annual rent is calculated using SSB's general CPI, as it correlates heavily with the developments in the cost of rent. See appendix 3.

Fundamental P/R Factors: The data chosen to represent the factors of the fundamental P/R model is in accordance with OECD's model for calculating fundamental P/R. In their 2006 report, they introduced the input variables they believed resulted in the most accurate results (Girouard et al., 2006). The capital gain is represented in the formula by the CPI for the country. There are publicly available data for the Norwegian mortgage rate and after-tax mortgage rate gathered by SSB. According to OECD, the cost of owning a house can be assumed constant at 4 percent (Girouard et al., 2006). Due to the great variance in property tax rates among municipalities and the fact that there are limited recorded data on annual property tax from previous years, this factor will be excluded from the calculations. The calculations can be seen in appendix 4.

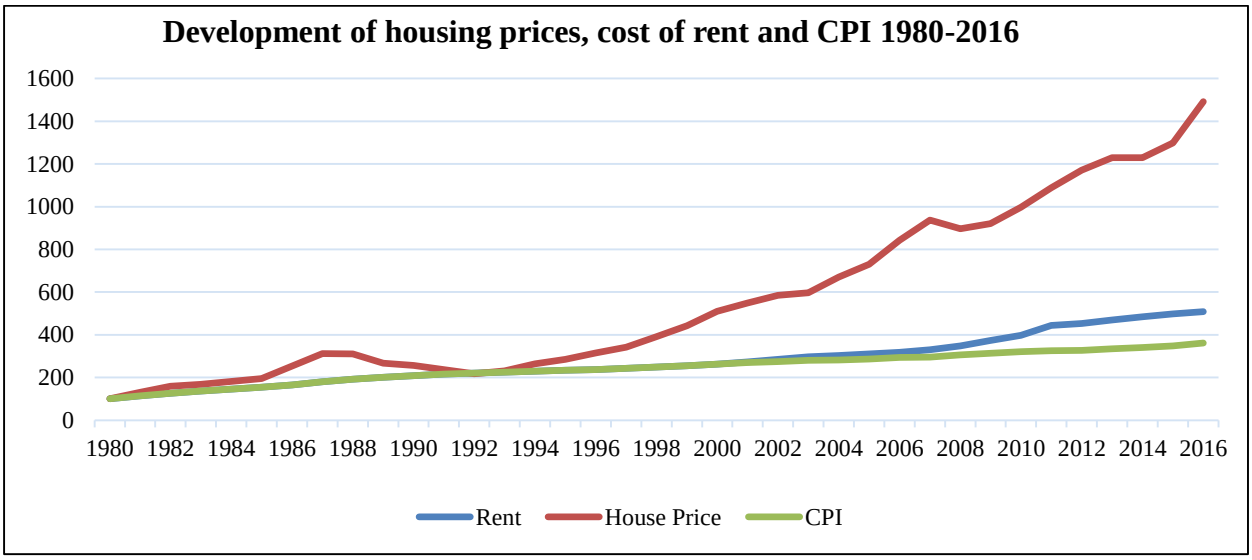
6.2.3 Empirical Analysis

In this section, the development of the Norwegian housing market will be analyzed by examining the changes in real and fundamental price-to-rent ratios. The empirical analysis will examine the changes in housing prices, the cost of rent and CPI and make comparisons. The analysis will also focus on the changes in real P/R ratio relative to changes in fundamental P/R ratio.

Figure 6.3 illustrates how the development of the Norwegian housing price has been significantly greater than that of the cost of rent and the CPI. Since 1992, the growth in housing prices has been

4,5 times greater than the growth in annual rental prices and nine times the growth on Norway's CPI. These developments cause significant changes in the real P/R ratios, which will be elaborated in the next section.

Figure 6.3

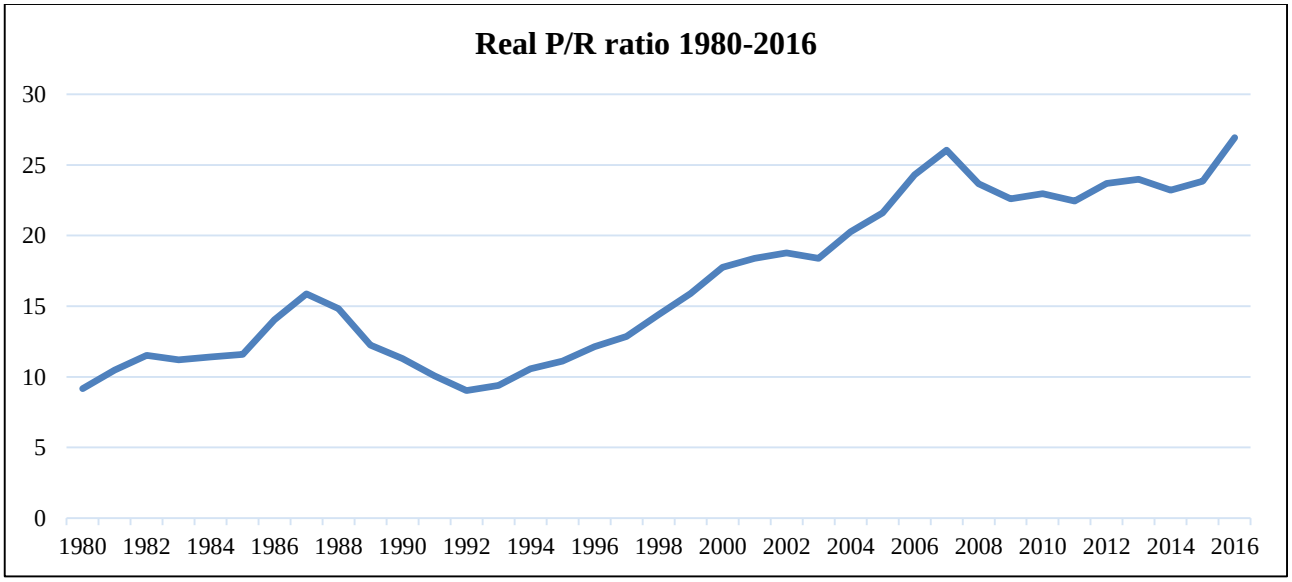


Sources: Norges Bank (2017a), Statistics Norway (2013; 2017a)

6.2.3.1 Developments in the Real P/R Ratio

By calculating the real P/R ratios for the years 1980-2016, developments of the ratio can be illustrated as a curve:

Figure 6.4



Sources: Norges Bank (2017a), Statistics Norway (2013; 2017a)

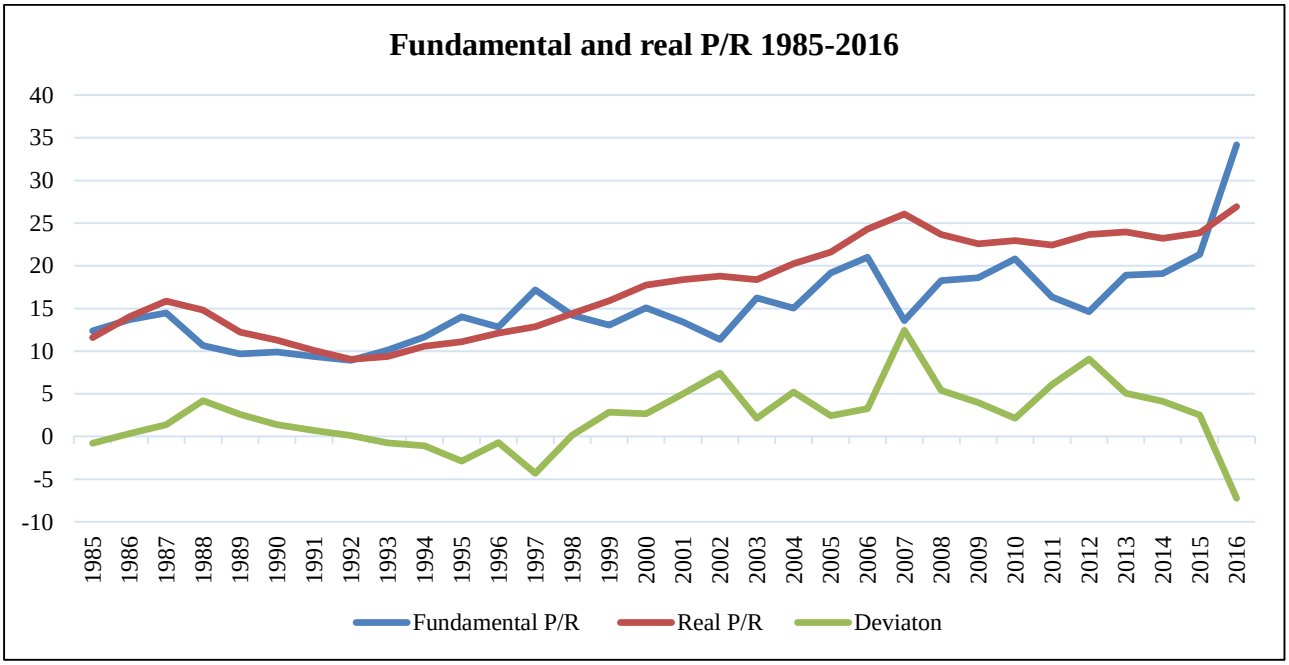
Over the past 35 years, the real P/R ratio has experienced big fluctuations, with the overall trend being an increasing P/R value. This is especially true in the years after the decline in housing prices during the banking crisis. With the exception of the years following the financial crisis in 2007, the P/R ratio have not seen any significant decline after 1992. This development suggests a high level of optimism among people and expectations of a further increase in housing prices. Poterba (1992) argues that the real P/R ratio will return to its average in the long-run. In 2016, the ratio was 26,92 which is the highest ratio in the time period and significantly above the average for the period which is 16,70.

According to the P/R model, this indicates that there exists a housing bubble. However, the real P/R ratio is only an indicator and not sufficient evidence for drawing conclusions. Because the ratio can be influenced by regulations on the rental market and other exploratory factors, it is necessary to complete more extensive research to see if other analyses support the hypothesis arisen from the real P/R analysis.

6.2.3.2 Fundamental P/R Ratios

As discussed earlier in this section, it is necessary to compare the real P/R ratio to the fundamental P/R ratio to evaluate to what degree housing prices deviate from the equilibrium. A large share of the increased housing prices in Norway has been contributed to the decrease and low level of the banks' mortgage rates. The low interest rates on mortgages result in low capital costs when owning housing, and will according to housing price models, contribute to high prices. It is also likely that the low interest expenses for the owners of housing have led them to require lower rent from tenants (Larsen, 2005). To provide support for the result of the real P/R analysis, it is, therefore, important to factor in the macroeconomic factors that are influencing the housing market. The fundamental P/R value for a given year is calculated using the growth in CPI, after-tax interest rate and cost of holding housing. Figure 6.5 below illustrates the developments in real- and fundamental P/R ratios, as well as the deviation between the ratios.

Figure 6.5



Sources: Norges Bank (2017a), Statistics Norway (2013; 2017a; 2017b)

It is evident from the curves that the fundamental P/R ratio has been the most volatile of the two ratios during the period in the data. The high level of volatility is explained by the developments in the fundamental factors that are applied, e.g. growth in CPI or interest rates. In the years before 2016, the real P/R ratio has been higher than the fundamental P/R ratio for every year since 1998. This indicates that the housing prices was overvalued in this period. In 2016, the Norwegian CPI grew by 3,6 percent and the interest rate recorded was at a record low 3,51 percent. Consequently, the fundamental P/R ratio skyrocketed from 21,35 in 2015 to 34,16 in 2016 and exceeded the real P/R ratio for 2016 (26,92).

Although the P/R ratios for 2016 indicate that the market is severely undervalued, this is only true in the short-run. For the housing market to be undervalued in the long-run, the CPI (inflation) must grow at the same rate in the future. As the 5-, 15- and 25-year averages in growth are 2,12, 1,90 and 2,08 percent, this level of annual growth seem unrealistic. With average inflation, the fundamental P/R ratio would be significantly lower than the real P/R ratio.

6.2.3.3 Limitations and Criticism of Data

Attempting to calculate the fundamental price-to-rent ratio by using only after-tax interest rates, capital gain and a constant for holding cost, provide oversimplified and inaccurate results. Any conclusions that are drawn from the deviations from the real- and the fundamental P/R ratios should

be accompanied by a more rigorous analysis of the many macroeconomic factors that are influencing the housing market.

It is also important to note that the calculations of the annual cost of rent before the year 2000 are based on the assumption that rent develops identical to the CPI. Although the developments may correlate strongly, this will provide unreliable data for the period.

According to Harald Magnus Andreassen, chief economist at Swedbank, there are limitations to the housing price index from Norges Bank. He claims that the index has not excluded all non-residential buildings and that the price increase of the buildings is lower than that of residential housing. Thus, the result is an underestimation of the housing prices (Haugen, 2013).

Lastly, it is crucial to remember the limitations of the P/R model. The assumptions that the model is built on are wrong and unrealistic when applied to the Norwegian housing market, and will, therefore, limit the credibility and accuracy of any conclusions drawn from the analysis.

6.3 Tobin's Q

In the short term, the price of housing is determined by changes in demand. However, when analyzing the price level over longer periods of time, an assessment and comparison with the construction costs of new housing are proposed. In this context, Tobin's Q is a useful theory. Introduced in 1968 by William C. Brainard and James Tobin, the theory was as an alternative to the neoclassical investment theories. While the neoclassical theory was built on the assumption that rational market players will invest as long as the net present value is positive (Weintraub, 2002). Brainard and Tobin introduced a new perspective by focusing on the relationship between current housing prices and the price of new construction. The theory implies that developers will continue housing construction as long as the current price of housing exceeds the cost of new construction, assuming no restrictions on essential factor inputs, especially vacant land (Lerbs, 2014).

Tobin's Q was originally the ratio between a physical asset's market value and its replacement cost (Brainard & Tobin, 1968). It was often applied to stocks and similar assets, but it has also been used in the housing market. The theory assesses whether the market price of housing is fundamentally supported by the corresponding replacement cost. In considering the replacement cost of a housing investment, Tobin's Q includes all costs related to the construction, i.e. labor, material, and land. In other words, the theory compares the market price to replacement costs of comparable housing. The relationship is defined in equation (6.9):

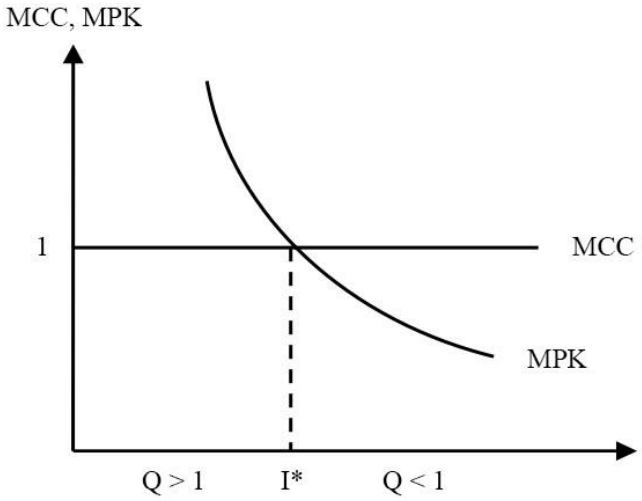
(6.9)

$$Tobin's\ Q = \frac{Market\ price}{Replacement\ cost}$$

Although Tobin's Q is based on the marginal Q (q_m), equation 6.9 represents the average Q (q_a). This is due to the fact that the marginal Q is not directly observable in the market (Hayashi, 1982). However, the marginal and the average Q will under certain assumptions be equal. These assumptions are explained in section 6.2.1.

When the value of Q exceeds 1, the theory implies that capital invested in the construction of new housing is worth more than capital not invested. As a result, suppliers will start to invest in order to take advantage of the arbitrage opportunity. As housing investments increase, the marginal Q will decrease. Investments will continue to rise until the marginal Q equals 1, which is the optimal level of investment. In other words, the marginal Q will move towards 1 in the long-term equilibrium, resulting in perfect competition and constant returns to scale. In the long-term equilibrium, the marginal Q is thus equal to the average Q. The relationship is between Q and the investment level is illustrated in figure 6.6:

Figure 6.6



Source: (Burda & Wyplosz, 2005, p. 146)[3]

Q illustrates the ratio of the marginal cost of capital (MCC) to the marginal product of capital (MPK). When Q > 1, MPK is greater than MCC, meaning that there is an arbitrage opportunity in the market. This will attract existing suppliers and maybe create new ones. Whether new suppliers enter the market or not is largely dependent on entry barriers, e.g. access to capital in the form of in the form

[3] Burda and Wyplosz (2005) disregard establishment costs in their illustration.

of limited equity or borrowing opportunities. When Q < 1, MCC is greater than MPK, and investments have surpassed the optimal level I*.

6.2.1 Marginal and Average Q

If the marginal Q was directly observable, then the econometric implementation of the model would be fairly uncomplicated. However, that is not the case. As a result, most empirical studies apply the average Q as a proxy because it is easily observed (Ang & Beck, 2000). Hayashi (1982) defines the marginal and the average Q as:

- **Marginal Q** = the ratio of the market value of an *additional* unit of capital to its replacement cost
- **Average Q** = the ratio of the market value of *existing* capital to its replacement cost

For the marginal and the average Q to be equal, certain conditions must be met. These conditions have been deduced by Hayashi (1982):

a. Suppliers are price-takers

The assumption that suppliers are price-takers in the market implies perfect competition, where the suppliers have no power concerning price level. In order to meet demand, suppliers can only adjust the quantity supplied. If suppliers were price-makers, then average Q would be higher than marginal Q by what is characterized as the monopoly rent.

b. Production and installation functions are linearly homogenous

The production function $F(K, N; t)$ is linearly homogeneous in capital (K) and labor (N), while the installation function $\psi(I, K; t)$ is linearly homogeneous in investment (I) and capital (K). This is consistent with constant returns to scale. If the capital (K) and labor (N) inputs are increased in the production function $F(K, N; t)$, it produces an equivalent increase in output. The same applies to the installation function $\psi(I, K; t)$, where an increase in investment (I) and capital (K) leads to an equal increase in output.

c. Perfect capital markets

The assumption of perfect capital markets implies a free flow of capital across countries.

6.2.2 Tobin's Q and the Housing Market

Although Tobin's Q was originally applied in analyzing the stock market, it can also be applied to the housing market. The numerator in equation 6.9 represents the market price of existing housing, i.e. the observed value the housing is sold for. The denominator represents the cost of new construction, including labor, material and property costs. Because housing come in different sizes, it is common practice to use data per m^2 for both parts of the equation. Also, when calculating the Q-values, property costs must be included or excluded in both measures.

In analyzing the housing market, Tobin's Q will be to determine whether there are bubble tendencies in the Norwegian market or not. As explained earlier, when Q exceeds 1, suppliers will increase investments in order to capture the profit, and this will push the marginal Q towards the long-term equilibrium level of 1. The reasoning behind this argument is the economic rationale behind buyers in the housing market: no informed buyer would pay more for a house than what it costs to buy the land and erect the building (Brueggeman & Fisher, 2001). If the value of Q has remained at a value higher than 1 for a longer period of time, it can be argued that housing is overvalued and that the market is experiencing a housing bubble.

When applying Tobin's Q to the housing market, it is important to be aware of certain conditions in the market that do not satisfy the assumptions of the model. Building new housing is a time-consuming process, with respect to both building permits and the construction process. Insufficient supply of unoccupied land can also limit the construction of new housing. These are all factors that may cause a slow adjustment of investments to housing price and construction cost changes.

6.2.2.1 Data Presentation

The data used to determine Tobin's Q consists of annual observations from 1985 to 2016. The market values per m^2 are obtained from Norges Bank (2017a). The data is based on recorded transaction prices, which means that they include the value of both the housing and the property (Eitrheim & Erlandsen, 2004).

The replacement cost is calculated based on data from the Norwegian State Housing Bank (NSHB) (2017). NSHB provides annual statistics for the approved new constructions, including average property and construction costs. In order to make the data comparable to the data from Norges Bank, the property and construction costs are put together. The combined cost is then divided by the average house size for each respective year in order to obtain the replacement cost per m^2.

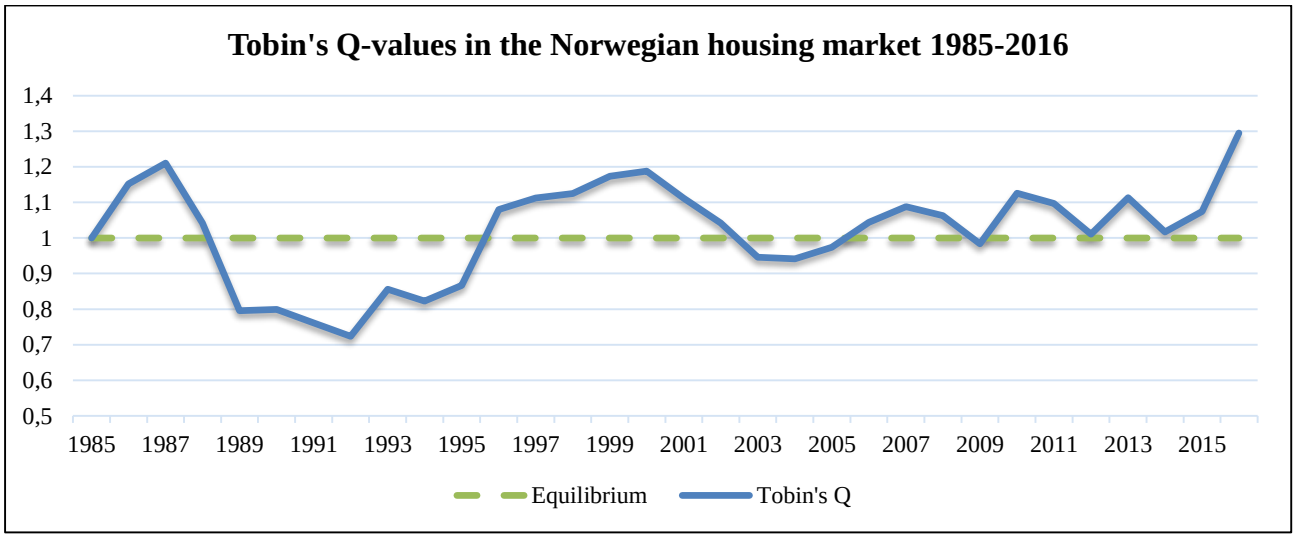
The estimated replacement cost can be characterized as fairly similar to the market value of housing provided by Norges Bank. Both include the cost of property and, to a large extent, the same areas of Norway. Due to these similarities, the following analysis will be based on this data. All numbers are calculated to be in real terms in 2016-prices.

6.2.3 Analysis of the Housing Market

The calculated Tobin's Q-values for the Norwegian housing market are illustrated in figure 6.7. When Q = 1, the market price of existing housing per m^2 is equal to the construction costs per m^2 of the equivalent housing. Here, the housing prices are in the theoretical equilibrium. See appendix 5 for calculations.

As figure 6.7 illustrates, there were major fluctuations in the Q-value from 1985 lasting until the turn of the millennium. Since then, with the exception of the major deviation in 2016, it has remained at approximately the same level. During the time period from 1985, the Q-value had its bottom level of 0,72 in 1992 and peaked in 2016 with a value of 1,29.

