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Are fundamentals behind the price rise or speculative factors - if so, are there any portents of a housing bubble in Norway today?

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Abstract

Norway has gone through a period of very high growth and skyrocketing housing prices. The run-up in housing prices has happened due to fundamental factors low unemployment, increasing population, disposable income, high GDP, low interest rate and the like. However, there may be some non-fundamental factors such as speculation and debt that may drives prices. The meteoric rise in house prices has attracted much spotlight and has concerned prominent economists, researchers, politicians and the like in Norway. It has become a hot button topic which has led this topic to be debated due to skyrocketing house prices. The media has given much coverage to house prices and even played a crucial role in order to cajole people into buying expensive properties by means of appealing advertisements. Financial liberalization has also done its part as well by making it possible to materialize huge mortgages.

There are some who has claimed that the high housing prices has reached to its unhealthy level and even they have used the word of bubble that may account for mounting house prices. On the other hand, there are others who opine that rocketing house prices can be justified due to high economic growth.

The incredible boom in the Norwegian economy has now turned into a period of lower growth because of the slump in oil prices and the unemployment has heightened up in places like Stavanger due to its oil concentrated position. The interesting part is that despite encountering hemorrhage of jobs, the house prices are still rising in Stavanger. Therefore, we found this topic very relevant for the master thesis and so we wanted to investigate quantitative support of whether this meteoric rise in house prices can be justified or not.

The purpose of this thesis is to investigate whether the fundamentals are behind or whether speculation is driving the house prices upwards. We will discuss the opinions of prominent researchers, economists and politicians and thereafter investigate whether we can support their opinions quantitatively by running regression analysis. This will enable us to find support for whether the prices are driven by the fundamentals or whether there are some portents of a bubble in the Norwegian housing market.

Preface

Right at the outset of vignette, first of all, we would like to thank our supervisor Professor Siri Valseth who has facilitated our dissertation all along the line, by means of her great suggestions for structuring the thesis despite having a very busy schedule.

We also would like to encapsulate our gratitude towards Stavanger University's professors who have played a vital role for preparing us for writing this thesis.

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Table of contents

| | |
|---|----|
| 1.0 Introduction | 8 |
| 1.1 Why write about this topic? | 8 |
| 1.2 Outline | 9 |
| 1.3 Delimitations | 10 |
| 2.0 Bubble theory | 11 |
| 2.1 Why do bubbles happen? | 11 |
| 2.1.1 Credit and interest determination | 14 |
| 2.1.2 Financial Fragility | 16 |
| 3.0 Methodology | 16 |
| 3.1 Design | 16 |
| 3.2 Sample | 18 |
| 3.3 Data Collection | 18 |
| 3.4 Data Analysis | 19 |
| 3.4.1 Data variables | 19 |
| 3.4.1.1 House price index | 19 |
| 3.4.1.2 Unemployment | 20 |
| 3.4.1.3 Construction cost index for residential buildings | 20 |
| 3.4.1.4 Building stock | 21 |
| 3.4.1.5 Real disposable income | 21 |
| 3.4.1.6 Real interest rates | 22 |
| 3.4.1.7 Population | 22 |
| 3.4.1.8 Debt | 22 |
| 4.0 Housing bubbles and homeownership returns | 22 |
| 4.1 Does low risk premium elucidate run-ups? | 23 |
| 4.2 Bubble evidence: High expected returns near market peak | 23 |
| 4.3 Learning from the hindsight of US in the case of Norway | 23 |
| 5.0 Demand and supply in the housing market | 25 |
| 5.1 Real estate demand | 25 |
| 5.1.1 Real estate demand concept | 26 |
| 5.1.2 Demand sensitivity to price to rent changes: price elasticity of demand | 26 |
| 5.1.3 Impact of actual price change vs expected price changes | 26 |
| 5.1.4 Exogenous determinants of real estate demand | 27 |

| | |
|--|----|
| 5.2 Real estate supply | 28 |
| 5.2.1 Real estate supply concept | 29 |
| 5.2.2 The long-run aggregate supply | 29 |
| 5.2.3 The short-run aggregate supply | 29 |
| 5.2.4 New construction | 30 |
| 5.2.4.1 The new construction behavior | 30 |
| 5.2.4.2 The drivers of new construction | 30 |
| 5.3 Real estate price adjustments | 31 |
| 5.4 Price determination methodology | 31 |
| 6.0 Comparative analysis | 32 |
| 6.1 Situation at hand | 32 |
| 6.2 The big Norwegian housing bubble | 34 |
| 6.2.1 Factor A Increased pressure on demand from the 1990s onwards | 35 |
| 6.2.2 Factor B The main driver for long-term housing prices is the long-term cost on houses but the sluggish and cycle sensitive supply makes the demand to raise the price of housing temporarily | 35 |
| 6.2.3 Factor C Rise in housing prices increases demand for housing further as an investment object | 39 |
| 6.3 Reasons for no bubble in the Norwegian housing market | 41 |
| 6.4 A discussion based on counter arguments | 42 |
| 6.5 Conclusion of comparative analysis | 50 |
| 7.0 Fundamental Analysis | 51 |
| 7.1 Fundamental factors in the housing market | 51 |
| 7.2 Fundamental model | 52 |
| 7.2.1 Interpretation of fundamental model | 53 |
| 7.2.1.1 Test for heteroscedasticity in fundamental model | 54 |
| 7.2.1.2 Test for autocorrelation in fundamental model | 55 |
| 7.3 Alternative model adding non fundamental factors | 56 |
| 7.3.1 Interpretation of alternative model adding non fundamental factors | 57 |
| 7.3.1.1 Test for heteroscedasticity in alternative model adding non fundamental factors | 58 |
| 7.3.1.2 Test for autocorrelation in alternative model adding non fundamental factors | 59 |

| | |
|--|----|
| 7.4 Discussion of models | 59 |
| 7.6 Conclusion of Fundamental Analysis | 60 |
| 8.0 Conclusion | 61 |
| 9.0 References | 62 |

Appendix

Table of figures

| | |
|--|----|
| Figure 1: Norwegian household expectation for home prices | 69 |
| Figure 2: Ratio of house price to rent | 69 |
| Figure 3: Ratio of household debt to income | 70 |
| Figure 4: The long-run aggregate supply | 70 |
| Figure 5: The short-run aggregate supply | 71 |
| Figure 6: New constructions (completions) | 71 |
| Figure 7: Effects of exogenous shifters on new construction | 72 |
| Figure 8: Market price determination | 72 |
| Figure 9: Morten Josefsen's model | 73 |
| Figure 10: Nominal and real interest rate in Norway (blue line being the nominal interest rates and red line being the real rate of interests) | 73 |
| Figure 11: The change in population regarding last year | 74 |
| Figure 12: Dagbladet regarding housing prices | 74 |