Figure 6.7



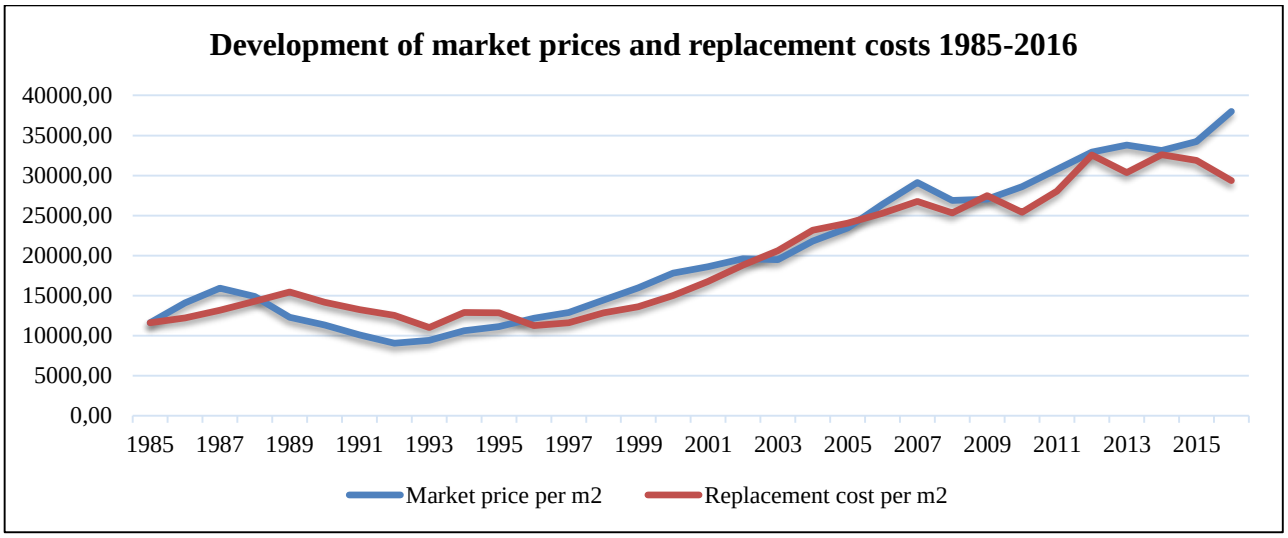
Sources: Norges Bank (2017a), The Norwegian State Housing Bank (2017)

Although the Q-value illustrates their ratio, it can be problematic to determine whether fluctuations come from changes in the price of housing or the replacement cost. In order to create a comprehensible portrayal of the developments, the driving forces of Tobin's Q are illustrated in figure 6.8. The rapidly rising Q-value at the start of the time series illustrates the housing bubble of the late 1980s. After having lifted the regulations of the housing market in 1982, the credit market was deregulated shortly after (Anundsen & Jansen, 2013). Accordingly, Norway saw its housing prices

increase significantly until they peaked in 1987. Before the bubble burst, the Q-value had peaked at 1,21. After the sharp decline in housing prices that followed, the Q-value hit its bottom in 1992 at 0,72, implying that the market price of housing represented only 72 percent of the replacement costs. The market price remained below the replacement cost until 1995, suggesting that investments in new construction were not profitable during this period.

Between the years of 1992 and 2000, the Q-value increased, reaching a new high of 1,19 in 2000. For Norway, this was a period of strong economic growth and surpluses in foreign trade. This led to increased demand for housing. However, as explained earlier, supply is inelastic in the short run. Accordingly, changes in demand will be reflected in the supply with a lag. As a result, the supply side in Norway did not manage to keep up with the growing housing demands, and housing prices increased. This was especially true in the major cities, where urbanization put pressure on the availability of housing. The factors that prevent the supply side from reacting quickly are the capacity constraints and the time-consuming process of construction. Figure 6.8 illustrates how replacement costs followed housing prices with a minor time lag during the latter half of the 1990s. Even though the Q-value was almost as high in 2000 as it was in 1987, Norway did not see its housing prices decrease. The drop in the Q-value after the millennium can instead be characterized by replacement costs growing faster than the price of housing.

Figure 6.8



Sources: Norges Bank (2017a), The Norwegian State Housing Bank (2017)

During the period from 2001 to 2015, the Q-value has fluctuated between 0,94 and 1,13. Compared to the previous years in the time series, it can be argued that it has remained fairly stable during these

years. The reason why is that the two driving factors to some extent have experienced similar developments. Over the 15 years between 2001 and 2015, the average Q-value was 1,02. This is very close to the theoretical equilibrium value of 1. However, in 2016 the Q-value jumped to 1,29, the highest value observed in the entire time series. While housing prices continue to increase, replacement costs decreased. The combination led to a significant rise in the Q-value.

Before coming to a conclusion on the analysis, it is important to be aware that there may be shortcomings in the data sets which can affect the results. Although they are reasonably similar in that they both include property cost and that they to a large extent cover the same areas of Norway, there may be differences deeming the data not representable. For example, housing prices from Norges Bank may be based on a different type of housing than what NSHB has based their construction costs on.

Conclusively, the analysis of the Norwegian housing market through Tobin's Q indicates that a housing bubble may be starting to form. The average Q-value from 2001 to 2015 is close to the theoretical equilibrium value of 1, and it hit 1,02 as late as in 2014. However, in 2016 the Q-value hit 1,29. As the Q-values have captured historical housing bubbles and earlier developments in the Norwegian housing market, it can be argued that the observed Q-value is accurate. According to the theory, this implies that housing is overvalued, supporting bubble tendencies. However, as there are several limitations of Tobin's Q, and conclusions about the Norwegian market should not be based on this analysis alone. The limitations of the model are outlined in the following section.

6.2.4 Limitations of Tobin's Q

Though the use of Tobin's Q may provide some insight, there are limitations to the model. This is especially true when applying it to the housing market, where several conditions contradict the model's assumptions. First, as mentioned earlier, building new housing is a time-consuming process, with respect to both building permits and the construction process. As a result, the supply side of the housing market will not be able to keep up with growing demands, possibly contributing to overinvestment in the housing market (Rosenthal, 1999).

Second, the model assumes that all assets are homogeneous. It can be argued that this is not the case in the housing market; newer constructions often have higher standards and longer lifespans than existing housing. For the model to produce more accurate results, the replacement cost should be adjusted for economic depreciation (Corgel, 1997).

A third inconsistency with the characteristics of the housing market is the model's assumption of unlimited supply. Since land is in limited supply, properties in areas with high demand for housing will experience increasing prices. This is the case in Norway's major cities where there is a lack of land available for new housing constructions. Admittedly, it is possible to build taller buildings, but there are restrictions regulating the allowed height of buildings. Urbanization has increased the demand for housing further, amplifying the issue. Because property prices in central areas are growing faster than in rural areas, the average site costs will likely increase (Larsen, 2005), affecting the Q-value.

Fourth, the model argues that the long-term equilibrium value of Q is 1. However, as the housing market is complex, it can be questioned whether this is likely. Tobin and Brainard (1977) are open the idea that the equilibrium value might be different from 1. Market power and other factors might cause the equilibrium value to change.

7 Fundamental Analysis

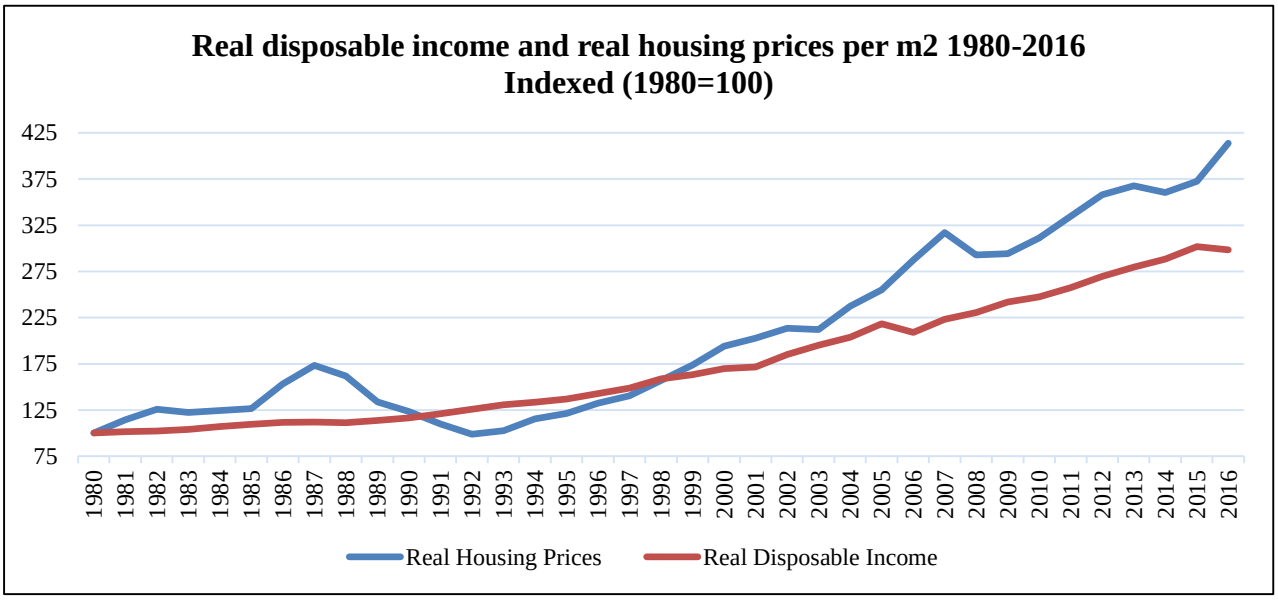
The following sections will analyze several fundamental factors believed to affect the Norwegian housing market. Thorough reviews of pricing models and the opinions of market experts in section 5 illustrated how a number of factors determine the price level, where disposable income and the interest rate was included in all the models. Further, housing prices are believed to be affected by changes in demographics, the unemployment rate, the credit market, banking regulations, housing taxation and new constructions. The analysis is focused on the demand side of the market, as it has been described how housing prices are affected mainly by demand in the short run.

7.1 Disposable Income

All of the housing price models discussed in this thesis agree that the households' disposable income is a contributing factor of developments in housing prices. The majority of housing investments in Norway are financed by loans which are paid by households' income over the years. When the income level rises, households have the possibility to borrow more money and invest in more expensive housing. Thus, raising the level of housing prices. However, when the increase in housing costs, through interest expenses and installments, exceed the growth of income, it often creates difficulties for households. Therefore, housing prices cannot experience higher growth than disposable income in the long-run (Larsen, 2005).

The real disposable income of a household is calculated by deflating the nominal after-tax income by the CPI. The disposable income is the sum of wages, benefits and capital gain minus the expenses from taxes and interests. Figure 7.1 illustrates the development in real disposable income relative to the development real housing prices in the years 1980-2016.

Figure 7.1



Sources: Norges Bank (2017a), Statistics Norway (2017a; 2017c)

The graph shows that the real housing prices how grown at a significantly higher rate than the real disposable income. Since 1992, the real pricing has grown by 419 percent, even though the growth in disposable income has only been 237 percent. The differences of the developments prove that the increase in housing prices cannot be explained sufficiently by the changes in disposable income.

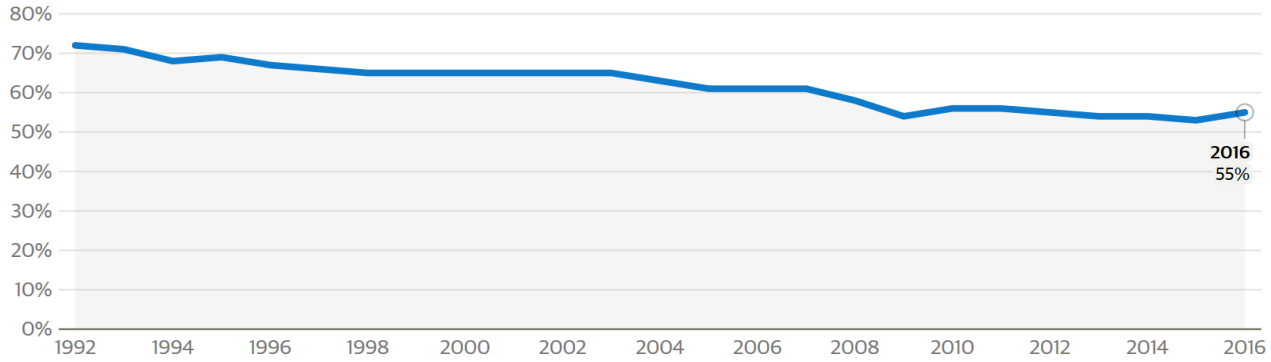
7.1.1 Cost of Living

The limitation when comparing the changes in housing prices to the changes in disposable income stems from the assumption that the price of all other goods and services have remained the same throughout the period. This assumption is true for Norway after the year 1992. The cost of living as a share of disposable income have declined significantly, allowing consumers to spend a larger portion of their salary on housing. In 1990, the average Norwegian household spent 59 percent of their disposable income on living expenses. Since then, the portion of the disposable income have steadily declined, and have not been over 40 percent since 2007 (Wig, 2017).

Because the costs related to owning a house and the cost of living has declined, paying for both required a record low share of the household income in 2016. The portion of disposable income paying for interest expenses has decreased from 13 percent to under 5 percent between 1990-2016 (Nordea, 2016). Figure 7.2 illustrates the percentage of household disposable income required to cover housing costs and cost of living for the Norwegian households. The calculations are based on

a family with two children, who are living in an average house with an 85 percent debt ratio and a repayment period of 25 years.

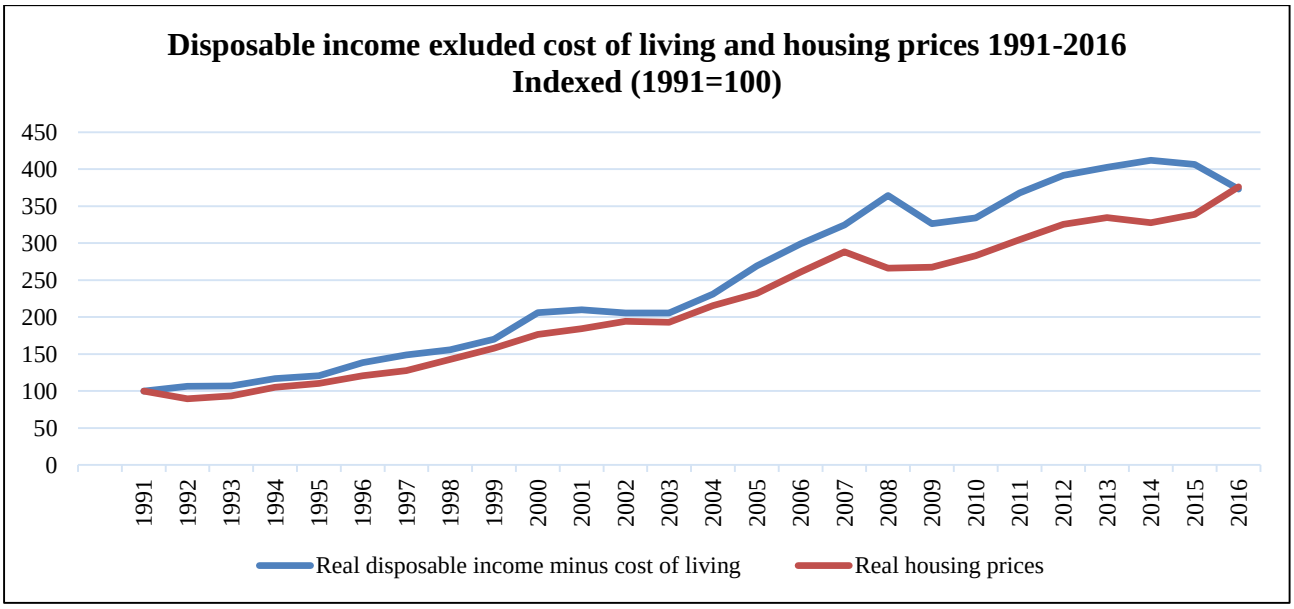
Figure 7.2



Source: Takla and Lund (2017) – based on figures from SSB and Consumption Research Norway (SIFO)

The graph shows that, despite the fact that disposable income has been outgrown by housing prices, the combined costs of housing and living has declined. These developments suggest that a comparison between disposable income left after the cost of living might provide more consistent growths. The developments can be illustrated by calculating the annual real disposable income excluded the cost of living. Figure 7.3 shows the development compared to the changes in real house pricing from the base year 1991.

Figure 7.3



Sources: Norges Bank (2017a), Statistics Norway (2017a; 2017c), Wig (2017)

The developments of housing prices correlate greatly to the change in disposable income when the cost of living is excluded. The correlation coefficient of the two curves is 0,965 with a significance level of 6,20E-19 which explains that there is a high correlation that is not random[4].

Even though the comparison proves that the income available to households after the cost of living is an exploratory factor for the changes in housing prices, it is important to mention that the annual reference budget developed by Consumption Research Norway accounts for many of the factors that are believed to be fundamental when examining housing prices. One example is the inclusion the interest rate on mortgage loans in the reference budget.

It is also crucial to remember that the reference budget is adjusted regularly by examining real changes in Norwegian consumption behavior, which are already affected by changes in fundamental factors.

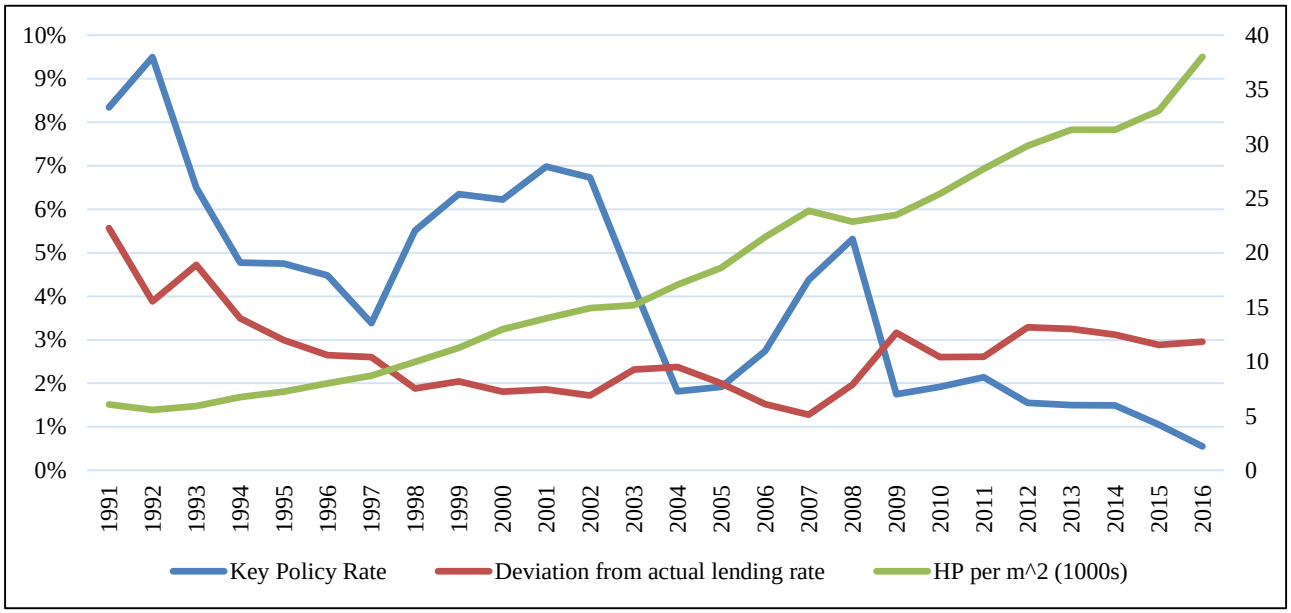
7.2 Interest Rates

One of the fundamental factors that influence housing prices the greatest is the level of interest rates on mortgage loans that are offered by banks. When the interest rates are low, consumers can afford to borrow more money and still be able to pay the monthly installments and interest expenses. More expensive housing become affordable will increase the demand for housing, resulting in a rise in the level of housing prices. The major impact interest rates are believed to have on housing prices is evident as it is included in all housing price models presented in section 5.

The key policy rate of a nation is one of the main tools applied when implementing monetary policies. In Norway, the key policy rate is determined by Norges Bank and is decided based on their evaluation and projections for the nation's economy. For the changes in key policy rate to have the intended effects on the Norwegian economy, it is necessary that the banks change their rates accordingly. Otherwise, the changes in monetary policy will not reach out to the Norwegian households. Figure 7.4 illustrates the development in Norges Bank's key policy rate on the left-hand axis compared to the changes in housing prices on the right-hand axis from 1991-2016. The graph also shows the deviation between the key policy rate and the bank's actual lending rate on the left-hand axis. See appendix 7 for calculations.

[4] See appendix 6 for regression output.

Figure 7.4



Sources: Norges Bank (2017a; 2017c), Statistics Norway (2017b)

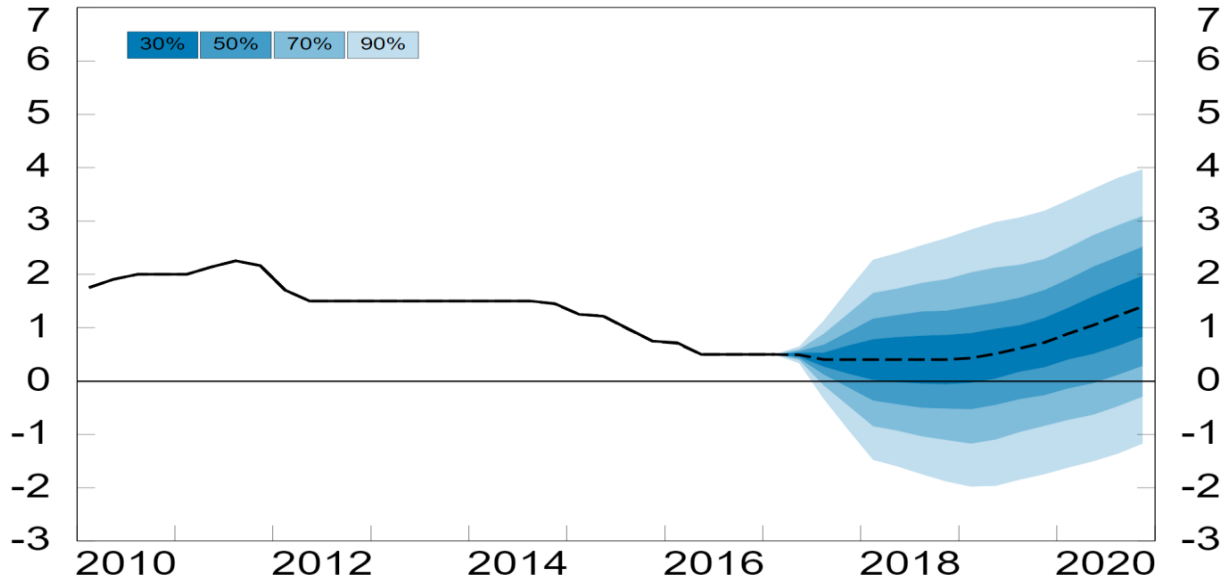
Since 1992, there has been a downward trend in the development of the key policy rate, although it has had several years of growth. In the period between 1993-1997, the key policy rate declined significantly, going from 9,5 to 3,32 percent. 1993 was also the first year of growth in housing prices following the Norwegian banking crisis. After 1997, the housing prices continued to increase despite the rising key policy rate. In 2003, the same year as Norwegian housing prices experienced a year without growth, Norges Bank decreased the key policy rate significantly. This resulted in rapid growth in housing prices in the years leading up to 2008, when the key policy rate reached a new peak. The key policy rate was increased in 2007 and 2008 as a response to the financial crisis. Grytten (2009) argues that the increase in key policy rate influenced the demand for housing and that the increase was influential to Norway experiencing its greatest annual decline in housing prices since 1992.

Taylor (2007) argues that low interest rates, as have been the situation in Norway since 2009, helps foster an extraordinary growth in housing prices. The low interest rates lead to cheap financing which results in a level of housing prices that cannot be sustained when interest rate return to normal levels. This assertion is supported by the vast growth in Norwegian housing prices from 2009 till today. That housing prices in 2016 experienced its greatest annual growth in the same year as the key policy rate was at a record low 0,55 percent also supports Taylor's argument.

From 1991, the banks' lending rates started to move closer to the Norwegian key policy rate. This development continued until 2007 when the difference between the interest rates was only 1,28 percent. In 2007 and 2008, the financial risk increased and the number of loans being defaulted on grew. Although the Norwegian banks were not influenced as badly by the financial crisis as banks in many other countries, they became more aware of the risks associated with lending money at low interest rates. The banks increased their margin and have since 2009 operated with interest rates around 3 percent higher than the key policy rate in Norway.

Norges Bank (2017d) has decided that the objective is an annual inflation of 2,5 percent. The key policy rate is an effective tool for impacting the Norwegian economy and is, therefore, able to influence the annual inflation. Norges Bank has, based on prognoses of the Norwegian economy, created estimates for the future developments in the key policy rate. Their predictions are illustrated in Figure 7.5, which shows that the key policy rate will be stable until 2018, before increasing 1 percent until the end of the year 2020.