List of tables

| | |
|--|----|
| House price index | 75 |
| Buildings completed dwellings | 77 |
| Disposable income | 79 |
| Population at the beginning of the quarter | 81 |
| Unemployment | 83 |
| Interest rates | 85 |
| Construction cost index | 87 |
| Consumer price index (Base year=1998) | 92 |

| | |
|------|----|
| Debt | 97 |
|------|----|

Own calculations

| | |
|------------------------------|-----|
| Consumer price index | 102 |
| Real disposable income | 104 |
| Real interest rate | 106 |
| Real construction cost index | 108 |
| Debt | 110 |

1.0 Introduction

The main objective of this thesis is to explain the behaviour of the housing prices in the Norwegian housing market. We will qualitatively discuss in the comparative analysis the counter arguments of prominent organizations, economists, researchers and the like whilst using the theory and investigate quantitatively whether fundamental or speculative factors are behind the movement in the prices. The intension of this thesis is not either giving an answer to whether is there any housing bubble in Norway or to predict whether the housing market will face it but rather is to ascertain some potential portents or hints of bubbles in the housing market.

The main objective for writing this thesis is to analyze what drives housing prices answering the following question; *Are fundamentals behind the price rise or speculative factors - if so, are there any portents of a housing bubble in Norway today?*”

1.1 Why write about this topic?

The housing prices in Norway have risen to new heights where we have seen a remarkably increase of 400% from 1992-2015 or in other terms they have quintupled whereas inflation and real disposable income have increased by 50% and 60% respectively (Bache, 2015). The household's debt and housing prices are rising much faster than the salaries and the high increase in debt is not only problematic for the owner of the debt but also for the country in general (Njarga, 2016). The meteoric rise of prices has led to a debate where the prices will head in the future; some believe that the plunge in oil prices will lead to slump the housing prices whereas others perceive that prices will continue to rise (Ravnaas, 2014).

The financial minister of Norway Siv Jensen has expressed her concerns about the development of high housing prices. Many other countries have experienced that a strong growth in housing prices has led to a fall in housing prices and she states that this can happen in Norway as well. She emphasizes that we have encountered a similar situation in Norway before, at the end of 1980s and 1990s (NTB, 2016). She warns that the buyers in the housing market hold a substantial amount of debt and it is not a question whether the interest rate will increase rather is when it will do so. She is now accelerating the measures for preventing a housing bubble in Norway (NTB, 2015)

A definition of financial bubbles is tradeable object in large volume at prices with significant

deviations from fundamental values. In practice referred bubbles situations where market prices for one or more financial instruments which are significantly overpriced relative to their fundamental or fair value. Bubbles occur when prices rise continuously because investors think that they can make a gain on resale due to continued growth in the price level. Bubbles in principle can occur at all tradable products where there is a possibility to speculate on the future price direction and the gain. (Grytten, 2009).

We will use this explanation as the definition of bubble throughout this thesis.

What do we mean by fundamentals?

“Fundamental analysis anchors the investors against the winds of speculation, fad and fashion. With a sense of value, fundamental analysis challenges prices fed by speculation, whether it be optimism that drives the prices above the fundamental value or pessimism that depresses prices downward” (Penman, 2013 p. 9)

1.2 Outline

This thesis is divided into three main parts.

1. Theory
2. Comparative analysis
3. Fundamental analysis.

To be able to answer the aforementioned research question in the most appropriate manner, we will start off by explaining the bubble theory contributed by Allen and Gale to elucidate the characteristics of bubbles and what drives them. Furthermore, we will use the article contributed by Kevin J. Lansing and Marius Jurgilas who wrote that article for the Federal Reserve Bank of San Francisco that gives a comparison between the housing bubble that took place in the US in the midst of 2000s and the situation in Norway where they explain how rational and irrational investors act in different situations and how they should react when it comes to risk and return from run-ups in prices. This will give us insight in order to ascertain some indications whether fundamental factors drive the actions of the participants in the housing market when they increase demand and subsequently prices or there are non-fundamental actors that drives prices or a combination of both. To better understand what

should drive demand and supply in the housing market we will use the theory of Sivitanidou (2011) where they explain the different drivers of these two concepts and what affects them. In order to investigate whether fundamental or speculation is behind the price rise and any portents of a bubble, we will first use a qualitative approach in form of a comparative analysis and then a quantitative approach in form of a fundamental analysis.

In the comparative analysis we will start by explaining the situation at hand in the Norwegian economy and the housing market and thereafter present two views on the housing market. The first view is that there is a housing bubble in Norway contributed by Ole Røgeberg who is a senior researcher at SSB. The second view is that the fundamentals are behind the price rise and that there is no bubble in the housing market which is contributed by Øystein Olsen who is the governor of the Norwegian Central Bank, Idar Kreutzer who is CFO of Finans Norge and Terje Halvorsen who is CEO of DnB Eiendom. These two views will be discussed in a discussion part and concluded at the end of the comparative analysis.

We perceive that we will be able to draw some salient conclusions about what drives prices based on our comparative analysis discussion based on the counter arguments of prominent figures, researchers and economists regarding what drives supply and demand in the housing market whilst using the theory contributed by Allen and Gale, Sivitanidou and the like. In the fundamental analysis, we will test whether the factors driving housing prices presented by each side really are driving the prices by running regression models. For the fundamental model we will use the fundamental factors presented by the magma article of 2015 whereby they test whether a housing bubble is present in Norway today. We will run the regression for this model and see whether this is a good model for housing prices or not. These factors are backed up by the prominent economists claiming that there is no bubble in Norway today. Further on, we will use the factors explained by Ole Røgeberg and run a regression based on his suggested variables and try to determine whether there is quantitative support behind his reasoning which is also based on non-fundamental factors.

In the end we will make a conclusion of the fundamental analysis based on the findings in our models to try to explain whether fundamentals or speculation is behind the price development and whether there are some portents or hints of a bubble.

1.3 Delimitations

The housing market is of a complex character. There is reason to believe that the housing market in Norway cannot be seen as one market because of huge regional differences in price development. There are huge differences when it comes to the biggest cities in Norway. Oslo has experienced the biggest increase in housing prices where the prices has increased by approximately 10.5% from last year and the growth has been milder in the other big cities in Norway. Stavanger stands out in a negative way with a decline of 7.2% from last year. This has made the housing market divided into two where it is declining in Stavanger due to the slump in oil prices and continues to grow in other parts where Oslo is contributing the most (Wig, 2016). This may result in difficulties to capture the effects of fundamentals and any possible speculative drivers of prices due to regional differences and Stavanger which would contribute in an opposite direction if we consider the last years development because in some regional markets it is possible that fundamental drivers are driving prices whilst in others it can be the case that non-fundamental drivers such as speculation is behind. It would have been interesting to run regressions based on regional data and analyzed the results regionally but due to time scarcity and the same time inconsistency in data availability, we have chosen to treat the Norwegian housing market as one market. However, despite the huge differences now Stavanger has contributed a lot to historical rise in price whereas the price of apartments has risen by 616% since 1992 (Bache, 2015). Therefore, we believe that we still are able to explain factors that have driven the housing prices but it would be more complicated to give unbiased portents based on the future.

Some data were not available on a quarterly basis which our data are based on. We averaged monthly data to get to quarterly data which might give slightly biased data. We will come back to this segment in the methodology.

The collection of data for this thesis was completed on the 16 of May 2016 and therefore any published material after this point in time will not be considered.

2.0 Bubble theory

2.1 Why do bubbles happen?

Recalling the scenarios of Japan, Scandinavia and Mexico whereby the positive bubble was ensued due to busting of bubble. It fundamentally happened by dint of financial laxity which

instigated credit expansion and the like. It gave basically the rise to bank lending which ultimately resulted in either new investments or in assets whereby the supply of assets was fixed. As we know from the law of demand if the supply is fixed and the demand still heightens up then it results in rise in asset prices and sometimes it soars above the fundamental value. Since the assets those were pledged as collateral was not equal to its fundamental value and that's why when the value dropped of assets it resulted in banking crisis. Since the abovementioned countries are very distinct in their nature we can relate these events as a general phenomenon rather than something happening in a group of similar countries. (Allen and Gale, 2007). We have used the thought provoking insights contributed by Allen and Gale (2004) to explain bubble theory as

1. "What initiates a bubble?"
2. "What is the role of the banking system?"
3. "What causes a bubble to burst?"

Allen and Gale have developed the models which are based on rational behaviour and that highlight the aforementioned issues. In their standard models, assumption is made that people uses their own money and fundamental value is used as a benchmark. When the value of an asset rises above its benchmark, that implies the fact that a bubble is happened to occur. On the other hand, when an asset is bought by the borrowing money, investors are interested only in the value that may rise above this benchmark and that is why they are willingly interested to invest in risky assets. This scenario leads to a risk-shifting issue because people tend to bid above the benchmark which is in fact a bubble. In contrast to the aforementioned standard model, when people use borrowed money and they happen to default then they encounter limited liability. Besides, lenders find it difficult to know the volatility of projects and the same time where the lent money is being invested which triggers the agency problem. When it comes to real estate the aforementioned agency problem can be directly applicable compared to stocks whereby margin limits are used in order to contain people's borrowing and invest in an asset.

Allen and Gale explain about how the risk-shifting problem happens. There are two assets, one is safe and the other is risky. The first asset experiences the varying supply whereas the risky one faces the fixed supply. The return of safe asset is 1.5 in the period second when one unit is invested in period 1. Since the second one becomes the risky one because of facing the

fixed supply, we can assume that it can be either real estate or stock. When an unit is invested in the risky asset at price P in period 1 its return is 6 when the probability is 0.25 or otherwise is 1 when the probability is 0.75. So mathematically the total return of risky assets is calculated 2.25.

Further elaboration of the same illustration:

Considering that the both aforementioned investors are risk neutral and they have their own money to invest in one unit so their marginal return should be equal to as:

$$\frac{2.25}{PF} = \frac{1.5}{1}$$

$$PF = 1.5$$

So the fundamental value is the discounted present value of the asset which is 1.5.

$$PF = \frac{1.5}{r}$$

This is the standard asset pricing model.

So any price above or below 1.5 is the positive or negative bubble respectively. In the second scenario, investors do not have their own money so they use one unit of borrowed money to invest. They must pay back 33% interest on it and it is 1.33. If their investment turns out to be a disaster then lenders tries to claim whatever they can and subsequently it enters into agency problem whereby lenders do not have any control over how the borrower invests their money. If this borrowed money is supposedly invested in the safe asset the marginal return for an investor will be .17 which is calculated below.

$$1.5 - 1.33 = 0.17$$

If this borrowed money is presumably invested in the risky asset then the expected marginal return for investor would be 4.67 which is calculated below.

$$6 - 1.33 = 4.67$$

If hypothetically the return is nearly 1 which is below fundamental value then investment

turns out to be unfruitful and subsequently she defaults and so makes zero payoffs while lender gets 1 which is made. So marginal return of this risky asset is .67 and the calculation is shown below

$$0.25\left(\frac{1}{1.5}\right)*6 - 1.33) + 0.75*0 = 0.67$$

Since 0.67 is greater than 0.17 that is why risky asset is preferred to safe one. Borrowers tends to invest in risky assets in the wake of higher payoff because if money is invested in safe asset then she receives 0.17 and lenders get 1.33 and if money is invested in the risky asset then she gets 0.67 and lenders get 0.83.

$$(0.25*1.33) + (0.75*1*\left(\frac{1}{1.5}\right)) = 0.83$$

When borrower defaults then the value of .5 in expected value is expected to be shifted from lender to borrower due to the risk-shifting problem and the calculation is shown below.

$$1.33-0.83 = 0.5$$

Since the lenders do not have any control over the money about how it is invested and that is why the agency problem lies and it is in fact not preventable. Since supply is fixed when it comes to risky asset so price of risky asset ramps up and it is equal to safe asset in equilibrium. Mathematically which yields $P = 3$ and the calculation is shown below.

$$0.25\left(\frac{1}{P}\right)*6 - 1.33) + 0.75*0 = 1.5-1.33$$

Because it is above benchmark of 1.5 it implies the fact that there is a bubble in the price of the risky asset. Since there is an agency problem and that is why debt financed investors willingly invest in bubble priced assets. The price gets even higher when it is riskier because the more risk is shifted through the agency problem.