Figure 7.5



Source: Norges Bank (2017d)

The banks' deposit rate will also affect the demand for housing as high deposit rates will increase the return of what is considered a risk-free investment alternative. In 2016, the average deposit rate offered by the banks was 0,85 percent which is very low compared to the return of housing investment in later years (Statistics Norway, 2017b). The low deposit rates combined with cheap financing will contribute to increased housing investments.

7.2.1 Consequences of Increased Interest Rates

After several years of declining interest rates, Norges Bank is predicting a rise in key policy rate shortly. Even though the key policy rate has not been raised since 2011, DNB chose to raise their interest rates on mortgages by 0,15 percent from January 9th, 2017. The rise in interest rate was explained by their analyses of the economy and a belief that the interest rate bottom is reached. DNB plan to raise their interest rates slowly and believes that there will a long time until the Norwegian interest rate level is back to its normal level (Gimse, 2016).

One argument for increasing interest rates is the capital requirement reform, Basel III. The reform, which Norway has agreed to introduce gradually between 2013 and 2019, requires banks to be better prepared for a potential recession. To comply with requirements, the banks have to increase their liquidity and decrease their leverage ratio. These changes may be achieved through higher interest rates (Slovik & Cournède, 2011).

Due to the probability of increased interest rates, it is necessary to understand the consequences related to a rise in interest rates. In 2016, SSB made predictions for the changes in housing prices until 2019 if the interest rate were increased at the beginning of 2017. They predicted a decline of 16 percent in real prices if Norwegian banks charged a 2 percent higher interest rate (Norli, 2016).

When explaining the effects of developments in the interest rate, it is important to distinguish between the effects of short-term and long-term changes. The short-term interest rates reflect the current economic situation, while long-term changes are determined by the expected changes in fundamental macroeconomic factors. Borrowers with fixed rates will not be affected by short-term changes in the interest rate. However, these borrowers only represent a small share of Norwegian households with mortgage loans. In the 4th quarter of 2016, the latest data published, 91,4 percent of Norwegians had floating rates on their mortgages, while only 1,5 percent had fixed rates for over five years (Statistics Norway, 2017d).

Because floating rate mortgages are this popular among Norwegian households, the market is highly vulnerable to short-term increases in the interest rate. If banks increase their interest rates, an increased number of households will not be able to pay their monthly installments and interests expenses. The consequence will be a growth in homeowners needing to sell their homes, which will cause a decline in housing demand and lower housing prices.

The long-term changes in interest rate affect the housing market by conveying information about the future user costs of being a homeowner. The increased long-term interest rate will, therefore, decrease housing prices and reduce housing capital intensity (Poterba, 1984).

As explained in section 7.1, the cost of living and housing costs make up a smaller percentage of the disposable income than it did earlier. This indicates that a rise in the interest rate may not result in as severe consequences as predicted by SSB. The banks are also advised to make sure that all mortgage customers can handle a five percent increase in the interest rate (The Financial Supervisory Authority of Norway, 2011). However, a survey performed by SpareBank 1 in 2015 revealed that 70 percent of Norwegian households would not be able to pay their mortgages if the interest rate rose by five percent. If the interest rate were increased one percent, thirteen percent of the responders would not be able to pay their mortgages (NTB, 2015).

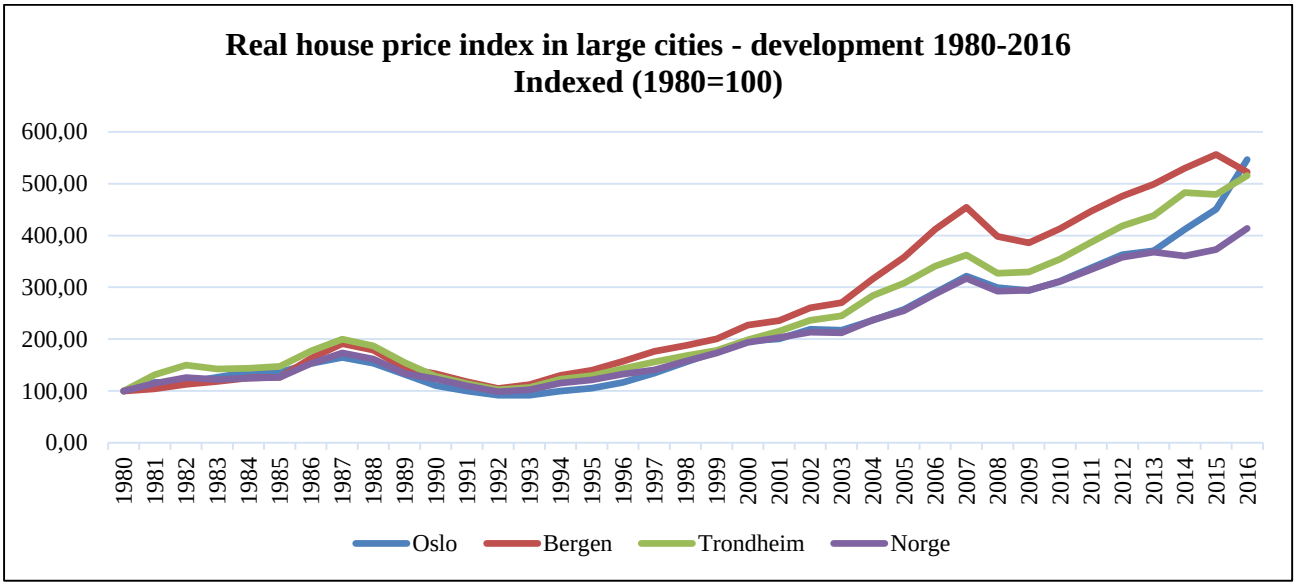
The banks' low lending rates support the current level of Norwegian housing prices. Still, the housing market is extremely vulnerable to the increases in interest rates that have been predicted by banks and analysts. Both major and minor rises in interest rates on mortgages can, therefore, result in lenders defaulting on their mortgage, and declining housing prices. As mentioned earlier, analysts believe that the banks' interest rates will return to its normal level in the long-run. For these changes to not result in a massive decline in housing demand, the process requires careful planning and thorough analyses.

The interest rate level is one of the fundamental factors responsible for the high price levels in the Norwegian housing market. The market can however still be overpriced, as the vulnerability to changes is greater than what is considered acceptable. Changes in the housing market have a massive impact on Norway's economy and should therefore not be exposed to the current level of risk. The vulnerability of the Norwegian housing market is a concern for the overall economy and the reason for the Financial Supervisory Authority's (FSA) desire for all borrowers to be able to withstand a five percent increase in interest rate.

7.3 Demographics

The housing prices in Norway have experienced significant growth over the last decades. However, the average growth in the country as a whole does not explain the market characteristics in detail. In order to provide a more comprehensive understanding of the market, figure 7.6 illustrates the real housing price developments in some of Norway's biggest cities.

Figure 7.6



Source: Norges Bank (2017a)

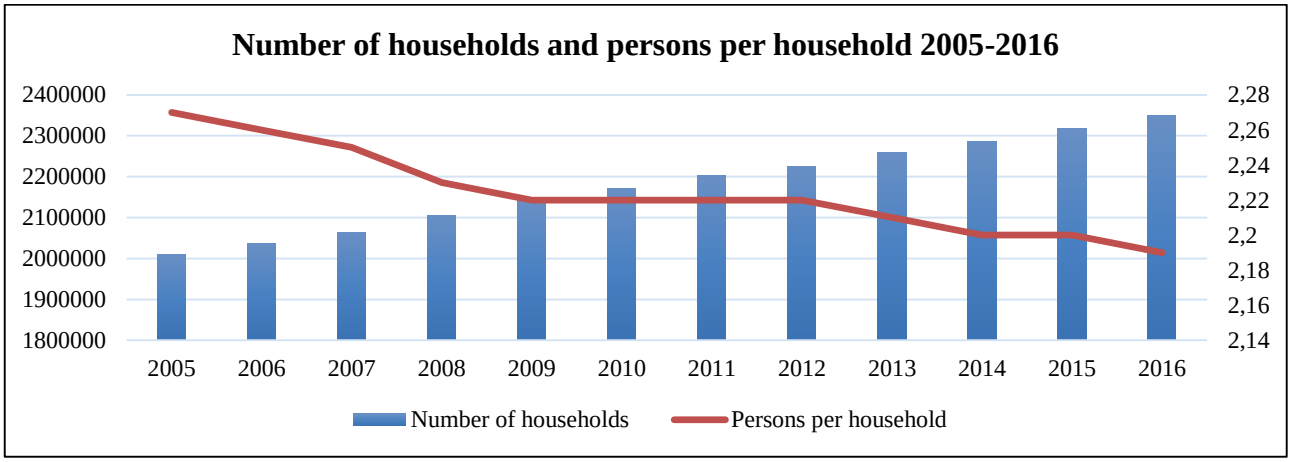
With the exception of the financial crisis, the large cities have experienced strong growth in housing prices since the early 1990s. However, the growth varies among the cities. Bergen and Trondheim have experienced stronger growth than Oslo and the country average for a long period of time. Oslo has followed the growth rate of the country average for most of the period since 1980, but the growth has accelerated significantly since 2011. Square meter prices of over 100.000 NOK is seen in an increasing number of areas in Oslo, illustrating the explosive growth (Wig, 2016). The strong housing price growth in the major cities is likely caused by a combination of various factors, some of whom will be explained in the following sections.

7.3.1 Increasing Number of Households

A high population growth implies that demand for housing will increase, in turn affecting prices. However, as a factor of explaining the Norwegian housing price growth, it is more relevant to assess the increase in households rather than the population growth. As the number of persons per household does not necessarily have to be constant, the number of households will to a large extent drive the demand side of the housing market (The Financial Supervisory Authority, 2013). Figure 7.7 illustrates how the number of households in Norway has increased since 2005. The yearly growth has been between one and two percent during the time period from 2005 to 2016. During the same time period, the average number of persons per household has decreased from 2,27 to 2,19. The trend appeared to be flattening in 2015, but it has decreased further in 2016. The combination of these developments

implies a greater need for housing and consequently an increase in demand. In central areas with a limited supply of housing, this has led to increased prices (Finanstilsynet, 2016).

Figure 7.7

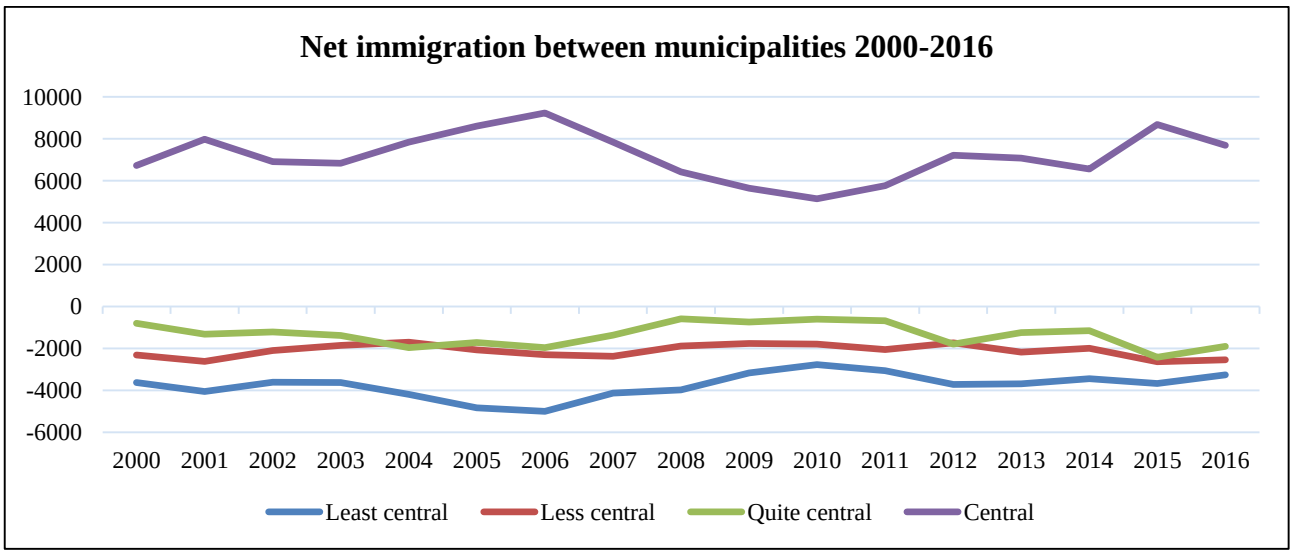


Source: Statistics Norway (2017e)

7.3.2 Urbanization and Changes in Households

Urbanization is the term for the various processes associated with the movement of people, markets and activities from rural to urban areas. Figure 7.8 illustrates the net immigration between municipalities ranked by their proximity to urban settlement. It is evident that people have a desire to live in central areas, and this desire is especially present among people within the age group between 20 and 29 years. This group represents on average around 40 percent of the relocations in Norway (Statistics Norway, 2017f).

Figure 7.8



Source: Statistics Norway (2017f)

Urban hot-spots, trendy neighborhoods and the housing's proximity to workplaces have become increasingly important for the younger generations. This implies that physical features like size and design are less empathized than location. This trend has been described as "the coffee latte factor" (Larsen, 2005). The increasing prices in larger cities are further substantiated by a higher willingness to pay for housing in urban areas (Larsen & Sommervoll, 2003).

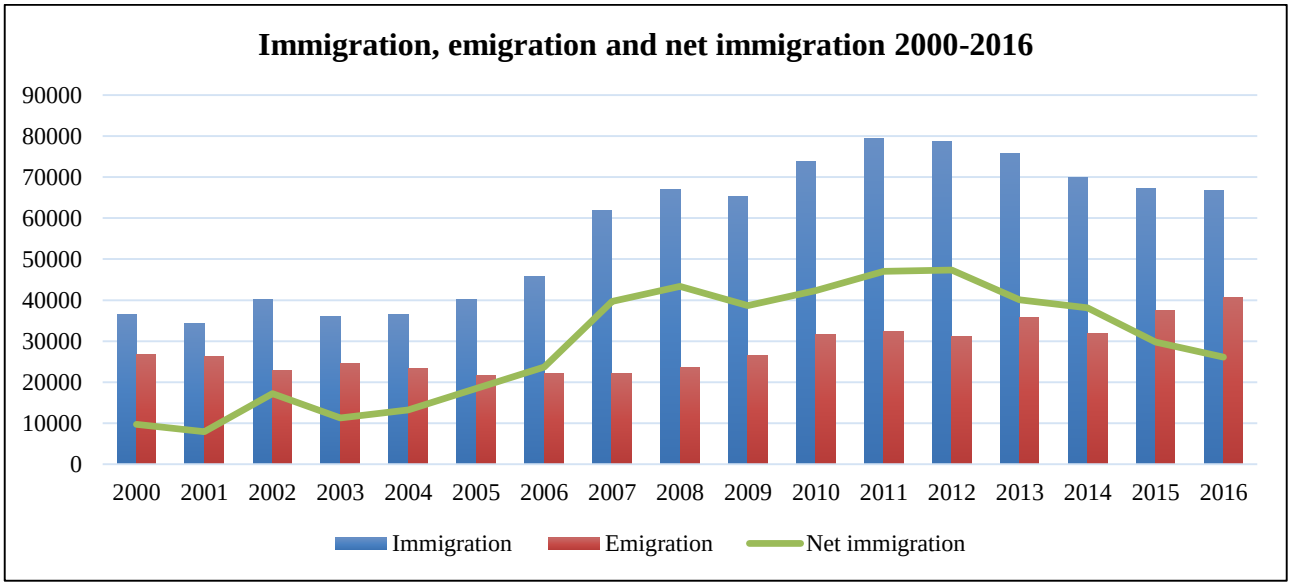
In parallel with increasing urbanization, there is a growing number of smaller households. As figure 7.7 illustrates, the average number of persons per household has decreased from 2,27 in 2005 to 2,19 in 2016. The increased divorce rate and a higher family establishing age are some of the reasons behind this trend. This contributes to an increased demand for smaller housing in favorable, central areas. Lifestyle changes and an increased student mass are other contributing factors (Larsen, 2005).

The combination of urbanization and increased demand for smaller housing puts pressure on the supply of housing in the cities. It also creates disparities in the development of various submarkets within the Norwegian housing market. Over the last couple of years, the price of smaller apartments in Oslo has experienced stronger growth than that of the larger apartments (Horjen & Rosa, 2012; Mikalsen, 2016a). This is reasonable considering that smaller apartments are often the only viable alternative for first-time buyers, singles, and people with low income. Increased housing prices, in general, might force couples and bigger households to look for smaller apartments as well, causing additional demand. The new regulations on requirements for residential mortgage loans, which took effect from 1 Januar 2017, might further reinforce this development (Kaspersen, 2017).

7.3.3 Immigration

Several international studies argue that immigration causes housing process to increase. While the process of constructing new housing is a time-consuming process, immigrants need a place to live from the moment they arrive. As a result, one can argue that immigration will contribute to higher housing prices in the short term. To the extent that there are limitations on vacant land, immigration can lead to increased housing prices on a permanent basis (Hagelund et al., 2011). This is especially true for centralized areas. Statistics Norway (2016a) argue that immigration contributes to the further centralization of settlement. Figure 7.9 illustrates the immigration, emigration and net immigration figures for Norway from 2000 to 2016.

Figure 7.9



Source: Statistics Norway (2017g)

With the exception of the negative GDP growth in 2009, Norway has generally experienced strong economic growth since 2004. Consequently, there has been a high demand for labor. According to Statistics Norway (2016a), employment has been the main reason for immigration since 2007. However, the Norwegian economy has experienced a decline since the summer of 2014. Both oil prices and oil investments have fallen markedly. The poor activity development has seen the unemployment rate rise significantly (Statistics Norway, 2016b). The market conditions might have contributed to the decrease in immigrations seen since 2011. Due to falling immigration numbers and steadily high emigration numbers, net migration has fallen by 21.300 since the peak year of 2012.

One can argue that the immigration supports the high housing price levels. However, as immigrants tend to move to countries with high growth in labor demand, there are reasons to believe that the forces generating this demand might also cause housing prices to rise. Separating immigration from other factors affecting the price of housing is difficult in practice (Hagelund et al., 2011).

Conclusively, the combination of immigration, urbanization and a growing number of smaller households has caused demand for housing in large Norwegian cities to increase, providing support for the price increases in these areas. The housing price growth in central areas is a lot stronger than in less central areas (Larsen, 2005). Consequently, the higher housing prices in the big cities contribute to increasing the average Norwegian housing prices.

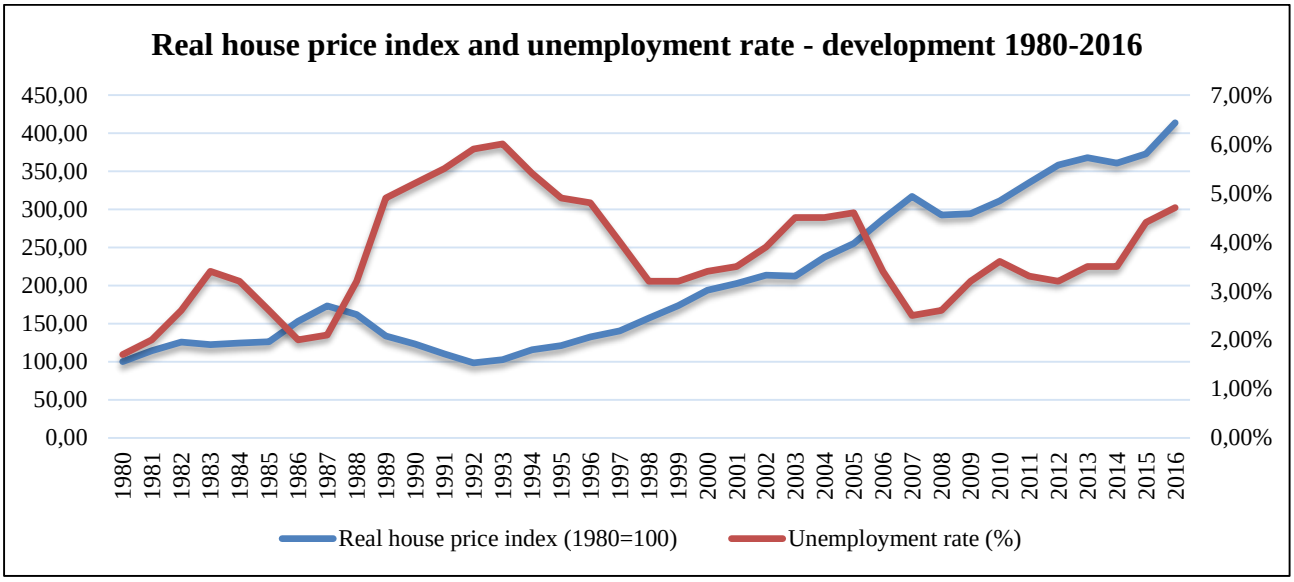
7.4 Unemployment

The level of unemployment can greatly affect the population's future expectations regarding their ability to service their debt, and consequently their mortgages and housing costs. This can, in turn, affect the demand and price for housing (Jacobsen & Naug, 2004a). Because it is such an influential factor in the housing market, the following section will analyze the development of the unemployment rate since 1980. The present unemployment rate in Norway is low compared to the OECD average, with their levels being at 4,7 percent and 6,8 percent respectively (OECD, 2016).

Two different unemployment figures are published in Norway. One figure applies to those registered as unemployed at the Norwegian Labor and Welfare Administration (NAV), while the other is based on interview surveys conducted by SSB through their labor force survey. NAV's figures provide precise numbers for everyone receiving unemployment benefits. However, SSB's figures give a more comprehensive illustration of the unemployment rate because it also includes those seeking employment without registering at NAV. This is also the measure of unemployment that is comparable internationally, as most countries apply the same methodology (Bø & Næsheim, 2015). As a result, the following analysis will be based on SSB's figures.

A higher unemployment rate normally leads to negative expectations regarding future income and financial solvency. As a result, households will become more reluctant to invest in housing because of their decreased ability to take on debt. When unemployment rates are low, the opposite is the case. As the unemployment rate normally increases during recessions and decreases during periods of economic expansion, it can provide a picture of the business cycle. Because the price of housing is often reflected through the economic conditions, the unemployment rate can serve as an important indicator for the price development of housing. However, through NAV, Norway offers extensive financial benefits to compensate the unemployed for their lost income (NAV, 2017). One can argue that this enables people to maintain their consumption levels while seeking new employment. If this is true, it is mainly when one expects to remain unemployed for a longer period of time that future expectations might worsen. Consequently, the previously mentioned tendencies might not be clear in the Norwegian market. The development of the unemployment rate is illustrated on the right-hand axis in figure 7.10, along with the real house price indices on the left-hand axis.

Figure 7.10



Source: Norges Bank (2017a), Statistics Norway (2017h)

As figure 7.10 illustrates, the unemployment rate has been below 5 percent for the most of the period between 1980 and 2016. However, although the rate has remained fairly low, it has experienced some fluctuations around the bubbles explained in section 2.1. The banking crisis of the late 1980s and the following years saw the unemployment rate increase from 2 percent in 1986 to 6 percent in 1993, the highest level during the observed time period. The period from 2005 t|o 2007 was characterized by strong economic growth in most sectors of the Norwegian economy, causing unemployment rates to drop (Eika, 2008). The years from 2008 to 2010 saw the rates increase again due to the financial crisis.

The developments over the last few years have to a great extent been affected by weak oil prices. After the demand from the petroleum industry had decreased towards the end of 2013, the situation was further intensified by significant drops in oil prices through the fall of 2014. The unemployment rate increased significantly from 2014 to 2015, going from 3,5 percent to 4,4 percent. The increase from 2015 to 2016 was not as significant, and the unemployment rate was at 4,7 percent in 2016. SSB argues that slightly stronger economic growth will stop the rate from increasing further and that it will gradually decrease to a level of 4,3 percent in 2019 (Statistics Norway, 2016c). Figures from early 2017 show that the unemployment rate is indeed decreasing (Statistics Norway, 2017i).

Norway has repeatedly been accused of preening its unemployment rate. In 2011, OECD published a comprehensive report about the Norwegian labor market. The report claims that Norway categorizes a large amount of their long-term unemployed people as disabled in order to keep the unemployment

rate low. It concludes that a big proportion of these disabled people would be classified as unemployed in other OECD countries (Aftenposten, 2011). More recently, a spokesman for the Legatum Institute made the same accusations, arguing that the unemployment level in Norway is artificially low (Withnall, 2015). Seeing as how Norway has one of the highest proportions of disabled people within the working age in the OECD, the unemployment level could arguably be significantly higher than what the official numbers suggest.

Figure 7.10 illustrates how real housing prices and the unemployment rate generally move in opposite directions over time. This is consistent with the underlying macroeconomic theory arguing that housing prices rise when fewer people are unemployed. However, this relationship is not true for the years 2008-2010 and 2012-2016. A possible explanation is that people expected a stronger increase in the unemployment rate during the financial crisis than what actually was the case. Because Norway got through the financial crisis without major financial stress, future expectations might have improved, in turn affecting housing prices. The development from 2012 to 2016 can possibly be explained by the increase in the total labor force and the number of people employed. However, the number of employed people has increased in most years where real housing prices and the unemployment rate have moved in opposite directions, so this is probably not the real reason behind the latest developments.

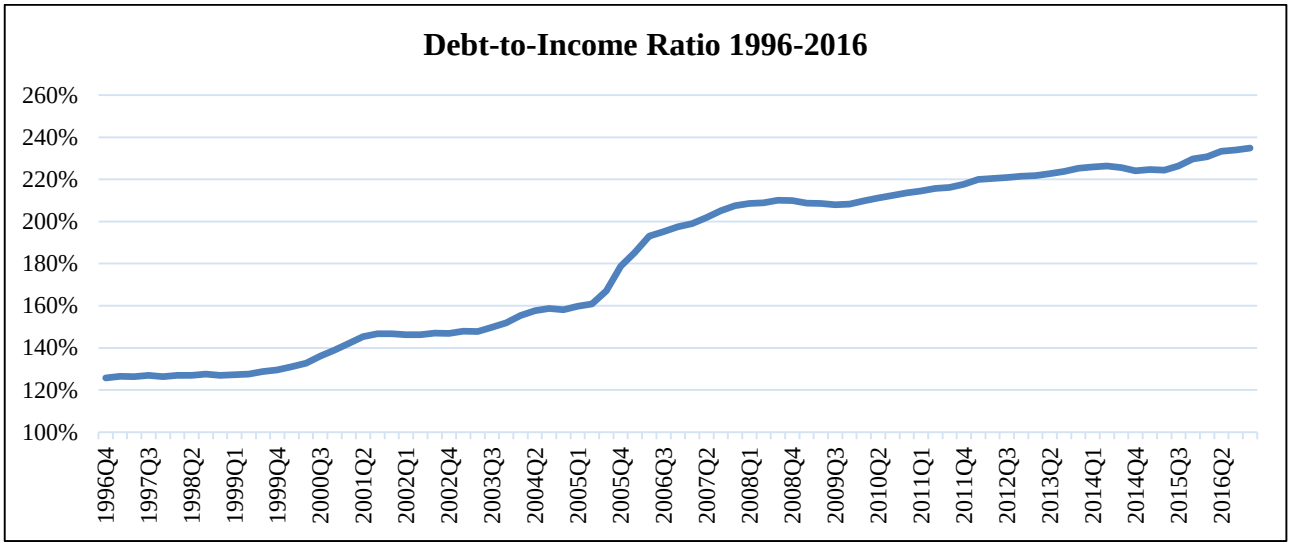
Conclusively, the unemployment rate in Norway has increased since 2012, but it is still fairly low compared to the OECD average. Despite this development, housing prices have continued to increase, contradicting the underlying macroeconomic theory. These findings imply that there are other fundamental factors that can better explain the development in housing prices.

7.5 Credit Market

7.5.1 Debt-to-Income Ratio

When examining the price level of the Norwegian market, it is necessary to assess the level of debt among households throughout the growth period. Increased housing wealth and ability to service more debt among households is a prerequisite when applying for increased loans and therefore required for the debt level to grow. The debt-to-income (D/I) ratio, calculated by Statistics Norway, measures the total debt among households relative to the total disposable income. Figure 7.11 shows the development of the D/I ratio among Norwegian households from 1996-2016.

Figure 7.11



Source: Statistics Norway (2017j)

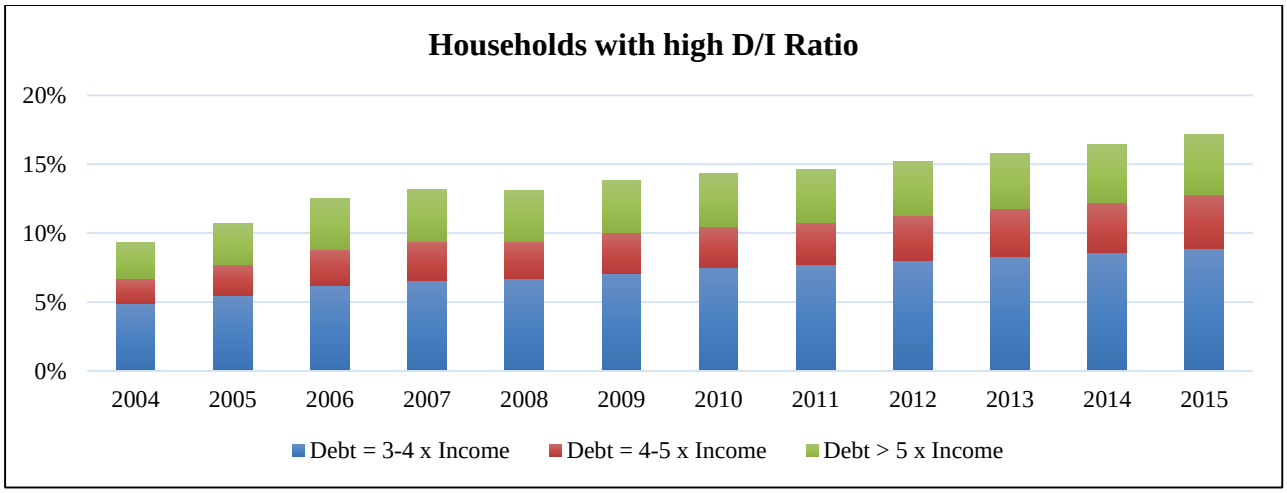
As illustrated in figure 7.11, the D/I ratio has increased significantly over the past twenty years and is currently close to 240 percent. The high D/I ratio is considered a result of the growth in housing prices. When housing becomes more expensive, the loan amount needed to finance the housing increases. The growth in D/I ratios for Norwegian households are also supported by several other factors in the Norwegian economy. Besides high housing prices, Norway is currently experiencing low interest rates, low unemployment and positive expectations related to households' and the nation's economic situation. These are all factors that support the high debt-to-income ratio. Low interest rates allow households to increase their level of debt without having to pay more interest expenses. This is an important factor as households often decide their level of debt based on their ability to pay the installments and interest expenses.

When the growth in household debt exceed the growth of other fundamental macroeconomic factors, like interest rate and income, it is often a sign that the economy is becoming more unstable and vulnerable. In economies with highly debt-financed investments, debt levels usually increase faster than the growth in production. Therefore, increased debt levels are worrisome to the central banks. Norges Bank' governor, Øystein Olsen, has expressed that they are more concerned with the rise in debt level than the rapid growth in housing prices. The reason is that a higher debt level increases households' vulnerability, and makes rapid declines in housing demand more likely to occur (Takla & Grande, 2017).

Because the banks offer mortgage loans with collateral in the housing, higher housing prices lead to higher mortgage loans. This mutually strengthening process in the mortgage supply markets may be an important element for increases in housing price level (European Central Bank, 2003). There have also been changes in the Norwegian credit market in recent years that may have resulted in the increased debt in Norwegian households. New loan products and increased time to maturity are some of the changes that might have influenced the Norwegian debt levels.

Figure 7.12 illustrates the changes in the portions of households which have a D/I ratio greater than 3. Between 2004 and 2015, the portion of households that have a debt more than three times their annual disposable income has increased from 9,3 to 17,2 percent. In the same period, the households with a D/I ratio of five or greater have increased from 2,6 to 4,4 percent. These households are the most vulnerable to higher interest rates and lower income, and the increases suggest that the risk of rapid declines in Norwegian housing market is increasing as well.

Figure 7.12



Source: Statistics Norway (2017j)

Conclusively, the high housing prices are supported by the growing level of debt among Norwegian households. However, it is necessary to mention the possibility that both the developments in housing prices and debt level are consequences of positive expectations among people regarding the housing market. It is, therefore, difficult to estimate the causal relationship between debt and housing prices.

7.5.2 Loan-to-Value Ratio

Disposable income among households is based on aggregate figures, meaning that households without debt are included in the measure. Consequently, the measures do not explain whether the

increased debt is due to households taking on more debt or if more households take on debt. This means that while the debt-to-income ratio might be high when comparing aggregate measures, it does not necessarily mean that the average household's total wealth includes a large share of the debt. As a result, the debt-to-income ratio does not serve as a good indicator of vulnerability among households. In order to get a better understanding of the debt burden among households, this section will examine their loan-to-value (LTV) ratio.

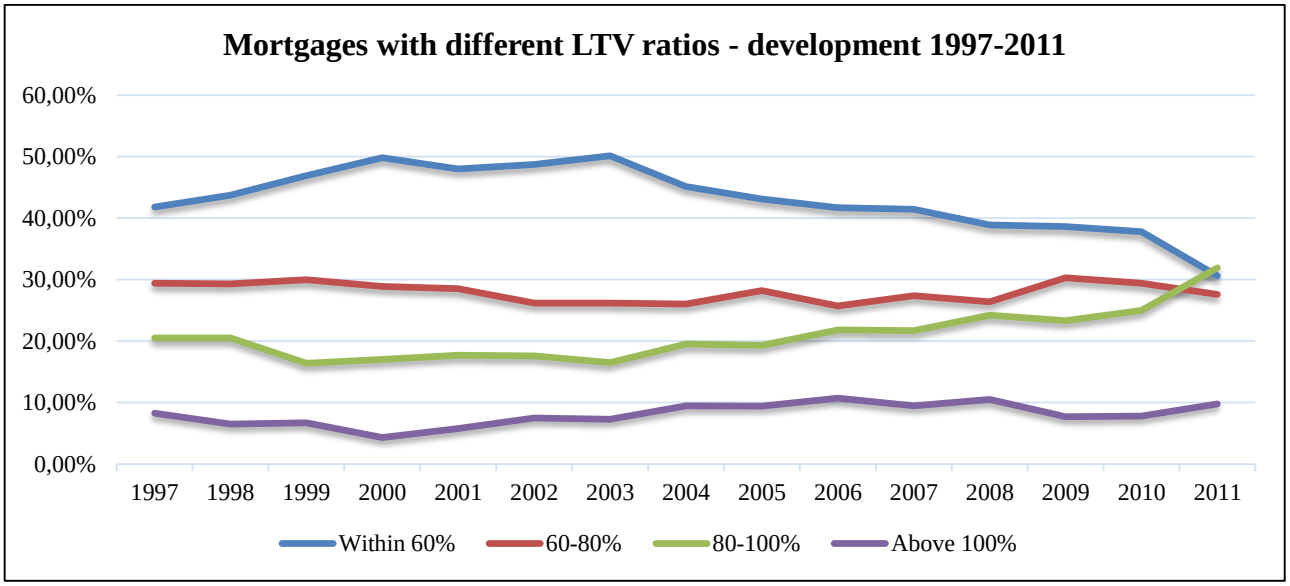
The LTV ratio measures the value of a mortgage relative to the value of the corresponding property, and is typically used by financial institutions when assessing mortgage risk. Households having mortgages with high LTV ratios can be heavily exposed to movements in the housing market because, while the value of the debt remains unchanged, the housing prices do not. In the case of falling housing prices, the household's equity might be significantly reduced, further increasing the LTV ratio. In general, a mortgage is considered riskier the higher the LTV ratio gets, and in practice the ratio can exceed 1, meaning that the value of the house is less than the mortgage.

The FSA conducts an annual survey of some of the biggest Norwegian banks issuing mortgages. The survey is called Boliglånsundersøkelsen, and has been conducted since 1994 (The Financial Supervisory Authority of Norway, 2017a). The survey's objective is to monitor the banks' practices with regards to mortgages and to make sure the banks comply with the FSA's guidelines for reasonable housing financing. As the developments of the debt burden among households are important for financial stability, these guidelines need to be strict in order to prevent households from getting mortgages they are unable to service. In December 2011, the FSA tightened the guidelines in order to improve financial stability. These adjustments lowered the maximum LTV ratio and increased the emphasis on thorough assessments of households' ability to service their debt. While the guidelines previously stated that repayable mortgages should not exceed 90 percent of the property's market value, the limit was reduced to 85 percent in December 2011. As for credit lines secured in housing, the limit was reduced from 75 percent to 70 percent. Additionally, when assessing the solvency of households, banks were advised to consider the effect of a 5 percent increase in interest rates. Previously, most banks stress tested their customers' economy with 3-4 percent increases in the interest rate (The Financial Supervisory Authority of Norway, 2017b). These regulations will be elaborated in section 7.6.2.

Figure 7.13 illustrates the proportional development of repayable mortgages with different LTV ratios between 1997 and 2011, as a percentage of the total portfolio[5]. Credit lines secured in housing are excluded from these numbers, and the percentages are based on the total number of loans. The share of mortgages with LTV ratios below 60 percent increased from 1997 to 2003 but then started to decrease until it hit a level of 30,6 percent in 2011. During the same period, the share of mortgages with LTV ratios between 60 and 80 percent remained fairly constant just below 30 percent, with a few minor deviations. Mortgages with LTV ratios between 80 and 100 percent decreased slightly in the late 1990s, but they experienced a steady increase until they hit a level of 31,9 percent in 2011. The share of loans with an LTV ratio of 100 percent or higher has remained relatively stable during the time period, with a few fluctuations. The share was at a level of 9,8 percent in 2011, compared to a level of 8,3 percent in 1997.

Overall, the LTV ratios of Norwegian households increased during this time period. The increasing ratio may have been caused by a combination of increasing housing prices and low interest rates, making it relatively inexpensive to service debt. Increasing wages and a low unemployment rate may also have contributed to the increased LTV ratios.

Figure 7.13

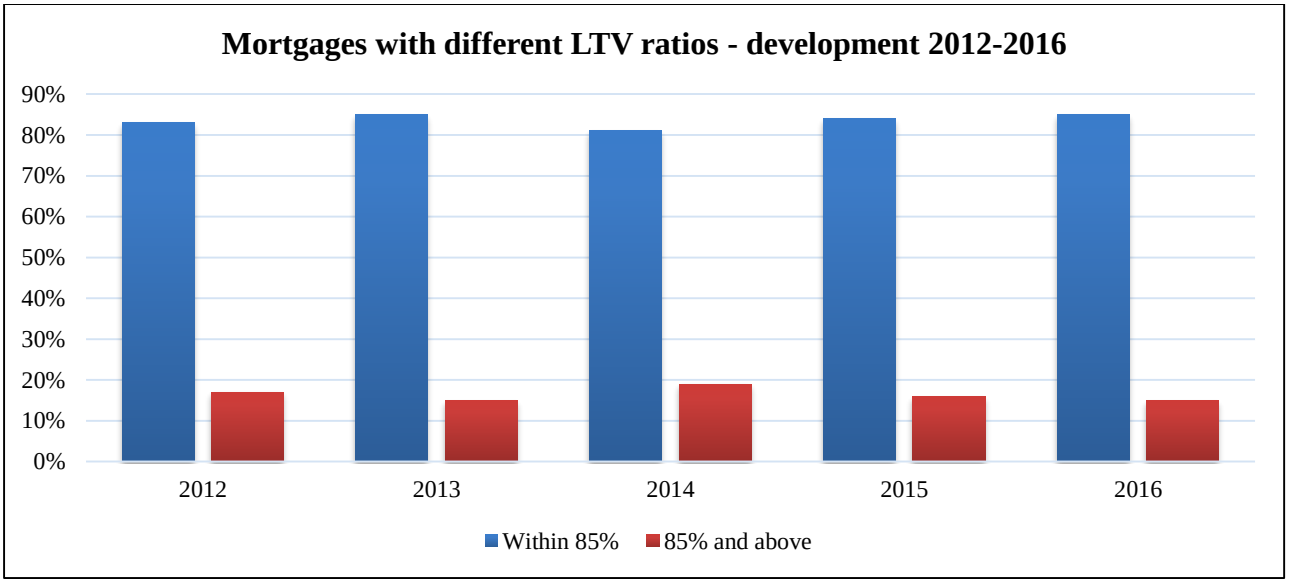


Source: The Financial Supervisory Authority of Norway (2017b)

[5] Figures prior to 1997 are not publicly available.

After the guidelines for reasonable housing financing had been adjusted in 2011, the FSA made changes to the categorization of LTV ratios, using only 3 categories compared to the earlier 4[6]. Consequently, it is difficult to compare the more recent figures to those observed prior to these changes. However, it is interesting to analyze the development from 2012 to 2016. Due to a lack of exact figures in the FSA's surveys the upper two categories have been combined. Figure 7.14 illustrates how the shares of mortgages with different LTV ratios have developed between 2012 and 2016. Credit lines secured in housing are also excluded from these figures, and the percentages are based on the total number of issued mortgages.

Figure 7.14



Source: Source: The Financial Supervisory Authority of Norway (2017b)

As figure 7.14 illustrates, there is no clear trend, and the share of both categories appear to remain fairly stable. The share of mortgages with LTV ratios of 85 percent and above has decreased slightly since 2014, possibly a result of the tightened guidelines. In 2016, 15 percent of mortgages have an LTV ratio of either 85 percent and above. In both 2014 and 2015, the share of new mortgages offered to households not fulfilling the requirements for servicing ability decreased. However, the figures from the 2016 survey show that this trend has been reversed. It appears like the banks have relaxed their requirements regarding servicing ability in their lending practice. It is important to keep note of the mortgages with very high LTV ratios, as these households are exposed to changes in the economy.

[6] The three new categories were "within 85 percent", "85-100 percent" and "above 100 percent".

Imbalances in the development of debt and housing prices can potentially affect the consumption of households and the economy's activity level, consequently causing losses for the banks.

7.5.3 Different Types of Financing

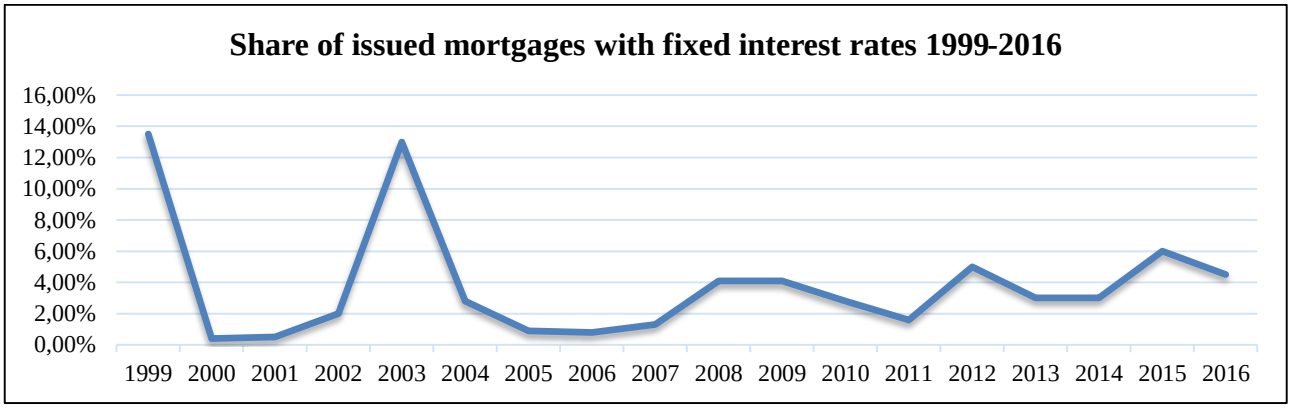
In recent years, the Norwegian credit market has been characterized by an increasing growth in real estate loans, as well as strong competition and the rapid emergence of new loan products. In order to limit this growth, there have been introduced several new regulations concerning the requirements for residential mortgages. These regulations are elaborated in section 7.6.2. The following section will describe the development of different types of mortgages issued to households.

7.5.3.1 Fixed-Rate Mortgages

Fixed-rate mortgages offer households the opportunity to lock the interest rate on their mortgages for a specific amount of time. This means that the repayable mortgage has the same loan costs each month during the determined time period. Because the loan payments are not affected by interest rate movements in the market, these types of mortgages provide stable and predictable costs, making it easier for households to plan their economy. On the other hand, because fixed-rate mortgage agreements are binding, they can reduce the households' economic flexibility. If the market interest rate is lower than the fixed rate, the household has to pay a premium if it wished to repay the mortgage before it expires. This can discourage households from locking the interest rates on their mortgages. However, in the case of early repayment, the household will receive a discount if the fixed rate is below the market interest rate. Common fixed-rate mortgage agreements in Norway offer households to lock the interest rate for 3, 5 or 10 years.

According to the FSA, the percentage of fixed-rate mortgages in Norway is very low. Norwegian households are almost exclusively having floating-rate mortgages. This was illustrated in Boliglånsundersøkelsen from 2016, where the percentage again fell after having increased significantly in 2015. Fixed-rate mortgages accounted for just over 4 percent of all mortgages issued in 2016. Figure 7.15 illustrates how the share of issued repayment loans with fixed interest rates has developed since 1999. Considering how the fixed interest rate was at historically low levels in 2016, the share of fixed-rate mortgages is still very low. The reason, Rolf Mæhle of Finance Norway argues, is that the population has limited knowledge about loans with fixed interest rates (Laustsen, 2015). He points out that the proportion of fixed-rate mortgages in Sweden and Denmark is significantly higher than it is in Norway.

Figure 7.15



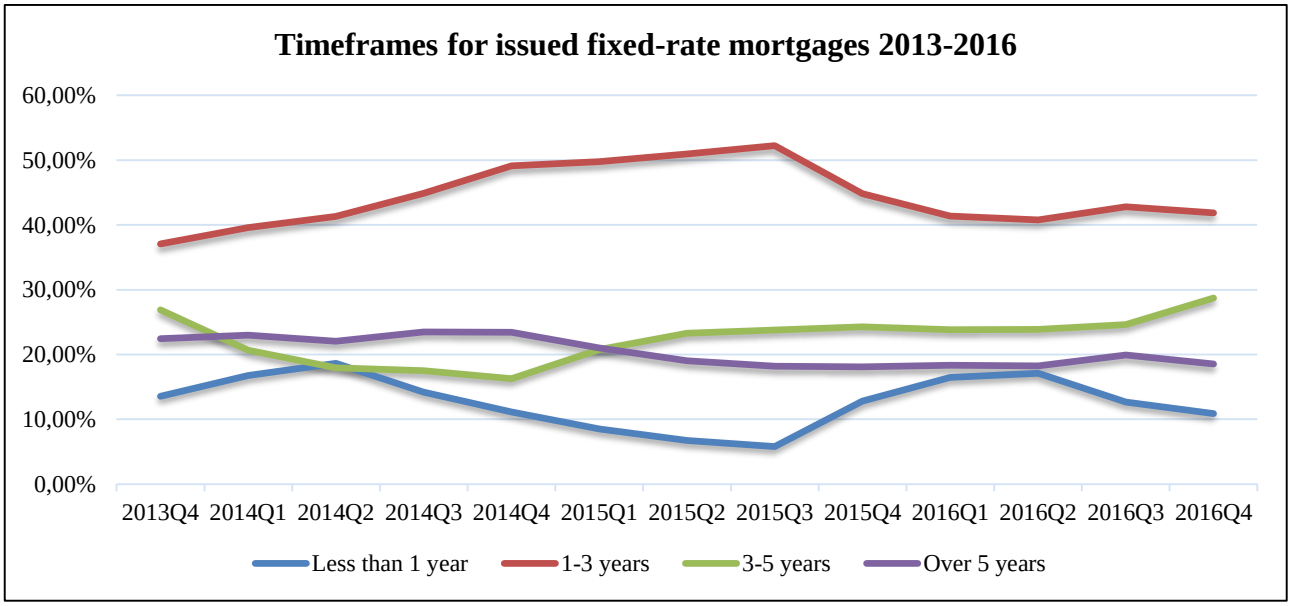
Source: The Financial Supervisory Authority of Norway (2017b)

Because the fixed rate takes the expectations of the floating rate into account, in theory, there is no difference between a fixed-rate and a floating-rate mortgage. In practice, however, this might not be true as banks operate with different profit margins, and interest movements may deviate from expectations. Therefore, it is reasonable to expect an increased demand for fixed-rate mortgages when the fixed rate is low, as households seek predictability. According to Rolf Mæhle of Finance Norway, households tend to lock their interest rates when the fixed rate is lower than the floating rate, but this is not necessarily profitable. Many households chose to lock their interest rates during the period 2002-2004 when the floating rate exceeded the fixed rate. Consequently, they missed the significant decline in interest rates in the following years (Mikalsen, 2016b). This explains the major deviation in 2003 and the following drop seen in figure 7.15.