2.1.1 Credit and interest rate determination

In the erstwhile case, credit and the interest rate are exogenous variables but now the central bank sets the limit of how much credit B the banks can offer to borrowers. So the amount of

the consumption good which can be invested at date 1 is x and $f(x)$ units at date 2. Since the total amount that can be invested is B so the business constraint for the date 1 is:

$$x = B - P$$

And further on it is assumed that

$$f(x) = 3(B - P)^{0.5} \quad f(x) = 3(B - P)^{0.5}$$

So the interest rate r will be calculated below in the given equation:

$$r = f'(B - P) = 1.5(B - P)^{-0.5} \quad 1.5(B - P)^{-0.5}$$

The safe asset will not be fruitful for investors giving the same threshold of borrowers and investors in the aforementioned equation. People will intend to buy safe asset if r gets lowered, but to the contrary, if r gets heightened up then people wouldn't invest in safe asset. However, then it is a paradox due to:

$$f(0) = \infty$$

So in this case, how much, investors will be willing to pay for risky asset whilst considering the same payoff as in equation 1 is calculated below.

$$0.25\left(\frac{1}{P} * 6 - r\right) + 0.75 * 0 = 0$$

And we have:

$$r = 1.5(B - P)^{-0.5}$$

So solving

$$0.25\left(\frac{6}{P} - r\right)$$

then

$$P = \frac{1.5}{0.25} r$$

and using r we solve for

$$P = 4(B - P)^{0.5}$$

Assuming $B=5$ then $P=4$ and $r=1.5$

So in this way, interest rate is set by the central bank whilst controlling the credit expansion. This relationship is different than the standard asset pricing model whereby the price of the risky asset is the discounted expected payoff which is shown below.

$$PF = \frac{2.25}{r}$$

Due to agency problem when fluctuation happens in credit expansion it leads to a substantial change in asset prices.

2.1.2 Financial Fragility

When the average credit expansion ramps up the price of asset rises and that's why default can be avoided. However, to the contrary, if the average credit expansion shrinks than asset prices slumps and investors will tend to default (Allen and Gale, 2007)

3.0 Methodology

The main objective for writing this thesis is to analyze what drives housing prices answering the following question; *Are fundamentals behind the price rise or speculative factors - if so, are there any portents of a housing bubble in Norway today?*

3.1 Design

Under this segment we will describe the approach we have taken in order to get access to the reliable data in order to accomplish our research question. The ontology which has governed

our methodological framework is pivoted on the comparative analysis based on the arguments of prominent economists, researchers, politicians and the like and then testing them with qualitative fundamental model regressions in order to ascertain the support. A theoretical framework is based on secondary data due to the fact that we will employ the counter arguments of prominent figures in order to enable ourselves to answer our research question.

The purpose of this thesis is not to state whether a bubble is present or whether Norway will face one in the nearest future but rather is ascertaining the possible portents of bubble in the Norwegian housing market. Furthermore, the purpose is neither to create a new model for assessing housing prices but to analyse *ceteris paribus* effects of fundamental factors and non-fundamental argued by prominent researchers on house price index in order to find out whether solely fundamentals are behind the price or also non-fundamental factors is driving the prices. The later part is highly of interest since speculative factors might drive housing prices above its benchmark namely the fundamental value and create a bubble in the housing market. We will use this approach due to the fact that we were interested to investigate both counter arguments of prominent researchers and their arguments whether there is a bubble-like situation or is not in housing price. It will be performed quantitatively by fundamental models followed by the comparative analysis theoretically and descriptively in order to know whether fundamental factors are behind the meteoric house price rise or merely non fundamental or a fusion of both.

The research was conducted as a qualitative and quantitative study that sought to explore what drives housing prices in Norway. The research question will be answered by applying empirical data and theory and addition to the writer's analytical assessment of the movements in the Norwegian housing market.

The qualitative and descriptive data will be used in the comparative analysis where we employs two opposing stances on what drives housing prices, one saying that there is a housing bubble present and that the high rise in price in Norway is not due to solely to fundamentals whilst the other view is stating that fundamentals are behind and that the high prices can be justified.

The quantitative data is performed through and fundamental analysis. The data are descriptive and we will gather explanatory variables based on both fundamental and non-fundamental factors in order to try to explain what drives the dependent variable which is the house price

index. By using time series data we believe that we will be able to give ceteris paribus effects on dependent variable and thereby be able to explain whether explanatory variable being fundamental or non-fundamental drive housing prices. If the non-fundamental variable drive housing prices then there is support for stating that not only fundamental are behind the price rise which will give us possible portent of bubble in the Norwegian housing market.

The viewpoints of both sides will be discussed and drawn together in the fundamental analysis on the basis of our findings from the models whether their explanations have quantitative support or not in order to give a better picture on whether fundamentals are behind the rise in prices or speculative factors which gives portents of bubble in the Norwegian housing market. Supporting the qualitative data by quantitative data is believed to increase the validity of our analytical assessments.

3.2 Sample

Since our area of interest is the Norwegian housing market however it is difficult to delve into the entire Norwegian housing market. We are attempting to immerse into Norwegian housing market not regionally but rather as a whole by taking the variables defined as fundamental variables and those stated as important factors by researchers and economists driving the housing prices. Due to time scarcity and data availability conundrum in terms of consistency we have limited our investigation somewhat with shallow investigation that may describe either fundamentals or non-fundamental variables are driving the prices. Our sample period is from 2003-2015.

3.3 Data collection

As mentioned above the data that was collected is secondary data. There is a possible weakness of secondary data. In the sense, that it was collected for particular purpose and therefore don't fit exactly to the purpose of this thesis.

The main instrument used for information collection was time series data from the period of 2003-2015 using quarterly data.

In order to collect the data we contacted NSD and had to get the special permission from our supervisor along with the officials for getting the access to use the database that is going to last for one year.

When we got the database of NSD we went through and started to analyze the data according to our needs to test whether fundamentals or speculation is behind the rise in price. We realized that the data included in the database of NSD contained very specific information regarding gender and did not contain the time periods and quarterly data for the variables that we needed. It also contained regional wise data which did not suit our purpose as we were looking for data for the whole Norway since we wanted to treat the housing market as one market as described in delimitation in the introduction part of this thesis.

We investigated the databases of SSB where we were able to find the relevant data that we needed for our analysis except some issues regarding the time observations for the data that we had to take care of and conversion from nominal to real which will be explained below.

3.4 Data analysis

In order to discuss whether fundamentals are behind the price rise or not we saw it necessary to apply the variables in real terms which was not available for the variable that we were looking for. Therefore, we have made our own calculations for some of the variables. This is concerned disposable income, interest rates and construction costs on outstanding loans that we have adjusted for inflation (CPI) in order to give a ceteris paribus effect of the real effects on house price index.

3.4.1 Data variables

3.4.1.1 Housing price index

We have used house price index taken from SSB which is for the whole country and all sorts of houses (total) as a y variable. We have limited our analysis to make use of data from the whole country instead of delving into each and every Norwegian county because of time scarcity and also facing issues regarding availability of data with the same consistency for each variable. We are well aware of the fact that there are regional differences in the housing market and that may skew our analysis to some extent. However, we have chosen to do so due to time and data scarcity and also the same time, evading result-wise complexities. Using result for 19 counties in Norway would be complex to conclude whether there is any indication of housing bubble or not. For instance, one county may have housing prices below fundamental value and another may have to the contrary above fundamental value so it will be difficult to conclude as a whole if there is any indication of housing bubble or not. In

addition, we tried to get hold of data from different sources but it wasn't giving the same consistency period-wise and that is why we chose to delve into a whole Norwegian economy instead of every single county.

We had to employ non-seasonally adjusted data because the seasonally adjusted data wasn't available for our time periods we have chosen. So in the sense, when data is not seasonally adjusted it will not give an accurate picture of housing prices for every period in the year since house prices tend to be higher during spring and summer since more buyers want to buy dwellings and therefore sellers do not need to give discount on dwellings (Nationwide 2015).

3.4.1.2 Unemployment (in percentage)

We have chosen unemployment as our first explanatory variable. There is a negative relationship between housing prices and unemployment. In the sense, higher the unemployment, lower the housing prices index and vice versa. We perceive that unemployment is a very important variable to determine housing prices. We have used the data from SSB. The group is from 15-74 years and the unemployment is in percentage. The data is seasonally adjusted which would give an accurate picture of the impact of unemployment on the housing prices. We are well aware of the regional differences in terms of unemployment. It could be the case that some regions might have more unemployment than others and due to that effect some regions might have higher prices due to lower unemployment.

3.4.1.3 Construction cost index for residential buildings

We have chosen construction cost index for residential buildings as our second explanatory variable. There is a positive relationship between housing prices and construction cost for residential buildings. So in the sense, higher the cost of construction of residential buildings, lower the supply of residential buildings and so higher the housing prices. Again due to regional differences the cost might be different in different areas due to, for example, price of land. The data was only available on monthly basis and that's why we had to take the average of each three months in order to get quarterly data which will lead to not having exactly the accurate quarterly data.

3.4.1.4 Building stock

We have chosen buildings completed dwellings as our third explanatory variable for the whole country for all sorts of dwellings including non-residential buildings. The reason why we have included non-residential buildings in the dwellings is that according to OECD “*a building is regarded as a non-residential building when the minor part of the building (i.e. less than half of its gross floor area) is used for dwelling purposes*” (OECD, 2001). The relationship between housing prices and buildings completed dwellings is positive since higher the housing prices higher the number of completed dwellings. Since the construction lag is assumed to be at least 6-12 months for the residential building and so having considered this construction lag the short run supply of real estate is not sensitive to prices or rent changes. So in the sense it is completely price inelastic. Having used the theory of Sivitanidou, the construction lag which involves building permits and start of construction which, in fact, do not impact the housing prices because during the process houses are not ready for the occupancy. However, new construction is the most important factor when it comes to analyzing real estate markets due to long life of real estate assets. As we have covered in the theory part, completion is the third stage in the development process and it will affect the housing prices because houses are ready for occupancy and so can be bought. That is why we have chosen to use buildings completed dwellings because that is what affect housing prices.

3.1.4.5 Real disposable income

We have chosen real disposable income as our fourth explanatory variable. We have taken the disposable income and divided it by the consumer price index with base year of 1998 which is equal to 100 and multiplied it by 100 in order to calculate the real disposable income. The consumer price index was only available on monthly basis and we therefore averaged each three months in order to get to quarterly data. Besides, the reason why we have chosen real disposable income is that that we are interested to ascertain the impact of the real purchasing capacity which is in fact the real disposable income on the dwelling prices. Because having increased nominal disposable income doesn't imply the fact that consumers wealth is increased which is an important determinant to drive demand and is in line with the theory of demand and supply by Sivitanidou. We presume that real disposable is the fundamental factor which influences the dwelling prices. In the sense, higher the disposable income greater the demand and so house prices index.

3.1.4.6 Real interest rates (percentage)

We have chosen real interest rates as our fifth and last explanatory variable. We have taken interest rates on outstanding loans and divided it by the consumer price index and then multiplied it by 100 in order to get to the real interest rates. The interest on outstanding loans is selected for banks only and we chose loans in total as the type of loan and for the sector we have chosen households. The reason why we have chosen real interest rates instead of nominal ones is that we are interested to know the real impact of interest rates on housing prices.

3.1.4.7 Population

We have chosen population as our sixth explanatory variable. We have included this variable based on Røgeberg's reasoning on how population has been a good driver of the housing prices in Norway. The relationship between house price index and population is positive. Thus, higher the population, greater the demand and subsequently high prices. This variable is assumed to increase the house price index. If population increases but as long as the supply side can cope by increasing more dwellings, it should not have any ceteris paribus effects as Røgeberg explains. However, we have included it to test its ceteris paribus effect on house price index.

3.1.4.8 Debt

Since we wanted to ascertain the quantitative support for the Ole Røgeberg's arguments regarding debt which has become a great source of house price rise, we wanted to test its significance by means of the regression. The debt is our explanatory variable. The relationship between debt and house price index is positive which implies the fact that higher the amount of debt, greater the house price index.

4.0 Housing bubbles and homeownership returns

Lansing and Jurgilas (2012) highlights in their paper "Housing bubble and homeownership returns" that whenever the characteristics of bubbles emerge then fundamental arguments rear its nasty head to justify high house prices. In this article authors attempts to compare the US housing boom of the mid 2000s with the Norwegian housing market in order to ascertain a

bubble. The countries whereby the household debt was highly increased compared to income it resulted in tremendous high house prices before 2007. The lenient mortgage credit expansion instigated very high prices in the US housing market and the same time it reduced the perception of risk. This economic letter draws a contrast between the US housing market and the Norway's housing market in order to investigate whether bubble can be explained from the perspective of legitimate tendency towards fundamentals.

4.1 Does low risk premium elucidate run-ups?

The fundamental value soars when the future service flows are discounted with a lower rate which implies a lower risk premium due to lower risk free yield. A contribution made by Favilukis, Ludvigson and Van Nieuwerburgh, 2012, mentioned in Lansing and Jurgilas (2012) they imputed the run-up in US house prices compared to rents to a lenient credit expansion which lowered down the investor's uncertainty of housing. However, it doesn't imply that there is a bubble. The authors used a theoretical model whereby they imputed a tremendous rise in house prices compared to rents to the lenient loans and lower mortgage transaction cost. The lenient loan facilities ensues in lower risk perception which encourage households to invest in risky assets such as houses whereby they can accept moderate returns on their purchases which gives rise to the model's fundamental price-rent ratio.