The time frames for many of the fixed-rate mortgages are fairly short. In 2016, 86 percent chose to lock their interest rate for less than 5 years, while 44 percent locked it for less than 3 years. Only a small share of households chose to lock their interest rate for longer than 5 years. From those who chose to lock their interest rates, only 10 percent locked their entire mortgage (The Financial Supervisory Authority of Norway, 2017a). The shares of different timeframes for issued fixed-rate mortgages are illustrated in figure 7.16 using figures from Statistics Norway. However, because of some changing procedures, the figures are not directly comparable with the older interest rate statistics. This is because, among other things, loans in foreign currency are not included in the new statistics, and also because the timeframe categories are changed. Consequently, the figures only go back to the third quarter of 2013. It is important to keep in mind that, in contrast to the FSA's Boliglånsundersøkelsen, where the percentages are based on the total number of issued mortgages,

these figures are based on the total value of issued mortgages. As a result, there will be some differences. However, they do illustrate the recent developments.

Figure 7.16



Source: Statistics Norway (2017d)

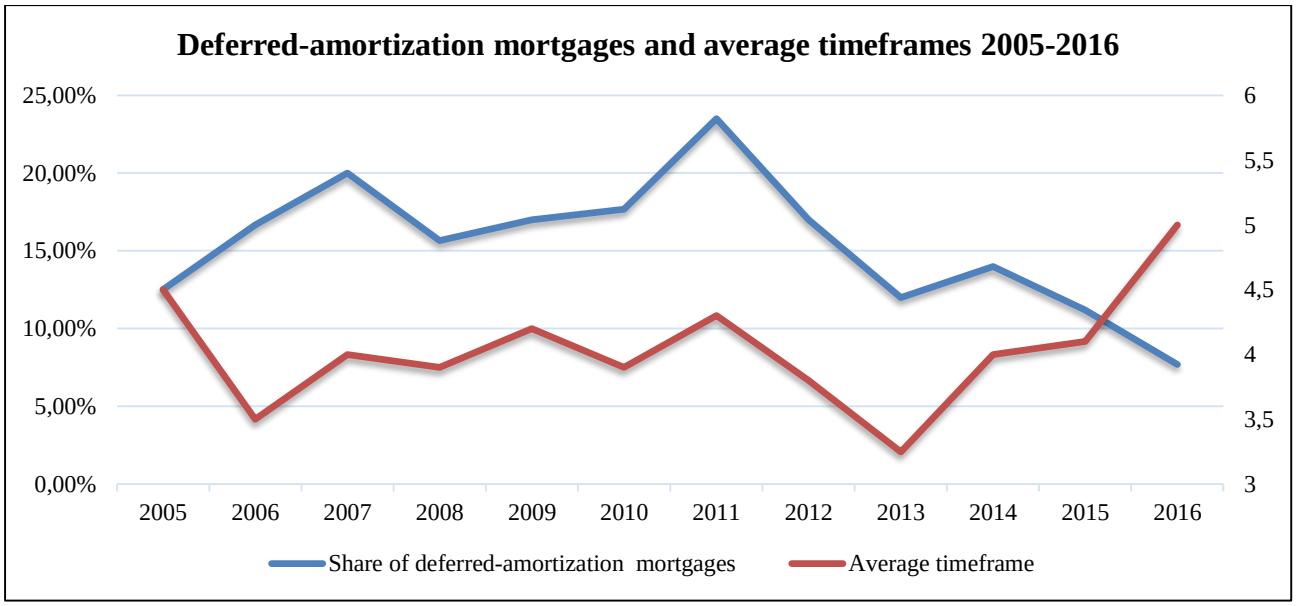
The share of fixed-rate mortgages is influential for how rapidly and significantly monetary policy changes affect the credit market, and eventually the economy in general. When there is a large share of floating-rate mortgages, and the timeframes for fixed-rate mortgages are short, monetary policy changes can affect the economy quickly. Over 95 percent of new mortgages issued to households in 2016 were based on floating rates, and the share of floating-rate mortgages has been significant for many years. The timeframes for fixed-rate mortgages are also fairly short, as illustrated in figure 7.16. Accordingly, households, in general, are exposed to changes in the economy, e.g. interest rate movements. In the case of rising interest rates, particularly vulnerable households may have trouble servicing their debt, possibly even defaulting on their mortgage. A larger share of fixed-rate mortgages would leave households less exposed, contributing to financial stability.

7.5.3.2 Deferred-Amortization Mortgages

In recent years, banks have offered repayable mortgages where the borrower only pays the interest on the mortgage for a specified period of time. Because the installments of the mortgage are not paid until later, the payments remain fairly constant during the interest-only term. When issuing deferred-amortization mortgages, most banks assume normal installments when assessing the servicing ability of the household. The share of deferred-amortization mortgages decreased from 11 percent in 2015

to just under 8 percent in 2016. The average timeframe for the interest-only period increased from 4 years in 2015 to 5 years in 2016 (The Financial Supervisory Authority of Norway, 2017b). Figure 7.17 illustrates the share of deferred-amortization mortgages on the left-hand axis and the average timeframe on the right-hand axis.

Figure 7.17



Source: The Financial Supervisory Authority of Norway (2017b)

In Boliglånsundersøkelsen from 2010, 2 out of 3 banks stated that they issued deferred-amortization mortgages to households also when the LTV ratio exceeded 90 percent. About 25 percent of every deferred-amortization mortgage issued in 2010 had an LTV ratio higher than 90 percent. In December 2011, the FSA updated their regulations on requirements for residential mortgage loans. One of the adjustments was aimed at deferred-amortization mortgages, suggesting that mortgages with LTV ratios exceeding 70 percent should require repayments. The new regulations caused the share of deferred-amortization mortgages to drop significantly in the following years (The Financial Supervisory Authority of Norway, 2017b). In 2016, 7 percent of all repayable mortgages with LTV ratios over 70 percent were deferred-amortization mortgages.

Economists argue that the decreasing share of deferred-amortization mortgages is a positive development. Christine Warloe of Nordea argues that although deferred-amortization mortgages may be necessary for certain periods, many households do not really have the need for these mortgages (Sparre, 2012). Warloe argues that they should be reserved for extraordinary periods, e.g. when entering the housing market for the first time, or when experiencing temporary unemployment.

Although the share of deferred-amortization mortgages has seen a downward trend since its peak in 2011, the average timeframe for these loans has actually increased. Consequently, many households do not get to take advantage of periods of low interest rates, which should be used to make principal payments on the mortgage. This leaves them vulnerable, and many can end up with financial problems if the interest rates rise or if the price growth in the housing market stops (Ravnaas, 2014).

When the period of interest-only payments expires, the household normally has three options. The first one is to convert the loan into a regular mortgage with an amortization plan, where the household makes both interest and principal payments. The second option is to extend the period of interest-only payments or to refinance with a new deferred-amortization loan. The third option is to repay the mortgage in full, either by means of savings or by selling the property. The options available will often depend on the household's financial situation, the credit- and housing market conditions, and the terms of the mortgage agreement.

Danmarks Nationalbank (2011), the central bank of Denmark, argues that the introduction of deferred-amortization mortgages contributed to the Danish housing bubble, which ultimately burst in 2007. If the prices in the housing market increases, new mortgages with amortization will experience an increase in overall payments compared to deferred-amortization mortgages. The higher cost will likely dampen the demand for housing and accordingly slow down the price growth. On the contrary, if housing prices decline, new mortgages with amortization will experience a larger decline in payments compared to deferred-amortization mortgages. The decreased cost will likely stimulate demand, and ultimately cause housing prices to increase. This stabilizing effect is lost when deferred-amortization mortgages gain ground in the housing market (Danmarks Nationalbank, 2011). When households get deferred-amortization mortgages, they might take on more debt than they normally would, because the installments of the mortgage are not paid until later. According to Ola Honningdal Grytten, a professor at the Norwegian School of Economics, argues that a high percentage of deferred-amortization mortgages is a classical sign of a housing bubble (Midtsjø & Lorentzen, 2012).

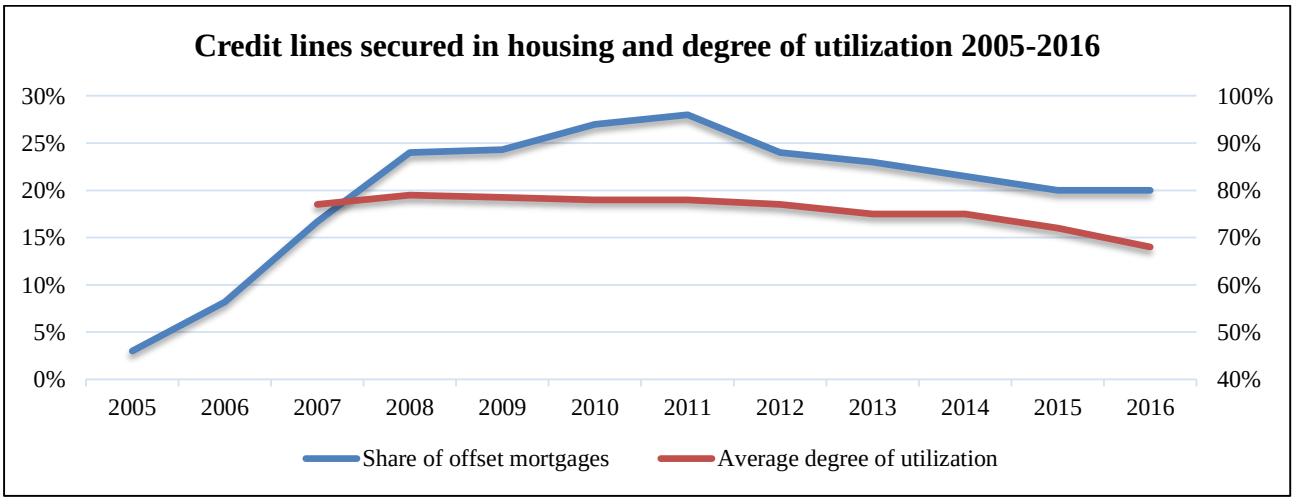
In an attempt to limit the housing price growth in Norway, the Ministry of Finance adopted new regulations regarding requirements for new residential mortgage loans in January 2017. These regulations state that deferred-amortization mortgages cannot exceed 60 percent LTV ratios. If the loan exceeds 60 percent of the property value, the financial institution issuing the mortgage shall require repayments (The Ministry of Finance, 2016a). It will be interesting to see what effects the new regulations will have.

7.5.3.3 Credit Lines Secured in Housing

Credit lines secured in housing is a relatively new financial product, and also different from the repayable loans previously described. It is basically a normal mortgage, but it offers households greater flexibility. The basic concept is that households are granted credit lines secured in the housing, where the security is the gap between the value of the remaining mortgage and the maximum LTV ratio for the loan. In other words, if the mortgage of a household has an LTV ratio below its upper limit, the credit lines allow the household to extract the difference. Because the LTV ratio of a mortgage decreases when housing prices increase, households are able to benefit from the appreciation in value before the housing is sold. It is up to the household to decide when it wants to withdraw money or when it wants to make payments on the credit line. Additionally, interest is only calculated from the amount the household chooses to make use of. Credit lines secured in housing were introduced around 2005 and rapidly gained ground in the credit market. It was evident that they satisfied the needs of many households, especially those who had paid off most of their debt and otherwise had a healthy economy (Finance Norway, 2013).

In 2016, credit lines secured in housing accounted for about 20 percent of total mortgages issued from banks and mortgage companies. The average degree to which households utilize their credit lines were just below 70 percent (The Financial Supervisory Authority of Norway, 2017a). Figure 7.18 illustrates the share of credit lines secured in housing on the right-hand axis and the average degree of utilization on the right-hand axis[7].

Figure 7.18



Source: The Financial Supervisory Authority of Norway (2017b)

[7] Figures on degree of utilization are only available from 2007.

In Boliglånsundersøkelsen from 2007, nearly all banks reported that they allow significantly lower LTV ratios for credit lines secured in housing compared to normal mortgages. The majority of the banks had upper limits of 75-80 percent LTV ratios for these mortgages. In March 2010, the FSA presented regulations for reasonable housing financing, suggesting that credit lines secured in housing should normally not exceed 75 percent of the property's value. These regulations were further tightened in December 2011, lowering the suggested upper limit to 70 percent (Finance Norway, 2013). The new regulations caused the share of credit lines secured in housing to drop after having peaked in 2011, and it has seen a downward trend since then.

Credit lines secured in housing to a great extent serve as a replacement for the more expensive consumer loans many households resort to in need of extra money. Because the interest rates on these credit lines are generally more favorable, they represent a significant interest rate saving for households (Finance Norway, 2013). According to a survey conducted for Finance Norway in 2011, more than 50 percent of households use their credit lines to renovate or refurbish their housing. This is a sensible use of the mortgage, seeing as it will probably increase the value of the housing. However, many households use their credit lines for consumer goods. Rolf Mæhle of Finance Norway points out that it is important to keep in mind that the loan eventually has to be paid down (Gjendem, 2011). The survey also reported that although it is optional, 70 percent made regular repayments on the mortgage, implying that the majority of households are able to handle the flexibility of the loan in a reasonable manner.

The regulations introduced in March 2010 and December 2011 suggest that the FSA wants to reduce the share of these loans, offering it primarily for households with solid economies. As mentioned earlier, the Ministry of Finance adopted new regulations regarding requirements for residential mortgage loans in January 2017. These regulations state that credit lines secured in housing cannot exceed an LTV ratio of 60 percent. It will be interesting to see what effects the new regulations will have (The Ministry of Finance, 2016b).

7.6 Banking Regulations

After years of rapid growth in the housing market, the Norwegian government has introduced several regulations on the banks in an attempt to avoid a housing bubble. This section will explain the regulations influencing the banks' ability to grant mortgage loans and examine the impact that these restrictions have on the Norwegian housing market.

7.6.1 Basel III

After discovering the banks' vulnerability during the financial crisis, the Basel Committee of Banking Supervision (BCBS) launched a program with the purpose of reviewing its capital adequacy guidelines. The program focused on ensuring financial stability and a more resilient banking sector that should not be able to damage the economy by excessive risk-taking (Basel Committee on Banking Supervision , 2010). This program resulted in the capital adequacy framework, Basel III, which Norwegian banks began implementing in 2013. All the requirements in the framework have to be implemented by the banks before March 2019.

One element of the new framework is the requirement that all banks are must maintain a solvency ratio of seven percent or higher. Before 2013, the banks were only required to keep a minimum solvency rate of two percent. The new requirement means that banks have to either raise more capital or decrease their level of lending. The Basel III framework also requires banks to increase the quality of their capital base compared to Basel II, making the banks more equipped to manage risk effectively.

In addition to the capital requirements, Basel III introduced liquidity and leverage requirements meant to prevent excessive borrowings and secure that the banks are better prepared for financial stress. The requirements order banks to maintain higher Liquidity Coverage Ratio and Net Stable Funding Ratio than they were required to by the Basel II regulations. After the implementation of Basel III, banks which hedge financial risks will be penalized. The fear of penalties should result in decreased liquidity in the markets and increase the costs related to hedging financial risks (Basel Committee on Banking Supervision , 2010)

7.6.1.1 Effects of Implementing Basel III

Abiding by the requirements from the new Basel III framework, demand several changes in the banks' operations. Achieving the capital- and liquidity requirements involve costly changes that affect the banks' profitability and have negative effects on their revenue. To establish and maintain Basel III's required Net Stable Funding Ratio, banks are likely to increase the average maturity on their internal funding which results in higher interest expenses. The profitability is also impacted by the liquidity requirements that results in a larger portion of the balance being assets with low expected returns.

Basel III attempts to create a banking sector with lower levels of risk. However, the reduction of risk also implies that the banks' levels of return are reduced. To relieve the high pressure on profitability, banks are likely to make strategic changes to ensure that extra costs related to the changes are paid

for by the customers. This is achieved by adjusting the lending rates, expanding the portion of liquid assets or introducing new fees. Both DNB and Danske Bank stated that they would be forced to increase their lending rates to accommodate the requirements of the Basel III framework (Landre & Sundberg, 2013).

However, Norwegian banks are also attempting to reduce their costs significantly. In 2016, DNB stated that they were closing 59 branches, while SpareBank 1 plans to close 21 branches in the upcoming years (Lofstad, 2016; NTB, 2016a). This will reduce the burden being placed on the customers following the new regulations.

Basel III will impact the Norwegian housing market if the banks determine to raise their mortgage lending rates due to the new regulations. The new regulations will also relieve some of the pressure in the housing market if the banks decide to limit their mortgage lending, restraining the households' ability to finance housing investments. As of May 2017, there is limited evidence of the Basel III framework having any negative influence on the Norwegian housing prices. There have been minor periodical increases in lending rates, but the overall trend since 2013 has been declining interest rates on mortgages. Due to the low risk-weights of mortgages, there is a possibility that Basel III have contributed to banks offering more mortgages to limit their capital requirements.

7.6.2 The Mortgage Loan Regulations

The Norwegian banks are required to follow a set of mortgage loan regulations introduced by the government. These regulations are based on the situation in the housing market and updated when the Ministry of Finance believe it is necessary. This section will, therefore, explain the requirements that banks are currently forced to fulfill when granting mortgage loans (The Ministry of Finance, 2016b).

The 15 Percent Equity Requirement

As a respond to the increasing level of debt among Norwegian households, the Ministry of Finance chose to introduce stricter regulations for mortgage loans in December 2011. The regulations were advised by the FSA who feared that the high level of competition in the banking industry had forced banks to grant loans to households with high LTV and high risks of defaulting. To increase the financial stability, the MoF introduced regulation which stated that the banks could only grant mortgage loans with a loan-to-value less than 85 percent.

5 Percent Rate Increase Test

The new regulations from 2011 also required banks to ensure that customers would be able to repay their mortgages if the interest rate grew by 5 percent. As discussed in section 7.2, Norwegian homeowners are extremely vulnerable to increasing interest rate. The high level of vulnerability was the main reason for the new regulations. The MoF believe that ensuring that all households could handle a five percent increase in interest rate will secure a more stable economy.

Maximum D/I Ratio of 5

From January 1st, 2017, there have been even stricter regulations on Norwegian mortgages. One of the new regulation is the requirement that households cannot be granted mortgages that cause their total debt higher than five times their annual gross income. The calculation of total debt includes all types of debt, e.g. student- and consumer loans.

The 40 Percent Equity Requirement on Secondary Residences

The 2017 regulations also require that households that are applying for mortgage loans for housing other than their primary residence cannot have an LTV of more than 60 percent. However, this requirement only applies to mortgages for housing in Oslo. The MoF argued that the regulation was necessary due to the amount of housing purchased for investment purposes and the high pressure of the housing market in Oslo.

It is important to note that the current mortgage loan regulations allow banks to grant 10 percent of their loans to households that do not fulfill all the requirements. This limits the effects of the regulations. The FSA has advised that the 10 percent rule should be removed, but the Ministry of Finance have decided to keep it. However, the rate has been lowered to 8 percent in Oslo and banks are only allowed to grant mortgages of a total of 40 mill NOK annually to these households (Vedeler et al., 2016). These mortgages are usually granted to applicants with secure jobs, high educations, and good prospects.

7.6.2.1 Effects of the Mortgage Loan Regulations

The direct effect of the mortgage regulations from 2011 and 2017 is that some households that would have been granted mortgage loans in the past are now being rejected. In theory, this should lead to a decrease in the total amount granted as mortgages, resulting in declining housing demand. In a survey from March 2017, twenty percent of the respondents claimed that the 15 percent equity requirement and the D/I ratio limit of five restrict their ability to buy a house (EiendomsMegler 1, 2017).

Requiring that all household have 15 percent of the housing's value in equity before granting mortgage loans should limit the number of households eligible for mortgage loans. The equity requirement is primarily an obstacle for single-person households and younger buyers. This is not a surprise as younger households have had less time to set money aside for housing. The 15 percent equity requirement results in fewer and lower mortgage loans to households with low equity and often low income. The stricter lending policies are decreasing the total risk level of the banks as they avoid granting the mortgages that have the highest risk of defaulting.

There are also several regulations that are directly targeting the low-income households. The banks are required to ensure that mortgage customers can pay their monthly installments and interest expenses with their current income even if the interest rate grows by 5 percent. This is another attempt to reduce the banks' vulnerabilities by eliminating the riskiest mortgages.

In 2017, another obstacle for low-income households was introduced. The new regulation states that the households are allowed a maximum D/I ratio of five. Like the other regulations, this makes it harder for banks to grant mortgages to the customers that are most vulnerable to changes and, therefore, most likely to default.

The revised mortgage regulations introduced in January 2017 also included regulation aimed at limiting the housing investment in Oslo. The rapid growth in house prices in the Norwegian capital is continuing, and the MoF believes this is partly due to housing being bought for investment purposes. In an attempt to limit the number of housing being bought as secondary residences, the government ordered banks only to grant mortgage loans for secondary housing with less than 60 percent LTV. This has created a situation where many households are not able to buy a new house before selling their old one, resulting in hesitation and fewer houses on the market. According to Carl Geving, CEO of the Norwegian Realtor Association, it is still too early to draw conclusions regarding the long-term effect of the regulation. However, they expect that the regulation will have limited effect on the housing prices (Buer, 2017).

There has been some criticism of the Norway mortgage loan regulations. Some experts believe that the 15 percent equity requirement resulted in an unwanted and reversed effect. Instead of first-time buyers being granted mortgages that they can afford based on their salary, they are often granted larger mortgages with security in their parents' homes. When first-time buyers are helped by parents who feel responsible for helping, the prices often exceed the valuations which help raise the housing

prices (Kaspersen, 2012). However, the D/I ratio limit introduced in 2017 is likely to restrict the possibility of parents helping their children get mortgages with high levels of risk.

The Norwegian mortgage regulations are primarily designed to prevent banks from granting high-risk mortgage loans to the households most likely to default on their debt. The regulation is currently making it hard for younger and single-person households to get into the housing market. According to Norwegian law, households are not allowed to increase the annual rent more than the annual increase in the CPI. However, they are allowed to adjust the rent to the market price for rent when there is a change in tenants. The increased rents make it even harder for non-homeowners to save up the needed capital and are part of the reason why the number of Norwegians renting is increasing (Statistics Norway, 2016d).

The changes made in the Norwegian mortgage regulations in 2011 was not able to slow down the increasing housing prices. However, as shown in section 7.5.2, the number of households with an LTV higher than 85 percent have gone down since 2012. This results in banks that are less vulnerable to financial stress. It remains to be seen whether the new regulations that came into force in January 2017 will decrease housing investment in Oslo and result in banks that are even better equipped to handle recessions. Removing the banks' opportunity to grant loans to households which do not fulfill the requirements could be an effective tool in the future if the new regulations prove to be unable to impact the market. If the prices continue to rise, removing this element should be considered ahead of the 2018 revision of the mortgage loan regulation.

7.7 Housing Taxation

In 2003, Paul van den Noord wrote a paper examining the effects of tax benefits on housing prices. He concluded that beneficial housing tax laws contribute to an increase in the equilibrium level of housing prices (van den Noord, 2003). Taxation of housing is a popular discussion topic in Norway and frequently debated by Norwegian politicians and economics. Due to Norway's many beneficial tax schemes, the attractiveness of housing as investments increases, contributing to the already high level of housing prices. This section of the paper will, therefore, present the most important aspects of the Norwegian housing tax policies.

7.7.1 Tax Deduction of Interest Expenses

One of the important tax benefits that given is the tax deduction of their annual interest expenses. Although the tax deduction is not designed to foster housing investment, the significant tax deduction

from mortgage debts makes housing investment more appealing. The argument for the tax deduction is to weigh up for the taxes on interest income. The tax on interest income is, therefore, the same as the tax deduction of interest expenses. As of 2017, the interest income is taxed at 24 percent, but the government has warned that they will decrease the tax to 23 percent in 2018 (Nordstrøm & Lorentzen, 2017). The tax deduction reduces the effective interest rate of debt in Norway, which support a higher level of housing prices.

Even though the tax deduction applies to all types of debt, the majority of deduction stems from interest expenses on mortgages. The element that separates housing investments from other investments is the absence of taxation on returns. Because housing investments receive the same tax deductions as other investments without the taxation on returns, it is understandable that Norwegians invest heavily in their houses.

7.7.2 Tax on Wealth

A large portion of the Norwegian households' wealth comes from the equity in their housing. According to §4-1 in the Tax Administration Act of 1999, the taxable wealth from housing capital is determined by its market value on January 1st of the taxation year (Lovdata, 1999). The Norwegian taxation of wealth is calculated from the citizens' net worth and is currently 0,7 percent of a person's wealth over 1,48 million NOK. All Norwegian citizens with a net worth below 1,48 million NOK are currently exempt from paying wealth tax.

7.7.3 Tax Value of Housing

Before calculating the households' wealth tax from their housing capital, the value of the houses has to be assessed. As a result of a political desire to secure low housing costs, the assessed value calculated for tax purposes are significantly lower than the housing's actual value. The Norwegian laws for evaluating the tax value of housing state that the tax value of a primary residence has to be equal to or less than 30 percent of the housing's market value. For secondary residences, the maximum tax value is 60 percent of the market value.

Given the current regulations for the wealth tax and the tax value of housing, homeowners can have significant equity in housing without paying taxes.

Example:

Assuming that all of his/her wealth is placed in the house, a homeowner can own a mortgage-free home with a market value of 4,9 million NOK without having to pay taxes:

$$1{,}480{,}000 \text{ NOK} / 30\% = 4{,}933{,}333 \text{ NOK}$$

If the same person decided to deposit the 4,9 mill NOK in a bank, the government would require 0,7 percent tax of the wealth exceeding 1,48 million NOK:

$$(4{,}900{,}000 - 1{,}480{,}000) * 0{,}7\% = 23{,}940 \text{ NOK}$$

By investing in housing rather than deposit the money in the bank, the homeowner will save 23,940 NOK annually.

Due to the favorable Norwegian tax laws, it is beneficial for households to invest their money in housing rather than other financial assets. The major financial differences between investing in housing and depositing money in the bank increase the demand for housing as households seek to reduce their annual costs. Therefore, the tax schemes for the wealth tax on housing capital and the valuation of houses is a contributing factor to the high level of prices in the Norwegian housing market.

7.7.4 Taxation of Sales Profits

As mentioned in section 4.1.1, the sales profits from housing investments are subject to different tax regulations than investment in other financial assets. Interest income, rental income and capital gain from investments are taxed at 24 percent, while few people pay taxes on the gain from housing investments. The reason for this is the tax laws that make it fairly easy to avoid paying taxes when selling a house. For someone to be exempt from paying taxes they need to fulfill two requirements set by the Norwegian government (The Norwegian Tax Administration, 2017):

1. The seller must have lived in the house for at least one of the last two years
2. The house must have been purchased more than one year from the date of the sale

Since these requirements are easy to meet for homeowners, very few pay taxes when selling their home. In addition to this, if the seller sells with a deficit less than five years after purchasing the house, the loss is tax deductible (The Norwegian Tax Administration, 2017).

7.7.5 Property Tax

The property tax is a municipal tax scheme that the Norwegian municipal councils can choose whether to impose or not. The councils can also decide the level of property tax, as long as they stay within the national tax regulation which states that the tax has to between 0,2-0,7 percent of the property's market value. The property tax is not dependent on the owners' financial situations, as it is the housing that is subject to taxation. In other words, the owner's level of equity in the housing is insignificant.

As of 2016, 365 out of the 443 Norwegian municipalities have decided that their citizens should pay property tax. In 2015, when 355 municipalities enforced the property tax, the national revenue from the tax scheme was over 11 billion NOK (Statistics Norway, 2016e).

The property tax is the only common Norwegian tax scheme that lowers the demand for housing. However, the impact of the tax scheme is limited due to the low tax rates and the fact that is heavily outweighed by the tax schemes favoring housing investments.

7.7.6 Tax on Rental Income

The tax rate on rental income is currently 24 percent, which is the same as the tax rate on capital gain. However, Norwegian households are exempt from paying taxes on their rental income if the tenants pay less for the rented-out areas than they would pay for the homeowners living area. This means that homeowners that would be able to rent out their house for 200 000 NOK annually can make 200 000 NOK from renting out other residences without paying taxes. All households are also exempt from paying taxes on rental income less than 20 000 NOK annually (Parr, 2016).

The tax exemptions on rental income were sanctioned to incentivize housing investments by allowing homeowners to rent out parts of their homes. As a result, households are investing more money into housing as they can use the houses as sources of additional income.

7.7.6 Effects of the Norwegian Tax Schemes

As shown in this section, the Norwegian tax regulations heavily favor housing investments compared to other types of investments. There are several tax deductions and exemptions that increase the

profitability of owning housing, which results in higher demand. The Norwegian tax laws are therefore one of the exploratory factors that support a high level of prices in the Norwegian housing market.

There have been advocates for removing or limiting the tax deductions from interest expenses. Elisabeth Holvik, chief economist at Sparebank1, is in favor of removing the tax deductions completely. She argues that Norwegian households are taking on more debt due to the tax scheme and that this will have negative effects in the long run. These arguments are supported by the IMF, who has advised Norway to remove the tax deductions (Stavrum, 2012). Removing the tax scheme would result in higher interest expenses and remove some of the incentives for housing investments.

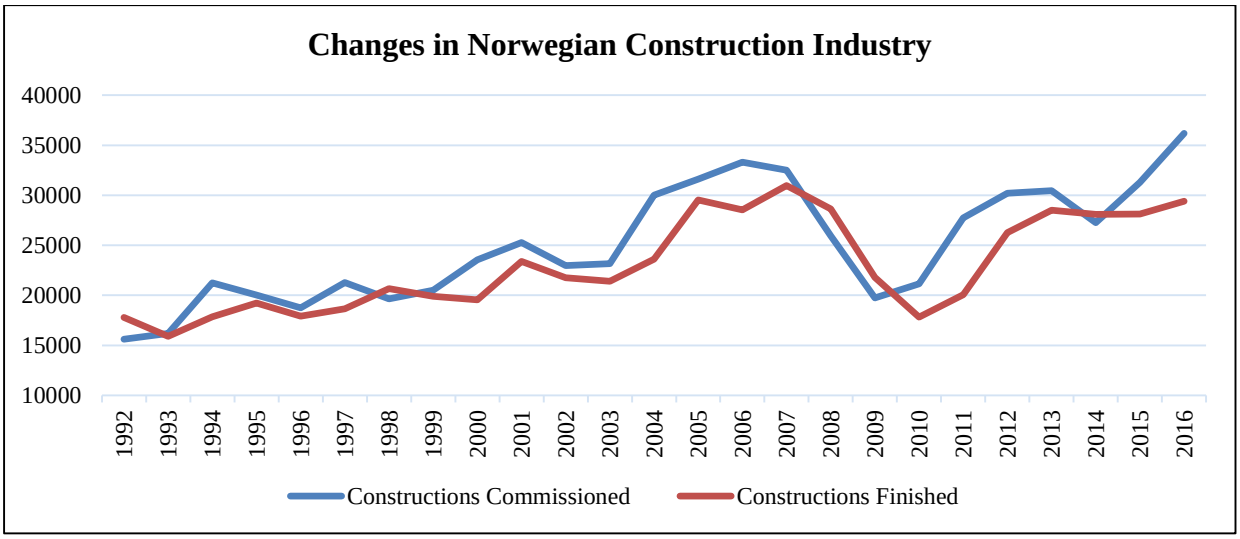
7.8 Housing Market Development

7.8.1 New construction

Even though changes in short-term housing prices are decided by the demand for housing, an increase in housing stock will impact the housing prices in the long-run. Therefore, it is important to examine whether the housing supply has begun responding to the extraordinary growth in housing demand.

The supply of housing is determined by building regulations, resources and the expected profits generated from new constructions. Figure 7.19 shows the annual new constructions commissioned and finished in Norway from 1992-2016. Statistics Norway predicts future growth in new housing and expects 41000 new construction started in 2018 (Moltubak, 2017).

Figure 7.19



Source: Statistics Norway (2017k)

As illustrated in figure 7.19, the new constructions commissioned increased in 2015 and 2016. The increased commissioning of new constructions will result in a higher housing supply once they are finished. If the predictions made by the analysists at Statistics Norway is correct, the number of new housing will continue to grow for several years. This will help dampen the massive growth in Norwegian housing market that has been happening in later years.

Even though the housing stock has not responded sufficiently to the increased demand for housing, the process of increasing the supply has started. According to the housing price models, an increased supply of housing will result in a lower level of housing prices. In other words, the housing price models predict declines in Norwegian housing prices shortly if the high level of new constructions commissioned continues.

7.8.2 How Long Does It Take to Sell a House?

When evaluating whether an economy is experiencing growth or decline, it can be useful to examine the number of days that houses stay on the market until they are sold. When houses are sold quickly, it indicates that the economy is going well, while houses tend to stay on the market longer during recessions. Since 2011, Real Estate Norway, have published statistics that have shown the monthly changes in the average turnover time for houses. The turnover time for a house is the period from it is put up for sale to someone buys it. Figure 7.20 and 7.21 shows the monthly and yearly averages in turnover times in days in the Norwegian housing market.

Figure 7.20

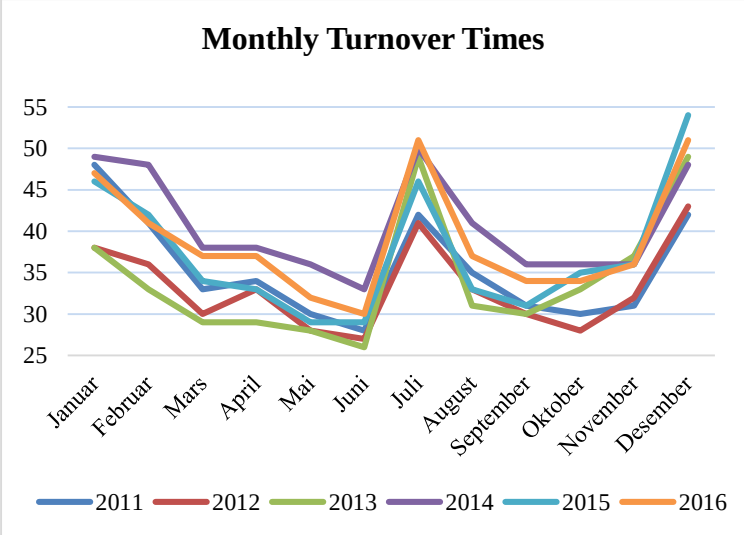


Figure 7.21

Source: Real Estate Norway (2017)

From 2013 to 2014, the turnover time rose by nearly 19 percent. 2014 was also the first year that Norway experienced a decline in housing prices since 2008. The housing price decline in 2014 was mainly a consequence of the significant drop in the price of crude oil. Because oil and gas represent 48,2 percent of Norwegian income from export, major changes in oil prices and gas prices influence the Norwegian economy greatly (Statistics Norway, 2017l). This support the assertion that the turnover time for housing is an indicator of the nation's economic situation. After 2014, houses are being sold quicker, although it is not being sold as fast as they were in 2011-2013.

It is important to note that the turnover times have been relatively low throughout the period included in the statistics. Kenneth Aadland, CEO of Proaktiv Eiendomsmegling, argue that short-term changes in turnover times are poor indicators of the state of the market because they are often caused by factors that are insignificant in the long-run. However, when the turnover times are low over a long period, it indicates a growing market (Parr, 2014).

Low turnover times are evidence of a market with high activity and many buyers competing for few houses. In markets where these factors are present, the demand for housing is high compared to supply, which results in growing housing prices. Hence, the low turnover times experienced in Norway since 2008 support the high price level of the Norwegian housing market.

7.8.3 Turnover Rate

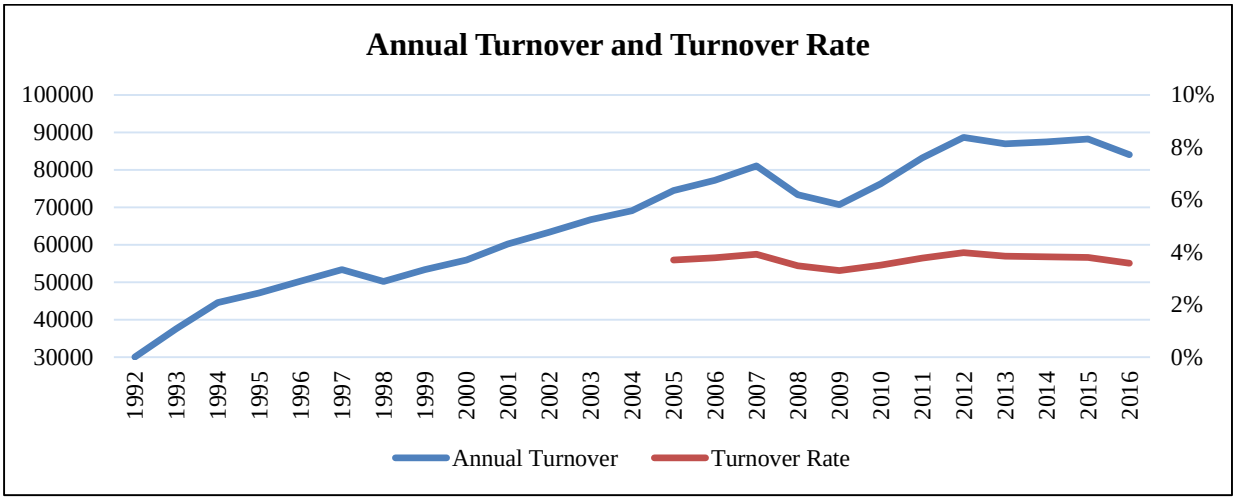
The rate of houses which changes owner annually is another indicator of housing market developments. A high turnover rate is often a result of expectations of future growth which lead to housing being purchased for investment purposes.

A survey completed by EiendomsMegler 1 in March 2017 concluded that the large majority of Norwegians expect the housing prices to increase in the next 12 months. The same level of optimism was recorded in the years 2009-2012, while people were expecting prices to be stable from the start of 2013 and halfway through 2016. In the years during the financial crisis of 2007-2008, people were expecting a decline in housing prices (EiendomsMegler 1, 2017). As shown in figure 7.22, changes in the annual turnover in the Norwegian housing market has corresponded with the level of optimism among people regarding short-term developments in housing prices.

During the Norwegian banking crisis, the nation experienced its lowest recorded turnover rates. At the beginning of the 1990s, less than 1,75 percent of the Norwegian households sold their housing annually. In 1993, the annual turnover rate grew significantly and helped fuel the growth in

Norwegian housing prices. Since 2005, the turnover rate has been relatively consistent at levels between 3,3 and 4 percent.

Figure 7.22



Sources: Statistics Norway (2017e; 2017m)

Jacobsen and Naug (2004b) explain how the increased turnover rate results in growth in the aggregated debt. If the higher level of turnover rates is permanent, the long-term level of aggregated debt will increase and push housing prices up. Therefore, the rise in Norwegian housing prices since 1992 is supported by the long-term increase in turnover rate.

The correlation between changes in turnover rate and changes in housing prices can be explained by their mutual dependence on housing demand. An increase in housing demand will result in higher prices and an increased turnover rate for the market. The mutual dependence supports the assertion that growth in turnover rate indicates a growth in housing prices.

Throughout the analysis of the fundamental factors, it is evident that there are several exploratory factors that support a high level of prices. However, it is difficult to determine what developments in the housing market that can be credited to the fundamental factors, and what changes that are caused by the expectations of the Norwegian people. The next chapter of the thesis will, therefore, examine the expectations of people, and how they influence the Norwegian housing prices.

8 Expectations

The developments in the housing market are often believed to be the result of fundamental drivers, such as unemployment, interest rates, disposable income, etc. However, one of the main reasons why the housing market is so complex and difficult to understand is because it is greatly affected by expectations. According to Shiller (1990), people's expectations in terms of future economic variables are fundamental to their behavior. The fact that Jacobsen and Naug (2004a) include future expectations in their house price model provides further support that it should be taken into consideration when analyzing the housing market. Accordingly, the following section will seek to identify the factors that form people's expectations, how these expectations affect the developments in the housing market, and how they are expected to develop.

8.1 Shaping expectations

Traditional economic theory hypothesizes a rational individual who is assumed to utilize all available information when making decisions (Simon, 1955). However, players in the housing market do not necessarily act rationally, making it difficult to determine what exactly shapes people's expectations about the future. The economy and its driving factors are complex, and as a result, expectations are often shaped through subjective assessments, often based on just a few chosen factors. However, due to this complexity, it is reasonable to assume that most households do now possess the necessary knowledge to recognize which factors should be emphasized, or how they affect the economy.

In his book "Irrational Exuberance", Shiller (2005) explains how people who communicate on a regular basis think similarly. This can cause even completely rational people to think in herd-like manners because they take the judgment of others into account. This can potentially result in an irrational group behavior, where people believe other people's misconceptions about the housing market to be true. This means that even if there are no circumstances in the housing market suggesting a price increase, one can potentially expect prices to rise if other households or acquaintances expect them to. Further, Nordvik (1993) found that households observing increasing housing prices typically expects prices to continue to rise. On the other hand, they typically expected prices to continue to drop when observing decreasing housing prices. These findings are in line with what Case and Shiller (1988) call "adaptive expectations", namely that people tend to base their future expectations on past developments in the economy rather than any knowledge of fundamentals. The reason for this is that people are believed to be influenced by information that is easily accessible and observable.

Because people tend to limit their attention to easily observable information, the mass media plays a deciding role for the people's expectations regarding the future development of the housing market. If the media focus their attention on a potential housing bubble, households will consequently focus their attention on the same issue (Koren, 2008). Although many articles may present different viewpoints of whether there is a housing bubble in Norway, the total exposure from the media will increase the focus on a potential crash in the housing market. At the same time, a focus on housing prices without mentioning a housing bubble can potentially be seen as an indicator of a solid market.

The housing market is difficult for analysts to predict because the players do not necessarily act rationally. Therefore, it can be argued that it is important to take psychological factors like future expectations into account when analyzing the house price development.

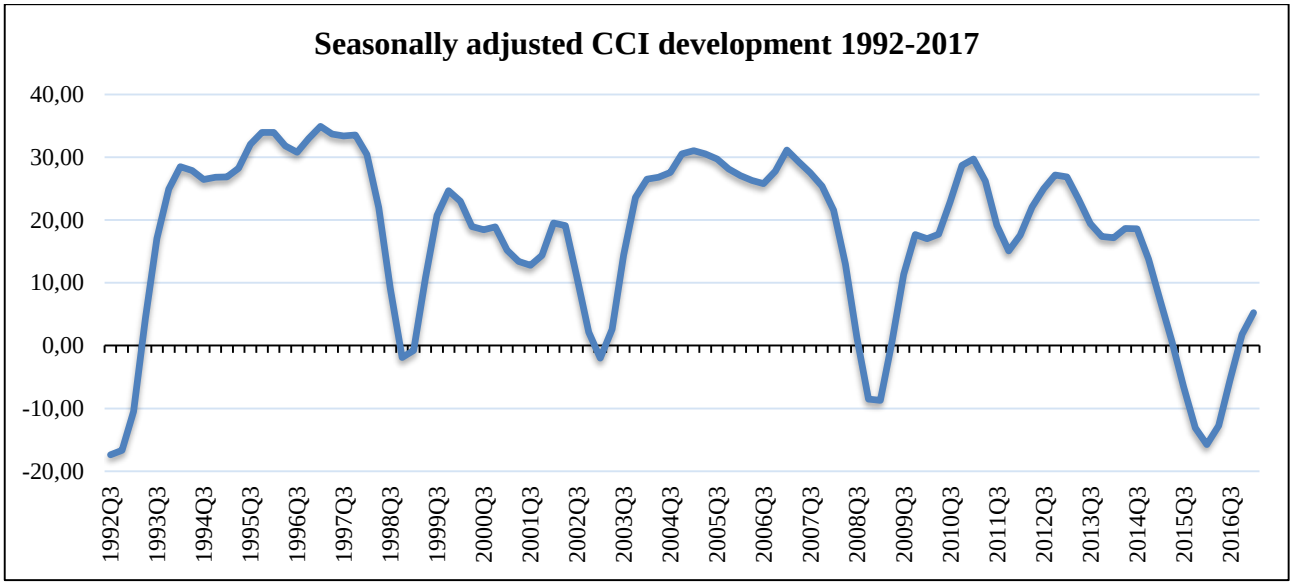
8.2 Measuring expectations

There are several surveys that measure the expectations Norwegian households hold for the economy. This section will present the results from two surveys that are frequently referred to in the media. The first one is the Consumer Confidence Index (CCI), which is a quarterly survey that measures households' expectations regarding its own and the country's economy. The survey is a collaborative project between Finance Norway and Kantar TNS and has been conducted since 1992. The second survey, Boligmeteret, is conducted by Prognosesenteret on behalf of EiendomsMegler 1, a Norwegian real estate brokerage chain. Among other things, this survey assesses households' expectations regarding the future development of housing prices and their purchasing patterns. Both surveys are based on around 1.000-1.400 interviews, and their findings are representative for households in the entire country.

The idea behind the CCI is that the future demand is a result of households' expectations regarding their own and the country's economy. The purpose of the CCI is, therefore, to measure consumer confidence, expressing the degree of optimism with regards to the economy. The survey consists of three main parts, where the first part is focused on the household's own economy. The second part focuses on the country's economic development, while the third part is an assessment of whether now is a favorable time for purchasing major household items. The main indicator is then calculated as the sum of the difference between the percentage of optimistic and pessimistic answers for each question, divided by five. The CCI consists of six questions in total, but the main indicator only takes

the first five questions into account[8] (Finance Norway, 2017a). The data used here are adjusted for both seasonally and random variations in order to make the trend clearer. It is important to note that there is greater uncertainty about the adjusted numbers at the end of the time series, much like the end-point errors mentioned earlier in connection with the HP-filter. The quarterly CCI figures from 1992 are illustrated in figure 8.1.