4.2 Bubble evidence: High expected returns near market peak

Rational investors expect low returns due to their low risk premiums with the continued price run-up whereas irrational bubble investors extrapolated higher returns. However, evidences explain the paradox that low risk premiums and low expected returns gave rise to the run-up in US house prices in contrast with rents. In the questionnaire of Shiller in 2000 author highlighted the fact that investors has tendency to predict future returns based on recent market trends and that is why the fluctuations of index is in sync with the stock markets movement. Furthermore, media also played a crucial role to induce speculators to invest in the housing market. The Fortune Magazine's cover on June 6 2005 depicted the title "Real Estate Gold Rush" in order to hustle people investing in housing market which gave some pretty rosy semblance of US real estate

4.3 Learning from the hindsight of US in the case of Norway

What happened in the United States may enable to find out whether other countries are heading towards a housing bubble. The case of Norway is eminently interesting in this regard. The contrast is drawn between US and Norway from 1890 to 2011 in figure 1. The figure depicts that house prices were static in both countries during the 20th century. Norway and other Scandinavian countries encountered many bank failures due to skyrocketing house price development in the late 1980s which instigated a financial crisis. The price development in Norway has the analogy to the US house prices evolution. The rising and slumping of Norwegian house price developments of late 1980s can be likened to the US house prices of 2006. The US house prices have sagged down to 40% from skyrocketing in 2006. Norway has been going through tremendously high house prices since 1990 which has not bust to date.

How the price-rent ratios in the US and Norway has been developed since 1960 is depicted in figure 2. The price-rent ratio rocketed at the outset of 2006 in the case of US and reverted back to the threshold right before the economic boom. The price-rent ratio of Norway, on the other hand, spiralled upwards which is nearly 50% above compared to the last boom which occurred two decades ago.

The figure 3 draws contrast between Norway and the United States in terms of household gearing ratio. The ratio of US household debt to disposable income has mounted approximately to 130% in 2007 whereas the ratio of Norway has appreciated to 210% across the past decade. Due to aforementioned housing market development the Central Bank of Norway 2012 warns that household sector in Norway is pretty susceptible to various externalities. The FSA (Norway's Financial Supervisory Authority) in 2012, has put the emphasis on the vulnerability which is triggered by high debt to income ratios of Norwegians and the same time having the belief that house prices will continually mount up (Lansing and Jurgilas, 2012).

The comments made by Morten Balzertsen, the head of Norway's Financial Supervisory Authority, "Lower interest rates and strong competition in the mortgage lending market could contribute to continued rapid growth in debt and house prices," which could give rise to the housing market into a "self-augmenting spiral," he emphasised. Norwegians are holding a high multitude of debt than ever which is approximately twice compared to their disposable incomes, a further comment made by the Norges Bank Governor Øystein Olsen and FSAs Baltzertsen which is in fact unsustainable. Another comment made by Steinar Juel a chief economist from Nordea that another rate drop of banks would cause more vulnerability and

may appreciate house prices by 15% or we are in fact in a bubble-like situation. Norway has attempted mitigating measures to redress the housing market situation by warranting 15% collateral in order to get a housing loan (Mohsin, 2015).

Jurgilas and Lansing (2012) discussed further in their article that 10% of Norwegians believed in 2008 that property prices would keep on rising the following year whilst 70% believed the same in 2011. It is shown in the figure 1 below taken from Financial Supervisory board displays of FSA'S survey result. The Norwegian housing investors can be akin to US whereby they anticipated higher returns on housing after the price run-up in the price-rent ratio, which is in fact contradictory, when it comes to moderate risk premiums. However, it is in sync with the behaviour of investor during bubble time. The International Monetary Fund 2012 emphasised that there is no doubt that fundamental factors such as high income, population growth and tax changes have triggered the high demand for housing. However, fundamentals accounts for only to some extent when it comes to the skyrocketing house prices in Norway. In addition, there are non-fundamental factors such as optimistic price expectation which have played a crucial role in the price development, however, can be varied due to its instability. The model as a whole posits that Norwegian housing property prices are mispriced by 15-20%. Broadly, the conclusion made in the FRBSF economic letter that the episodic development of credit expansion along with skyrocketing asset prices always leads to financial stress which was in fact the case for the US real estate market development during the mid-2000. Therefore, it is only the matter of time that will reveal whether the Norwegian housing market would develop differently (Lansing and Jurgilas, 2012)

5.0 Demand and supply in the housing market

The Sivitanidou (2011) spells out the theory of demand and supply of the housing market which we have employed. The urban real estate markets may be idiosyncratic due to its nature; however, they do follow the fundamental economic principles of demand and supply.

5.1 Real estate demand

The Real estate demand can be stratified into effective, ex ante versus ex post and pent-up demand. Furthermore, the price elasticity of demand and the difference between actual and expected price effects are elucidated.

5.1.1 Real estate demand concept

The demand for real estate can be defined as the quantity of space or number of units which can be demanded at different prices. So the definition of demand explains that, effective market demand is the concept whereby the purchasing capacity is exerted. In real estate analysis it is therefore primarily emphasis is put on ex ante demand which is the aggregate desired demand or the quantity of goods that is desired before the consumer makes any contact with a market. After making the participation in the market, the ex post demand which is the realized demand might become distinct relative to the ex-ante demand due to supply constraints. In addition, the pent-up demand can be termed as not-yet-realized demand.

5.1.2 Demand sensitivity to price to rent changes: price elasticity of demand

A significant feature of the demand curve is, that how responsive the quantity demanded is with regards to change in prices. This responsiveness can be termed as the price elasticity of demand ϵ_D which can be computed as percentage change in quantity demanded with the given percentage change in prices. The price elasticity explains that how much quantity demanded will decrease when price will increase by 1%. This relationship can be exemplified as a price elasticity of -0.5 which means that the demand for houses will decrease by 0.5% if the average prices ramps up by 1%. Fundamentally, when the price elasticity is less than one, it's meant to be inelastic. So in the sense, an inelastic demand schedule suggests that the demand is not sensitive against price surge which means that a huge price rise, drops quantity demanded meagerly. On the other hand, when price elasticity is equal to one, it is meant to be unit elastic which implies the fact that, as much the percentage of price changes, the quantity demanded fluctuates. Besides, when it comes to an elastic demand whose price elasticity is higher than one, responds price surge with a heavy plunge in quantity demanded. The real estate demand is assumed to be price inelastic on average. The price elasticity is conditional on the opportunity to find substitutes. For instance, luxury housing is expected to have less elastic demand compared to a product with plenty of substitutes, such as middle-income housing.