Figure 8.1



Source: Finance Norway (2017b)

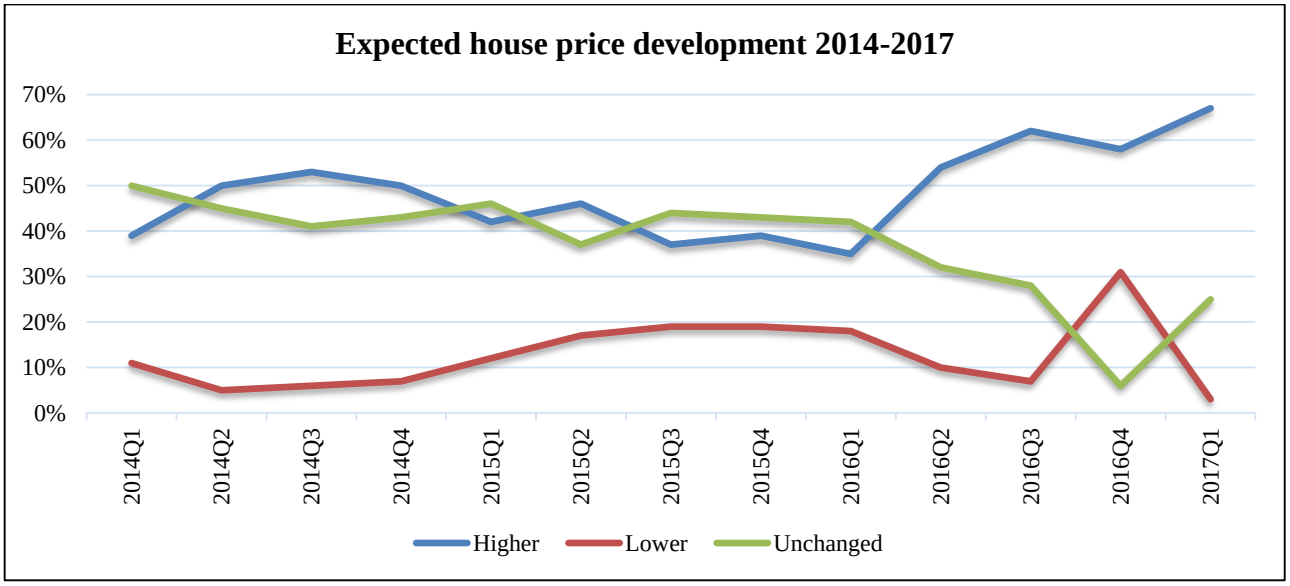
Figure 8.1 illustrates the cyclical development of the CCI, and the four significant drops that have occurred during the time period the survey has been conducted. Household expectations started to increase in the early 1990s, as the economy recovered from the recession following the banking crisis of the late 1980s. When the Norwegian krone came under increasing pressure due to unrest in the international financial markets in 1998, Norges Bank raised the key policy rate. Additionally, the price of oil and other commodities fell dramatically (Norges Bank, 1999). The combination of these circumstances affected the CCI, causing it to drop significantly. After having recovered to some extent, the Norwegian economy suffered a downward trend from 2000-2003. Norges Bank kept the key policy rate at a high level in order to ensure a price inflation in line with the inflation target. This, combined with repercussions from the burst of the dot-com bubble around 2000, resulted in a dropping consumer confidence. The negative development in 2007-2008 can be explained by the international financial crisis (Eggen, 2011). The decreasing trend seen from 2014 can be explained

[8] See appendix 8 for a complete list of all six questions.

by falling and consistently low oil prices, lower investments and significant staffing reductions, particularly in the petroleum industry (Finance Norway, 2015). This caused the unemployment rate to increase, possibly amplifying the low expectations. When the survey came out in the first quarter of 2017, the CCI had increased in four consecutive quarters. The index demonstrates consistently greater optimism across most age groups, likely caused by an increasing oil price, a decreasing unemployment rate and the fact that consumers have long been showing a strong will to save. Households generally have a stronger confidence in their own economy than the country's (Finance Norway, 2017a).

The findings of Boligmeteret is in line with the CCI, demonstrating an increasing optimism among households regarding the economy. In Boligmeteret from March 2017, 34 percent of respondents expected the economy of their household to be better in 12 months, while only 8 percent expected it to be worse. However, households are more moderate in their expectations regarding the country's economy, with 26 percent being optimistic and 17 percent being pessimistic (EiendomsMegler 1, 2017). In addition to asking questions regarding the households' and the country's economy, Boligmeteret also asks questions specific to the housing market. One of the questions particularly relevant for this thesis asks the respondents where they expect the housing prices to be in 12 months. Figure 8.2 illustrates the percentage of households that expects the housing prices to be higher, lower or to remain unchanged.

Figure 8.2



Source: EiendomsMegler 1 (2017)

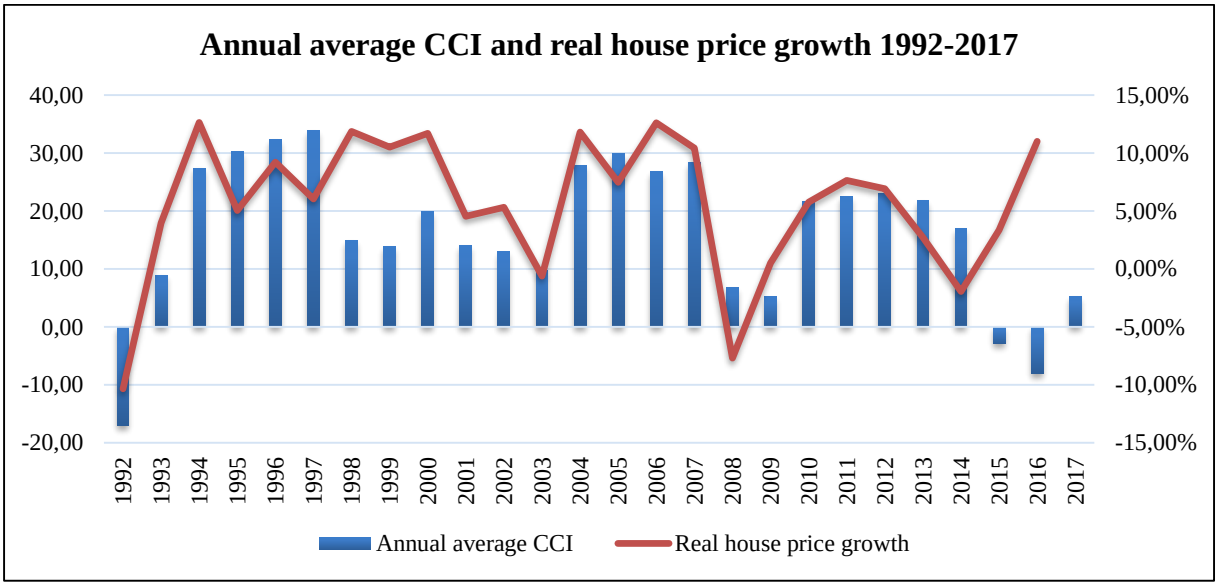
As figure 8.2 illustrates, the percentage of households expecting decreasing housing prices has been fairly low for most of the time period since 2014. The percentages expecting higher or unchanged housing prices remained at almost the same level until the start of 2016, where the trends started to deviate from each other. The number of households expecting higher prices increased, while those who expected the price level to remain unchanged decreased in numbers. In December 2016, there were significant changes in the percentages that expected lower and unchanged housing prices. However, in March 2017, both trend lines appear to be back to their previous levels. In March 2017, 67 percent of households expected increasing housing prices in 12 months, up from 58 percent in December 2016. On the other hand, only 3 percent expected the housing price level to be lower in 12 months, a significantly downward fall from 31 percent in December 2016.

The survey demonstrates that those who expect increasing housing prices are represented the strongest in the age groups 20-29 years (74 percent) and 30-39 years (71 percent). Further, there are large geographical differences regarding expected price changes in the housing market. In many cities, less than 70 percent of households expect the housing prices to increase, while 80 percent of households in Oslo expect rising prices (EiendomsMegler 1, 2017). The consistently optimistic expectations among households, particularly in the larger cities, may have contributed to the increased housing prices seen in recent years.

8.3 The Housing Market and the CCI

In order to assess the relationship between the CCI and price movements in the housing market, this section will compare the two measures. Because the development of the housing price index is based on annual observations, the CCI has been calculated into an annual average in order to compare the two. This will have some limitations for the analysis. Figure 8.3 illustrates the annual average CCI on the left-hand axis and the house price growth on the right-hand axis. Although Norges Bank does not provide any house price figures for 2017 yet, the CCI for the first quarter of 2017 is included in the figure to demonstrate its increasing trend.

Figure 8.3



Source: Norges Bank (2017a), Finance Norway (2017b)

As figure 8.3 illustrates, the trend of the CCI and the housing price growth follow each other relatively close, except for a few deviations. The first deviation observed during the time period is in 1998, where the CCI dropped significantly. The housing price growth, however, remained at a high level it started to fall after 2000. After this, the trends followed each other fairly close up until 2014, where they started moving in opposite directions. While the CCI continued to decline in 2015 due to trouble in the petroleum industry, the housing price growth started to increase after having fallen for 3 straight years. In 2016, the house price growth continues to rise, while the CCI hits a new low. As explained earlier, the CCI was at a higher level in the first quarter of 2017, implying increased optimism among Norwegian households.

Conclusively, the trends of the CCI and the house price growth have followed each other fairly close since 1992, implying that household expectations do affect housing prices. In 2015 and 2016, however, they moved in opposite directions, suggesting that fundamental factors might be of greater importance than expectations.

9 Case and Shiller's Criteria for a Housing Bubble

In this section, we will evaluate whether Case and Shiller's seven criteria of a housing bubble are fulfilled in the Norwegian housing market. The analysis of these criteria will determine if the essential elements required for housing bubbles exist in Norway, and provide further basis for our conclusion.

9.1 Expectations of Increased Housing Prices

Future expectations regarding the development of housing prices are further elaborated in section 8.2. According to Boligmeteret from March 2017, the majority of Norwegian households expect housing prices to increase during the next 12 months. Only a very small percentage expects housing prices to decline. Hence, the first criterion is considered to be fulfilled for the Norwegian housing market.

9.2 House Prices Grow Faster than Private Income

The statistics published by Norges Bank and Statistics Norway shows that the growth in housing prices have been a lot greater than the growth in disposable income since 1992. This has been elaborated in section 7.1. In the analysis, it is argued that the disposable income may not be the best indicator of what households can afford. Nevertheless, Case and Shiller's second criterion for a Norwegian housing bubble is met.

9.3 Attention from the Media and the Public

It is difficult the evaluate the Norwegian housing market's media attention without access to professional media analysis tools. However, a search for the word "*boligpris"* (housing price) in Google News shows that the word has been mentioned in 3390 news headlines between 10th of May 2016 and 10th of May 2017. This is an increase from 2030 mentions in the previous year. The significant media coverage of a housing market that has seen massive growth in prices may contribute to the high expectations among Norwegians.

To assess the popularity of the housing market as a private conversation, we conducted a survey asking how often the Norwegian housing price level was the topic of conversation among Norwegian people[9]. Of the 119 respondents, ninety answered that they participated in conversations about housing prices at least once a month, while only five said that they speak about housing prices less

[9] See appendix 10.

than once a year. The survey shows that the Norwegian house price level is a frequently talked about subject among people.

It is important to note the limitations of the survey. Besides the low number of respondents, posting the survey in Facebook groups and other online forums may have resulted in a group of respondents which are not representative of the Norwegian citizens.

The data from Google News and the survey suggest that the Norwegian housing market is a popular topic both in the media and in private conversations, fulfilling the third criterion.

9.4 Widespread Belief That Owning Housing is Profitable

The fourth criterion indicating a housing bubble is a belief among people that it is profitable to own housing. In 2016, the Norwegian Fund and Asset Management Association conducted a survey to assess the Norwegians' perception of different types of investments. The survey showed that Norwegians heavily overestimates the returns of investing in housing compared to investments into stocks or funds (Mikalsen, 2016c). According to the survey, Norwegians believe that investing in housing offers the highest returns and the lowest levels of risk.

The belief that housing is profitable compared to renting is supported by several experts. Kjetil Olsen, chief economist at Nordea, has stated that the growth in rent costs is increasing the profitability of buying a house significantly (NTB, 2016b). Dag Hveem, Head of Personal Economy at BI Norwegian Business School, agrees and argues that owning housing has never been as lucrative compared to renting as it has been in recent years (Hoemsnes, 2015). Following the announcement of the new mortgage loan regulations in 2016, partners from several Norwegian real estate agencies argued that households that could afford secondary housing would benefit greatly from investing buying houses with the purpose of renting them out (Ekeseth, 2016).

The belief that housing is profitable may be correct. By comparing the annual rental cost to the interest expenses on a mortgage for the same housing it, the profitability is evident. The calculations below are based on a 100-square meter house with an LTV ratio of 85 percent and a 30-year repayment period. Housing price and cost of rent are calculated from their price per square meter from 2016, and the stamp duty is 2,5 percent of the house price of 3.801.700 NOK. It should be noted that the calculations do not include maintenance costs or the tax deductions from interest expenses. The rent is expected to rise 2 percent annually as it is adjusted using the CPI.

	1 Year	2 Years	3 Years	4 Years	5 Years
Cost of rent	141248	144072	146954	149893	152891
Interest expense	79950	78098	76198	74250	72253
Stamp duty	80786				
Gained by owning	**-19488**	**46486**	**117242**	**192885**	**273523**

In addition to this calculation supporting the assertion that owning is cheaper than renting, Norwegian people expect house prices to rise which would increase the profitability of owning a home.

All evidence suggest that the fourth criterion is met in the Norwegian market. The general assumption is that households save money by owning their home.

9.5 Limited Understanding of Risk

Case and Shiller argue that a limited understanding of the risks related to housing investment is key to the creation of a housing bubble. As mentioned above, Norwegians generally believe that housing investments are both low-risk and high reward. 25 years of high growth has resulted in a misapprehension that high growth is the natural state of the housing market (Mikalsen, 2016c).

The poor understanding of the risk level is indicated by the rising debt level despite the low lending rates. This implies that households are borrowing more money instead of increasing the installments on their mortgage loans. The high LTV and D/I ratio for Norwegian households' show how vulnerable they are to increased interest rates or other financial stress. However, this does not seem to affect the decision making in the households.

In Sparebank1's survey from 2015, 70 percent of respondents did not believe they could pay their monthly installments and interest expenses if the interest rate on their mortgage grew by 5 percent. The high ratio of households willing to bet against a 5 percent hike in interest rate, shows that the Norwegian people believe that this is extremely unlikely to happen.

All these elements suggest that Norwegians heavily underestimates the risks associated with housing investments.

9.6 Simplified Opinions Regarding the Housing Market

In a report assessing the relationship between housing prices and expectations regarding housing prices, Nordvik (1993) found that households typically tend to base their expectations on past developments in the economy rather than any knowledge of fundamentals.

Even though the number of deferred-amortization mortgages granted has declined significantly in the past years, they still make up 7,7 percent of all mortgage loans granted. The decline is heavily due to the regulations introduced in 2011 that required applicants for deferred-amortization mortgages to have a maximum LTV of 70 percent. Before 2011, more than 25 percent of the mortgages granted was deferred-amortization mortgages. The fairly high share of these loans during periods of very low interest rates suggest that households do not really know how to handle these loans responsibly. Many households risk not being able to take advantage of the low interest rates, leaving them vulnerable to increasing interest rates when they start making down payments.

Another over-simplification that affect the discussions about the Norwegian housing price level is the assumption that the interest rates and unemployment rate are at their natural level and will remain constant. Experts often argue that the housing prices are justified due to the interest rates and economic growth, disregarding the analyses and experts predicting increased interest rates and less economic growth in the near future.

Additionally, the housing market is to a great extent characterized by unprofessional players. Conclusively, this criterion is considered to be fulfilled in the Norwegian housing market.

9.7 Pressure to Become a Homeowner

To evaluate whether there exists pressure of becoming a homeowner, we will examine the arguments used to support buying a house. As discussed in criterion number 4, there is a widespread belief that owning a house is cheaper than renting. This implies that households should buy a house as soon as they can, and that renting is seen as a waste of money. This pressure the households into buying houses, as they believe waiting is expensive.

Another source of pressure stems from the expectations of rising house prices. Households are forced to buy a house while they are still able to afford it. The fear of growing prices resulting in unaffordable housing leads to a time pressure for the non-homeowners. The time pressure cause desperation among buyers and a belief that they must buy a home regardless of the price level.

The high pressure felt by Norwegians to become homeowners stems from their perception of the Norwegian housing market. The expectations of future growth and the perceived profitability of being a homeowner result in the assumption that it is beneficial to buy a house as soon as possible.

Ultimately, all the criteria of Case and Shiller is argued to be fulfilled in the Norwegian housing market, suggesting that all the key features of a housing bubble are present.

10 Final Conclusion

The purpose of this dissertation has been to examine whether the Norwegian housing market is experiencing a bubble. Although there are several definitions of bubbles, we chose to use Stiglitz' (1990) definition, arguing that a bubble exists when the price level of an asset is not justified by the underlying fundamental factors. It is difficult to identify a housing bubble before it bursts (Vale, Kutluay, & Yildiz, 2015). However, by conducting both an empirical and a fundamental analysis of the housing market, we have managed to arrive at a conclusion. The following section will summarize the findings of the dissertation before the final conclusion is presented.

In order to comprehend the development and the characteristics of the housing market, we chose to start by reviewing the supply and demand theory as well as various Norwegian house price models. This enabled us to identify the exploratory factors. After having laid out the theoretical foundation, we conducted an empirical analysis of the housing market, using three different models that look at the market from different perspectives. The HP-filter was used to evaluate the trends of the market, the P/R ratio was used to compare the housing costs to the cost of renting, and Tobin's Q was used to analyze whether housing prices correspond with the construction costs of similar housing. After having finalized the empirical analysis, we conducted a fundamental analysis of the housing market, assessing the exploratory factors identified earlier. The psychological element of the housing market was then explored, before we finally analyzed Case and Shiller's criteria for a housing bubble.

The HP-filter was able to capture how housing prices have deviated from the long-term trend during both historical and more recent bubbles in the housing market. The bubbles are typically characterized by having considerably high housing prices compared to the trend before they burst. As the real housing prices in 2016 are above the estimated HP-filter trend lines for both λ-values (100 and 5.000), the model suggests that there are bubble tendencies in the Norwegian housing market. The real P/R ratio in 2016 suggests that the current price level is not sustainable over time, as the ratio is above its long-term average. However, the real P/R ratio is below the fundamental P/R ratio, suggesting that the development of housing prices is justified by the underlying fundamental factors. While the Tobin's Q-value was fairly low as late as in 2014, it has increased considerably since then. In 2016, the Q-value hit 1.29, implying that the Norwegian housing market is overvalued, supporting bubble tendencies. The contradicting results may be the result of data being collected from different sources.

The fundamental analysis demonstrated how the increasing housing prices in recent time has been, and still is, supported by several exploratory factors. Interests rates in Norway have been at low levels

since 2009. The combination of low deposit rates and cheap financing has contributed to increasing investments in the housing market. Additionally, Norwegian tax regulations heavily favor housing investments compared to other types of investments, increasing the demand for housing. The Norwegian economy is characterized by low unemployment rates and a well-functioning welfare system, further supporting a high housing price level. Demographic trends are also likely to have contributed to the increasing price level. The rising number of households and the decreasing amount of persons per household, combined with fairly high net immigration numbers, are likely to have caused the demand for housing to increase. Due to increasing urbanization, these trends are especially affecting the demand in the big cities, where the supply of housing is limited. This has caused the price of housing in central areas to outgrow the housing prices in less central areas, increasing the average Norwegian housing prices along the way.

However, the fundamental analysis also uncovered that the development of the households' disposable income provides support to the assertion that the housing in Norway is overpriced. Since 1992, the real housing prices have outgrown the disposable income by over 180 percent, suggesting that the growth in disposable income cannot explain the current price level in the housing market. However, when excluding the costs of housing and living from the disposable income, the developments of housing prices and the disposable income correlate considerably. Although the developments excluding costs of housing and living move more closely, it is important to note that the annual reference budget developed by Consumption Research Norway accounts for many of the factors that are believed to be fundamental when examining housing prices.

It was also revealed through the fundamental analysis that the share of household with high D/I and LTV ratios is fairly big. Although these characteristics in themselves may not support the assertion of a housing bubble in Norway, they leave many households vulnerable to changes in the economy. It is evident that the Norwegian government is troubled by these figures, and they have introduced several new regulations restricting the banks' ability to grant mortgages to households. These regulations are hoped to reduce housing demand, and to ultimately make households with mortgages more resilient to potential changes in the economy. These regulations were further tightened in January 2017, but we are yet to see the result of these adjustments.

The analysis of the psychological aspect revealed that the development of future expectations and housing prices follow each other relatively close. These findings suggest that housing prices are affected by the future expectations of households. As of March 2017, households, in general, were

very optimistic regarding the future development of housing prices. The psychological aspect is also included in Case and Shiller's criteria. In the analysis of Case and Shiller's seven criteria, we conclude that all of them are fulfilled in the Norwegian housing market. These results suggest that there is a housing bubble in Norway.

To sum up, the house price models assessed in the empirical analysis provided contradicting results. As almost every fundamental factor analyzed throughout the thesis support the house price growth to some extent, it is clear that housing prices in Norway are not solely driven by expectations. Although we argue that all of Case and Shiller's criteria are fulfilled, we believe that several of these can be explained by the developments of underlying fundamental factors. Even though Case and Shiller's criteria are often applied when trying to determine whether a housing bubble exists, one can argue that an analysis based on households' expectations and understanding of the housing market cannot provide a satisfactory answer.

Based on Stiglitz' definition of a bubble, we conclude that Norway is not currently experiencing a housing bubble. However, it is difficult to determine whether the housing market is overvalued. There are many aspects of the Norwegian economy indicating that the current level of housing prices may not be sustainable in the long run. The low level of interest rates, unemployment, and housing supply are fundamental factors supporting the current price level that are likely to change in the future.

Even though we conclude that Norway is not experiencing a housing bubble, we believe that the nation is at risk of a housing crisis in the near future. We will, therefore, end our conclusion with our recommendations for policy changes that could help avoid a housing bubble or massive declines in house prices.

As discussed in the thesis, Norwegian households are extremely vulnerable to increased interest rates on their mortgage loans. Therefore, the experts' predictions, saying that the interest rate will develop towards a normal level 2-3 percent higher than the current level, is concerning. To make sure that the Norwegian economy becomes less vulnerable, the Norwegian government should implement policy changes to increase the economic stability. One of the most effective policy changes available is to remove the banks' right to grant loans to households which do not meet all the requirements. This would help lower the average LTV and D/I ratios, resulting in households that are more equipped to handle increased lending rates and other changes impacting their economies.

As for the process of raising the interest rates, it is necessary that there are no dramatic changes. The government should, by using the key policy rate, make sure that the raising of lending rates happens gradually over many years. This would allow the banks and the people to adjust to the new rates, and prevent dramatic changes in the short-term demand for housing.

Another important challenge for the Norwegian government is to prevent that the housing prices continue to grow as rapidly as they have done in past years. To achieve this, we would recommend a revision of the current tax laws that are influencing the housing demand positively. In recent years, the property tax revenue has grown, but the tax scheme has had limited effect on the housing prices. By introducing an upper limit for the tax deduction from interest expenses or increasing the tax value of housing or the property tax, the cost of being a homeowner would increase and lower the housing demand.

To respond to the massive growth in housing demand, the government should continue increasing the number of new construction commissioned. This effort has already started and is predicted to continue. However, it is important that the commissioning of new housing does not fall due to short-term declines in housing demands.

We recommend that the Norwegian government implement these changes and that this will create a more stable and less vulnerable economy. The changes will also result in households that are better equipped to deal with upcoming changes and potential financial stress.

It is important to keep in mind the limitations of this thesis. As highlighted throughout the paper, the various models are built on unrealistic assumptions, and have several limitations. Accordingly, the results of our analysis cannot be presented with absolute certainty. Additionally, there are distinctive regional differences in the housing market that optimally should have been elaborated further. In some contexts, it has been difficult to retrieve sufficient data.

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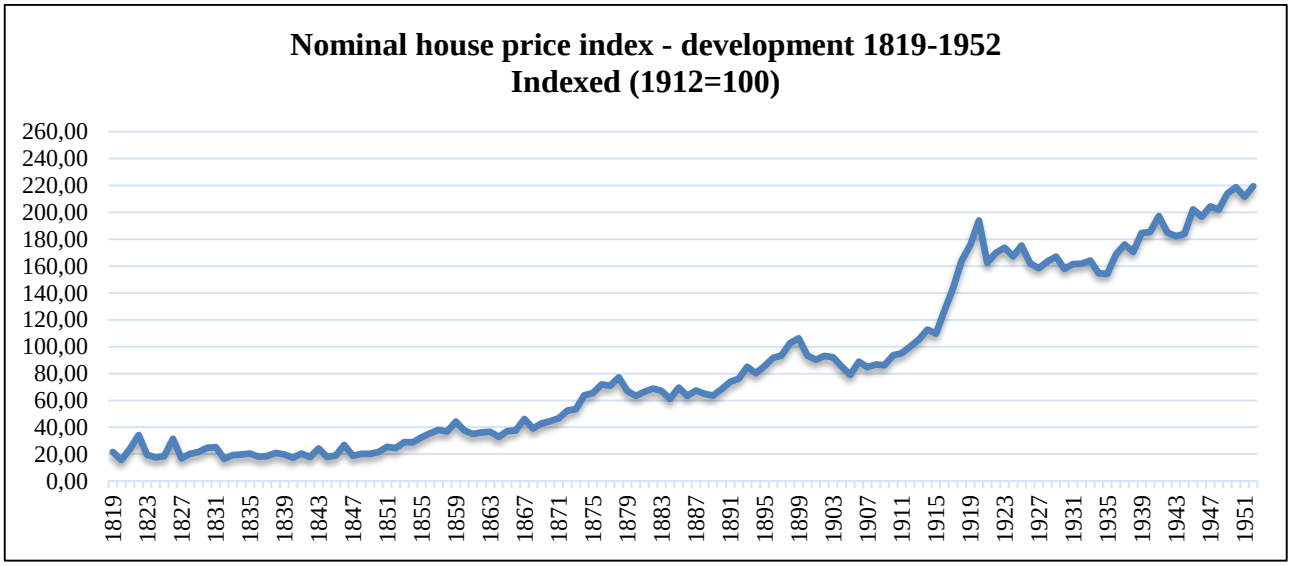
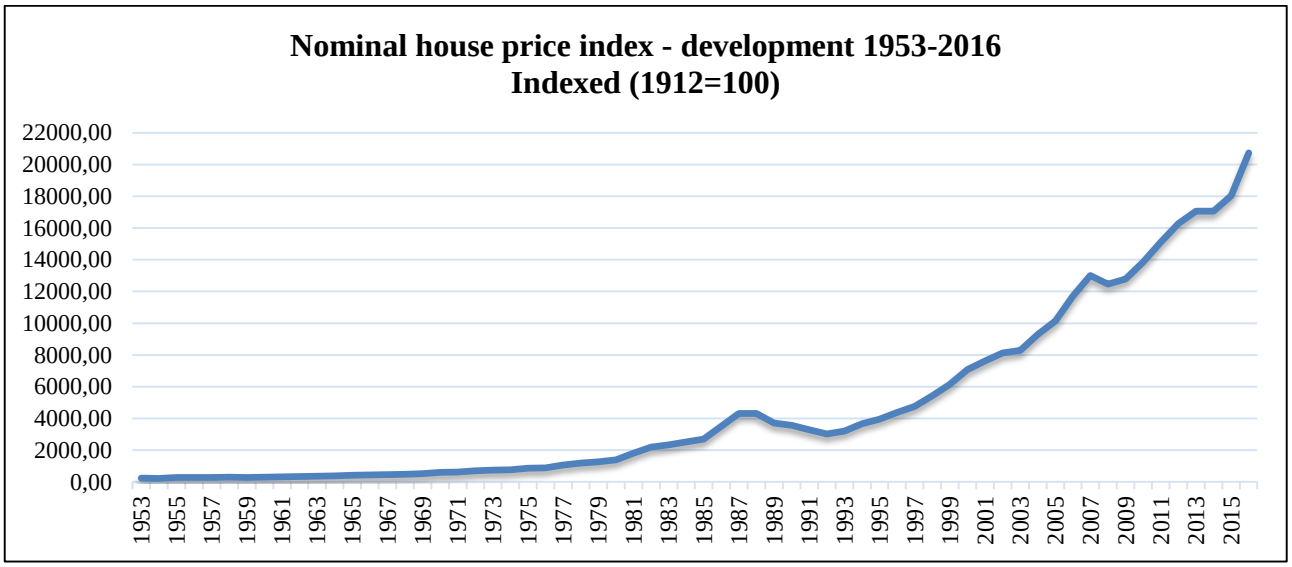
Appendices

Appendix 1: Detailed Overview of the Nominal House Price Development

Development from 1819 to 1952:



Development from 1953-2016



Appendix 2: Calculation of Real Housing Prices

Year	Nom. house price index (1912=100)	Consumer price index (1912=100)	Real house price index (1912=100)
1819	21,67	121,88	17,78
1820	15,69	109,15	14,37
1821	23,96	100,96	23,73
1822	34,36	114,69	29,96
1823	19,59	109,00	17,97
1824	17,53	87,98	19,92
1825	18,51	69,03	26,81
1826	31,50	80,17	39,29
1827	16,99	89,26	19,03
1828	20,23	77,32	26,17
1829	21,60	78,55	27,49
1830	24,70	81,30	30,39
1831	25,33	91,05	27,82
1832	16,63	86,27	19,27
1833	19,18	78,64	24,39
1834	19,70	73,20	26,92
1835	20,35	74,51	27,30
1836	17,99	76,77	23,43
1837	18,56	77,25	24,03
1838	20,88	76,72	27,22
1839	19,74	79,90	24,70
1840	17,28	78,04	22,14
1841	20,38	67,75	30,07
1842	17,71	65,75	26,94
1843	24,25	65,68	36,92
1844	17,80	64,74	27,50
1845	18,91	68,28	27,70
1846	26,87	72,08	37,28
1847	18,86	82,41	22,89
1848	20,10	74,08	27,13
1849	20,13	71,83	28,02
1850	21,73	69,20	31,41
1851	25,38	69,60	36,46
1852	24,43	73,35	33,30
1853	29,03	76,27	38,06
1854	28,89	83,91	34,43
1855	32,72	88,36	37,03
1856	35,49	95,28	37,25
1857	38,10	94,62	40,27
1858	36,85	83,52	44,12

Year	Nom. house price index (1912=100)	Consumer price index (1912=100)	Real house price index (1912=100)
1859	44,23	83,61	52,90
1860	37,58	87,61	42,90
1861	35,10	89,95	39,02
1862	36,07	87,80	41,08
1863	36,69	87,09	42,13
1864	32,73	85,97	38,07
1865	37,17	83,51	44,51
1866	37,67	87,78	42,91
1867	46,21	90,57	51,02
1868	39,14	93,39	41,91
1869	42,92	88,50	48,50
1870	44,49	85,05	52,32
1871	46,71	85,90	54,38
1872	52,45	91,20	57,51
1873	53,69	94,96	56,53
1874	63,75	99,88	63,82
1875	65,48	97,96	66,84
1876	71,91	95,27	75,47
1877	71,07	96,04	74,00
1878	77,09	91,43	84,32
1879	67,18	85,67	78,42
1880	63,25	88,82	71,22
1881	66,48	88,97	74,72
1882	68,77	89,28	77,02
1883	67,08	90,05	74,49
1884	61,11	86,59	70,57
1885	69,61	82,90	83,97
1886	63,35	79,60	79,59
1887	67,43	77,83	86,64
1888	64,93	78,44	82,77
1889	63,55	79,60	79,83
1890	68,28	80,75	84,55
1891	73,80	84,59	87,25
1892	76,23	83,28	91,53
1893	85,16	78,98	107,83
1894	80,36	76,83	104,59
1895	85,41	76,83	111,17
1896	91,60	78,37	116,88
1897	93,30	76,98	121,20
1898	102,78	79,14	129,88

Year	Nom. house price index (1912=100)	Consumer price index (1912=100)	Real house price index (1912=100)
1899	106,25	83,36	127,45
1900	93,44	86,90	107,53
1901	90,33	85,21	106,01
1902	93,06	85,97	108,24
1903	92,14	87,97	104,74
1904	85,27	87,59	97,36
1905	79,18	90,20	87,78
1906	88,83	89,58	99,15
1907	84,83	91,81	92,39
1908	86,60	91,58	94,56
1909	86,31	89,05	96,92
1910	93,52	92,27	101,35
1911	95,09	94,17	100,97
1912	100,00	100,00	100,00
1913	105,26	103,79	101,42
1914	112,70	104,96	107,38
1915	109,72	120,12	91,34
1916	126,80	143,15	88,58
1917	143,45	177,84	80,66
1918	164,08	249,85	65,67
1919	175,72	267,20	65,76
1920	193,87	311,37	62,26
1921	162,52	288,63	56,31
1922	169,83	241,98	70,18
1923	173,69	227,41	76,38
1924	167,29	249,27	67,11
1925	175,39	253,64	69,15
1926	161,96	215,74	75,07
1927	158,34	193,88	81,67
1928	163,39	180,76	90,39
1929	167,05	173,47	96,30
1930	158,00	167,64	94,25
1931	161,60	158,89	101,71
1932	161,68	155,98	103,66
1933	164,15	154,52	106,23
1934	154,55	154,52	100,02
1935	154,22	157,43	97,96
1936	168,71	161,81	104,27
1937	176,19	173,47	101,57
1938	170,62	179,30	95,16
1939	184,58	180,76	102,12
1940	185,27	211,37	87,65

Year	Nom. house price index (1912=100)	Consumer price index (1912=100)	Real house price index (1912=100)
1941	197,20	247,97	79,52
1942	184,97	263,41	70,22
1943	182,24	269,44	67,63
1944	184,04	272,80	67,46
1945	202,40	277,83	72,85
1946	196,75	284,54	69,15
1947	204,41	285,89	71,50
1948	202,00	283,87	71,16
1949	213,92	284,88	75,09
1950	218,71	299,31	73,07
1951	211,59	346,29	61,10
1952	219,37	377,49	58,11
1953	240,68	385,88	62,37
1954	213,01	401,65	53,03
1955	275,70	405,68	67,96
1956	280,43	421,11	66,59
1957	282,85	433,19	65,29
1958	300,86	455,00	66,12
1959	290,18	465,40	62,35
1960	310,39	467,08	66,45
1961	317,09	477,15	66,45
1962	337,65	502,32	67,22
1963	364,14	514,73	70,74
1964	382,78	544,93	70,24
1965	424,66	567,75	74,80
1966	445,48	586,20	75,99
1967	466,38	613,05	76,08
1968	490,36	634,19	77,32
1969	526,88	652,98	80,69
1970	596,68	722,43	82,59
1971	626,67	767,40	81,66
1972	706,21	823,10	85,80
1973	741,32	884,17	83,84
1974	769,77	967,38	79,57
1975	857,46	1080,46	79,36
1976	886,26	1179,45	75,14
1977	1062,84	1286,83	82,59
1978	1186,07	1391,85	85,22
1979	1271,47	1457,62	87,23
1980	1388,81	1616,67	85,91
1981	1805,68	1837,46	98,27
1982	2207,75	2045,50	107,93

Year	Nom. house price index (1912=100)	Consumer price index (1912=100)	Real house price index (1912=100)
1983	2329,60	2217,64	105,05
1984	2522,28	2357,56	106,99
1985	2703,30	2490,77	108,53
1986	3513,00	2669,95	131,58
1987	4323,35	2902,82	148,94
1988	4306,68	3096,77	139,07
1989	3718,67	3237,37	114,87
1990	3572,02	3370,91	105,97
1991	3293,61	3486,34	94,47
1992	3022,22	3568,22	84,70
1993	3213,52	3649,75	88,05
1994	3670,31	3700,76	99,18
1995	3949,65	3791,35	104,18
1996	4367,79	3838,67	113,78
1997	4750,43	3937,65	120,64
1998	5433,75	4026,91	134,94
1999	6145,11	4120,86	149,12
2000	7075,75	4248,04	166,57
2001	7620,45	4376,21	174,13
2002	8129,92	4432,59	183,41
2003	8280,25	4542,31	182,29
2004	9300,01	4563,45	203,79
2005	10148,13	4632,91	219,04
2006	11695,37	4740,95	246,69
2007	13007,97	4775,52	272,39
2008	12460,56	4955,37	251,46
2009	12795,96	5062,75	252,75
2010	13856,69	5184,21	267,29
2011	15107,52	5251,66	287,67
2012	16266,54	5288,90	307,56
2013	17066,46	5401,65	315,95
2014	17070,54	5511,04	309,75
2015	18025,24	5630,83	320,12
2016	20727,93	5833,54	355,32

Appendix 3: Real P/R ratio

Year	Rent per m^2	HP per m^2	P/R ratio
1980	*278*	2547	9,16
1981	*316*	3312	10,49
1982	*352*	4049	11,51
1983	*382*	4273	11,19
1984	*406*	4626	11,40
1985	*428*	4958	11,58
1986	*459*	6443	14,03
1987	*500*	7929	15,86
1988	*533*	7899	14,82
1989	*557*	6820	12,24
1990	*580*	6551	11,29
1991	*600*	6041	10,07
1992	*614*	5543	9,02
1993	*628*	5894	9,39
1994	*637*	6732	10,58
1995	*652*	7244	11,11
1996	*661*	8011	12,12
1997	*677*	8713	12,87
1998	*693*	9966	14,39
1999	*709*	11271	15,89
2000	**731**	12978	17,74
2001	**760**	13977	18,39
2002	**794**	14911	18,78
2003	**826**	15187	18,39
2004	**842**	17057	20,26
2005	**861**	18613	21,61
2006	883	21450	24,29
2007	916	23858	26,05
2008	966	22854	23,66
2009	1039	23469	22,59
2010	1107	25414	22,96
2011	1235	27709	22,44
2012	1260	29834	23,68
2013	**1306**	31302	23,97
2014	**1349**	31309	23,21
2015	**1386**	33060	23,85
2016	**1412**	38017	26,92
		Average:	**16,70**
Bold	Calculated from "debt paid" in CPI		
Italic	Calculated from general CPI		

Appendix 4: Fundamental P/R ratio

					P/R Ratio		P/R Ratio (1985=100)		
Year	ΔCPI	**Interest Rate**	**After-tax**	**Holding**	**Fund.**	**Real**	**Fund.**	**Real**	**Deviation**
1985	5,49 %	13,30 %	9,58 %	4 %	12,37	11,58	100,00	100,00	0,00
1986	7,24 %	14,65 %	10,55 %	4 %	13,68	14,03	110,65	121,18	10,53
1987	8,86 %	16,35 %	11,77 %	4 %	14,47	15,86	117,01	136,99	19,98
1988	6,59 %	16,65 %	11,99 %	4 %	10,64	14,82	86,04	128,03	41,99
1989	4,55 %	15,13 %	10,89 %	4 %	9,66	12,24	78,15	105,74	27,60
1990	4,17 %	14,29 %	10,29 %	4 %	9,89	11,29	79,95	97,50	17,55
1991	3,34 %	13,91 %	10,02 %	4 %	9,37	10,07	75,74	87,00	11,25
1992	2,42 %	13,38 %	9,63 %	4 %	8,92	9,02	72,14	77,94	5,80
1993	2,21 %	11,22 %	8,08 %	4 %	10,13	9,39	81,93	81,08	-0,85
1994	1,39 %	8,27 %	5,95 %	4 %	11,67	10,58	94,41	91,34	-3,07
1995	2,44 %	7,74 %	5,57 %	4 %	14,01	11,11	113,30	95,96	-17,34
1996	1,34 %	7,12 %	5,13 %	4 %	12,84	12,12	103,82	104,71	0,89
1997	2,49 %	5,99 %	4,31 %	4 %	17,18	12,87	138,94	111,12	-27,83
1998	2,29 %	7,39 %	5,32 %	4 %	14,22	14,39	115,00	124,26	9,26
1999	2,38 %	8,39 %	6,04 %	4 %	13,05	15,89	105,53	137,26	31,73
2000	3,14 %	8,03 %	5,78 %	4 %	15,06	17,74	121,80	153,23	31,44
2001	2,91 %	8,84 %	6,36 %	4 %	13,42	18,39	108,53	158,84	50,31
2002	1,29 %	8,45 %	6,08 %	4 %	11,37	18,78	91,93	162,17	70,24
2003	2,54 %	6,53 %	4,70 %	4 %	16,23	18,39	131,27	158,79	27,52
2004	0,37 %	4,19 %	3,02 %	4 %	15,05	20,26	121,70	174,97	53,27
2005	1,60 %	3,92 %	2,82 %	4 %	19,17	21,61	154,99	186,63	31,64
2006	2,31 %	4,26 %	3,07 %	4 %	21,01	24,29	169,94	209,81	39,87
2007	0,71 %	5,66 %	4,08 %	4 %	13,58	26,05	109,84	224,95	115,12
2008	3,77 %	7,29 %	5,25 %	4 %	18,26	23,66	147,70	204,33	56,63
2009	2,16 %	4,91 %	3,54 %	4 %	18,60	22,59	150,42	195,09	44,67
2010	2,45 %	4,52 %	3,25 %	4 %	20,80	22,96	168,22	198,28	30,06
2011	1,30 %	4,75 %	3,42 %	4 %	16,35	22,44	132,20	193,78	61,58
2012	0,64 %	4,84 %	3,48 %	4 %	14,62	23,68	118,20	204,50	86,31
2013	2,13 %	4,75 %	3,42 %	4 %	18,90	23,97	152,87	207,04	54,18
2014	2,09 %	4,61 %	3,32 %	4 %	19,11	23,21	154,51	200,49	45,98
2015	2,15 %	3,93 %	2,83 %	4 %	21,35	23,85	172,63	205,99	33,37
2016	3,60 %	3,51 %	2,53 %	4 %	34,16	26,92	276,26	232,46	-43,80

Appendix 5: Tobin's Q

Year	Nom. house price per m2	Real house price per m2 (2016-prices)	Replacement cost per m2 (2016-prices)	Tobin's Q
1985	4,96	11,61	11,61	1,00
1986	6,44	14,08	12,22	1,15
1987	7,93	15,94	13,17	1,21
1988	7,90	14,88	14,28	1,04
1989	6,82	12,29	15,45	0,80
1990	6,55	11,34	14,18	0,80
1991	6,04	10,11	13,27	0,76
1992	5,54	9,06	12,53	0,72
1993	5,89	9,42	11,01	0,86
1994	6,73	10,61	12,90	0,82
1995	7,24	11,15	12,86	0,87
1996	8,01	12,17	11,27	1,08
1997	8,71	12,91	11,60	1,11
1998	9,97	14,44	12,84	1,12
1999	11,27	15,95	13,60	1,17
2000	12,98	17,82	15,00	1,19
2001	13,98	18,63	16,77	1,11
2002	14,91	19,62	18,83	1,04
2003	15,19	19,50	20,63	0,95
2004	17,06	21,80	23,17	0,94
2005	18,61	23,44	24,07	0,97
2006	21,45	26,39	25,28	1,04
2007	23,86	29,14	26,79	1,09
2008	22,85	26,90	25,31	1,06
2009	23,47	27,04	27,49	0,98
2010	25,41	28,60	25,40	1,13
2011	27,71	30,78	28,05	1,10
2012	29,83	32,91	32,55	1,01
2013	31,30	33,80	30,37	1,11
2014	31,31	33,14	32,60	1,02
2015	33,06	34,25	31,89	1,07
2016	38,02	38,02	29,36	1,29

Appendix 6: Regression Output – Disposable Income

SAMMENDRAG (UTDATA)

Regresjonsstatistikk	
Multippel R	0,982176665
R-kvadrat	0,964671
Justert R-kvadrat	0,963198959
Standardfeil	21,06662559
Observasjoner	26

Variansanalyse

	fg	*SK*	*GK*	*F*	*Signifkans-F*
Regresjon	1	290836,6139	290836,6139	655,3286061	6,19567E-19
Residualer	24	10651,26513	443,8027138		
Totalt	25	301487,879			

Appendix 7: Interest Rates

Year	Banks' lending rate	Key Policy Rate	Deviation	HP per m^2 (1000s)
1991	13,91 %	8,34 %	5,57 %	6,04
1992	13,38 %	9,50 %	3,88 %	5,54
1993	11,22 %	6,50 %	4,72 %	5,89
1994	8,27 %	4,78 %	3,49 %	6,73
1995	7,74 %	4,75 %	2,99 %	7,24
1996	7,12 %	4,48 %	2,64 %	8,01
1997	5,99 %	3,38 %	2,61 %	8,71
1998	7,39 %	5,51 %	1,88 %	9,97
1999	8,39 %	6,35 %	2,04 %	11,27
2000	8,03 %	6,22 %	1,81 %	12,98
2001	8,84 %	6,98 %	1,86 %	13,98
2002	8,45 %	6,73 %	1,72 %	14,91
2003	6,53 %	4,21 %	2,32 %	15,19
2004	4,19 %	1,82 %	2,37 %	17,06
2005	3,92 %	1,92 %	2,00 %	18,61
2006	4,26 %	2,74 %	1,52 %	21,45
2007	5,66 %	4,38 %	1,28 %	23,86
2008	7,29 %	5,32 %	1,97 %	22,85
2009	4,91 %	1,75 %	3,16 %	23,47
2010	4,52 %	1,92 %	2,60 %	25,41
2011	4,75 %	2,14 %	2,61 %	27,71
2012	4,84 %	1,55 %	3,29 %	29,83
2013	4,75 %	1,50 %	3,25 %	31,30
2014	4,61 %	1,49 %	3,12 %	31,31
2015	3,93 %	1,05 %	2,88 %	33,06
2016	3,51 %	0,55 %	2,96 %	38,02

Appendix 8: Consumer Confidence Index – Questions

The survey consists of six questions, but the main indicator only takes the first five questions into account:

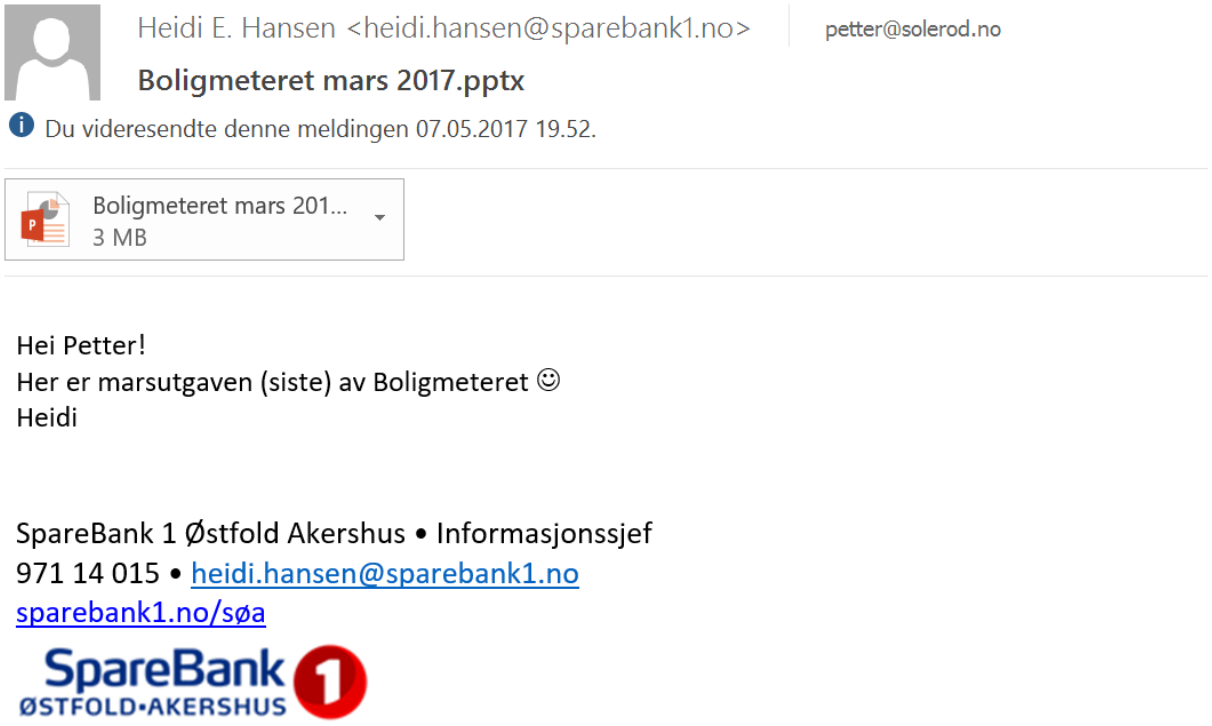
1. Would you say that the economy of your household is better, worse or the same as it was last year?
2. Do you believe that the economy of your household will be better, worse or the same on year from now?
3. If we consider the overall economic situation in Norway, would you say that the country's economy in general is better, worse or the same as last year?
4. Do you believe that the economic situation in Norway will be better, worse or the same one year from now?
5. Do you believe *now* is a good or a bad time for the general population to purchase larger household items?

The sixth question is referred to as the industry indicator:

6. If the economy of your household improved, what would you spend the money on?

Appendix 9:

Boligmeteret March 2017 was sent to us by Heidi Hansen of SpareBank 1.



Heidi E. Hansen <heidi.hansen@sparebank1.no> petter@solerod.no

Boligmeteret mars 2017.pptx

Du videresendte denne meldingen 07.05.2017 19.52.

Boligmeteret mars 201...
3 MB

Hei Petter!
Her er marsutgaven (siste) av Boligmeteret ☺
Heidi

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SpareBank 1 ØSTFOLD•AKERSHUS

Appendix 10 – Survey