5.1.3 Impact of actual price change vs expected price changes

One important aspect of real estate demand is to draw a contrast between actual price increase and expected price increase. There might be some scenarios whereby fundamental law of demand seem to be violated. For instance, some market experts may conclude that the law of demand is not held when demand rises in response to increasing prices. However, when the law of demand seems like to be violated it is fundamentally still in harmony with economic theory.

Under this scenario, the demand surge does not happen due to actual price rise instead it rises due to the expectation that futuristic prices would rise further. This scenario can be further developed whereby the demand for housing ramps up because of rapid escalation in the multitude of immigration of households and subsequently housing prices increases in the market. When initial housing price rises, it triggers housing buyer's expectation that futuristic prices will rise further which is in fact in sync with empirical studies that real estate investor's shows myopic behaviour when they participate in the market. So in the sense, they hold the tendency of speculation of the futuristic price development based on recent housing price development. However, these expectations of futuristic housing prices surge do not affect the demand when it comes to single family housing demand because it may demotivate them to materialize their plans just because now they cannot afford to buy themselves a house. However, it may encourage other households to decide to buy themselves a house before prices can even increase further. The expectations of higher prices trigger a shift rather than a movement on the demand curve. So in this way, expected price changes are exogenous driver of demand.

5.1.4 Exogenous determinants of real estate demand

The actual prices and rents are the endogenous drivers of real estate demand. So it implies the fact that quantity demanded depends on prices as well as on non-price or exogenous factors which causes the demand schedule to shift. Therefore, exogenous drivers are essential for real estate analysts in order to ascertain project profitability and investment opportunities. The determinants of the demand for real estate can be divided into four kinds.

1. Market size (population and employment)
2. Income/wealth
3. Prices of substitutes
4. Expectations

Market size: The real estate drivers including population and employment determine the demand for real estate which is contingent on the property kind. For instance, the number of households is an exogenous driver when it comes to housing whereas it is the market size which is office employment when it comes to office space.

Income/wealth: When income rises, more households can buy a house which suggests the fact that income/wealth influences the demand directly for residential property. On the other hand, income fluctuations can also indirectly trigger demand for office and industrial space. For instance, demand for office services may rise due to income increase because then it may become necessary for local office firms to recruit more employees and the same time elaborate their office space requirements so they can host increased demand. So in the sense, income rise may trigger demand shifts for office space because of its impact on office employment.

The prices of substitutes: The prices of substitutes may also cause the demand for real estate's shift. For instance, when it comes to single family housing prices it is likely become the case, that apartment rents increase can cause the demand curves shift towards a right direction. This behavior may happen when renting becomes more expensive for renters compared to owning a house and subsequently they tend to see home ownership appealing. On the other hand, when it comes to office market when rents increase in one market then some firms are likely to look for space in the cheaper market.

Expectations: Under this category the shift in demand for the different types of real estate can be triggered by consumer or firm expectations. For example, the number of housing units or amount of office space demanded can rise due to speculation that futuristic prices or rents will soar. In the case of demand for commercial real estate the demand curve can be shifted when expectation for growth can be speculated by firms. On the other hand, in a market an office firm may have a need for increasing the amount of space when it is growing dramatically due to futuristic development compared to similar firms which do not expect any futuristic development.

5.2 Real Estate Supply

Under this scenario the main area of concentration is the realm of new construction which is in fact the focal point of the supply of real estate from a market perspective. This area puts the emphasis on the fundamental law of supply, the price elasticity of supply and the other determinants which determines investment decisions and real estate matrix.

5.2.1 The real estate supply concept

The real estate supply is a schedule which depicts the number of housing units which are supplied at different prices. The supply curve is an upward sloping curve which depicts the fundamental law of supply whereby it is shown greater the supplied quantity higher the prices. The real estate market can be divided into three kinds: long-run aggregate supply, short-run aggregate supply and new constructions.

5.2.2 The long-run aggregate supply

The long-run aggregate supply portrays a relationship between long-run prices or rents and the total number of units which are supplied over the long run which is shown in the figure 4. The long-run aggregate supply does not come handy when it comes to market analysis. However, it is being employed for the theoretical studies in the area of long-run behaviour of real estate.

5.2.3 The short-run aggregate supply

The short-run aggregate supply depicts a total market stock at a given point in time. When it comes to the short-run, the real estate stock is considered to be fixed. The short-run aggregate supply is portrayed in the figure 5 in a vertical line with the price to quantity relationship. This topic comes very handy in order to infer the short-run adjustments in real estate markets. The real estate stock is considered to be limited due to the fact that short-run is exposed to the construction lag constraint which means a time period is being employed for planning and building houses. This construction lag is assumed to employ roughly 6-12 months when it comes to residential and industrial building and it is 18-24 months when it comes to office and retail. Because of this construction lag the short-run supply of real estate is unresponsive to prices or rent changes, or can be referred as price inelastic when it comes to economic terms. For instance, if office rents ramps up by 20% in a market, the total office space stock

will still be the same for some period of time due to construction lag because it would take some time to house new demand according to the demand of rent increases.

5.2.4 New construction

Due to the long durability of real estate assets the topic of new construction is essential for scrutinizing real estate markets when it comes to supply side. The concept of new construction can be understood as completed buildings that provide occupancy. The project completion goes through three major transitions which are building permit, start of construction and completion. Permits can be inferred as approved plans whereas starts can be considered as the beginning of construction which is recognized by inspection records. On the other hand, completion can be ascertained to the completion of construction and having approved the document of occupancy. These three transitions can be taken as the process under the pipeline concept. It could be the case that the projects have gotten a permission to build but have not accomplished. Besides, the proportion of permits that are right at the outset relative to what has already accomplished may have different percentage's proportion depending on the market conditions.

5.2.4.1 The new construction behavior

The new construction schedule follows the law of supply. So in the sense higher the property prices greater the quantity of new space supplied in the market. This linear relationship between the property prices and the quantity of the new space supplied is depicted in the figure 6.

Thus, when property prices are below the threshold of a minimum price level, property developers do not make a reasonable profit because of not recouping their development cost. Therefore, in the sense, this minimum price level enables developers to determine whether to develop residential property or not.

5.2.4.2 The drivers of new construction

It is profit a salient driving force which enables housing developers in a speculative

commercial real estate market to determine whether to develop new construction or not. Thus, under this scenario the exogenous factors that shifts the new construction schedule of a market depending on the variables which determines the profitability and the volatility which is involved along with it. These factors are availability, cost factors of developing a property, the speculation about futuristic real estate demand and prices along with the market volatility which is associated with it. The variables of property development which are employed in order to develop any real estate project involve capital, labor, land and building materials. Fundamentally, greater the cost of capital, labor, land and building materials, higher the cost of project and subsequently lower the profitability which discourage investors to develop more properties. That is why, when the cost of either of these factors mounts up, it causes the new construction schedule to shift downward because at the same price level lower units of properties are made available. It is shown in the figure 7.

It is essential to notice that the cost of these variables is regionally different when it comes to the cost.

5.3 Real estate price adjustments

Rents and prices are very important when it comes to real estate markets. It is essential to infer how market rents and prices reach its equilibrium and the determinants which cause the shift.

5.4 Price determination methodology

When supply and demand or sellers and buyers participate in the real estate market real estate rents or prices are established. This interaction is shown in the figure 8.

The price level can be mathematically shown as $Q_D = Q_S$. It is the rent or price level at which the number of willing buyers/tenants is equals to the number of willing sellers/landlords. This price level is always established as an equilibrium market price. If market price is at P_1 which is in fact below the equilibrium level, at this price the number of units supplied Q_S is lower than the number of units demanded Q_D which causes the prices to rise due to higher number of demand compared to supply. Due to rise in prices some buyers would be discouraged and so leave the market but the same time it will encourage some sellers to enter the market due to

higher prices. The equilibrium's price will be P^* whereby $Q_D=Q_S$. For example, if the market price is now P_2 which is in fact above the equilibrium point, at this stage the demand Q_D is lower than the supply Q_S which will induce sellers to drop the prices of property in order to appeal buyers. This price will continually drop lead to establish an equilibrium price whereby $Q_D=Q_S$. (Sivitanidou, 2011).

6.0 Comparative Analysis

6.1 Situation at hand

The Norwegian housing market has been become a hot button issue for the debate due to the rising prices. Since 1990 the housing prices in Norway has mounted by 356% (Langeberg, 2013).

The discovery of oil has played a crucial role in the growth of the economy which has been meteoric over the last decades. Even though that Norway had discovered oil for over 40 years ago, the period since 2000 onwards is the one that stands out. The country managed to weather the financial crisis of 2008 and even they were able to keep the unemployment low (Olsen, 2015).

Norway became the most affluent country according to the prosperity index in 2011, when oil prices reached its peak whilst trading at more than \$ 120. However, the oil prices started dropping in 2013 and due to that reason the economy experienced downturn. Because of drastic fall in oil prices, it is becoming more and more apparent that Norway is slumping into so called Dutch disease due to its over-reliance on oil industry.

Erna Solberg emphasizes the fact that oil and gas industry made the country too prosperous during the last 4-5 years. Due to strong growth in the oil sector and the currency appreciation, the traditional industries have been lagged behind. The heavy plunge in oil prices by \$30 a barrel led the Norwegian energy behemoth so called Statoil to retrench numerous jobs and even incur a colossal loss of NOK 37 billion in 2015. Stavanger has been hit savagely relative to Oslo due to its oil concentration. On the other hand, about three years ago the Norwegian krone had been appreciated a lot during the last 13 years due to highly oil concentrated economic growth. The Norwegian became affluent and they enjoyed holiday's abroad and imported consumer goods which they considered away cheaper. In 2014 the salary on average

rose to \$ 33 492 when the salaries impressively escalated at the rate of 3-4% per year which is relative to OECD average of \$25 492. Due to this phenomenal economic development it ensued in both expenditures and credit expansion because of these boom years. When it comes to house prices it mounted up threefold during the last six years. The household debts exceeded more than 200% of annual disposable income. This made the Norwegians the most indebted people in Europe. All this housing price development happened due to lenient tax terms when it comes to mortgages and the same time historically low interest rates (Madslie, 2016).

According to Carl O. Geving, a prominent real estate broker who shares his concerns that the housing prices have been climbed a lot which seems daunting and haunting because of its unhealthy levels due to historically low interest rates, impressive purchasing power and the same time high competition for buying few houses (Becker, 2016).

The Hegnar.no emphasizes that prices in Oslo have been rising by 9% whereas in Stavanger it has been dropped by 6% when it comes to property prices last year (Parr, 2016).

The intriguing fact is that despite going through somewhat downturn, the prices of property has started to rise again in Stavanger in 2016. As a whole Norway has experienced the strongest growth in house price development in Norway since 2003 (Sørheim and Dalen, 2016).

The minister Kari Gjesteby states that Oslo needs more places to accommodate more people and that is why they have taken a measure in order to redress the situation of sluggish supply of houses by delegating a housing growth committee which will make it possible for houses to be built faster than before. Their arguments are that more people should get into the housing market and should be able to buy bigger houses when their family warrants it. That is why; they have attempted to accelerate the pace of housing construction.

Hanna Marcussen shares her concerns that it is becoming more and more difficult for young people to enter housing market which is the main driving force, that they being as councils put emphasis on increasing the housing construction with great pace. They have recognized the fact that it is difficult to build new houses and which puts pressure on the processing of cases. She accentuates that in order to build new houses fast enough, they are trying to dumb down the regulations and processes so houses can be built faster (Mikalsen, 2016).

The “Finansavisen” spotlights the fact that none of the OECD countries have lower rents relative to house prices compared to Norway. The association between housing prices to rental prices are 70% higher compared to the historical average.

The administrative director of Utleiemegleren Vibecke Lyse Augdal emphasizes that housing prices are increasing faster than the rents. The house rents are more static in nature and if in case house prices nosedives then rents would not behave the same. Besides, she highlights the fact that Norwegians feels merrily when they own their own house rather than just rent it.

The professor Ola H. Grytten from NHH enlightens that Norway has encountered similar ratios of housing to rental prices in three periods before, right before Kristiania Crisis in 1899, the interwar period and right before the banking crisis in the early 1990s. He further explains that the association between housing and rental rates has been historically a good portent of ascertaining a housing bubble. He put the emphasis that whether we use real prices of houses to disposable income or construction cost, in either cases houses prices are very high relatively (Haugen, 2013).

6.2 The big Norwegian housing bubble

Now we are employing the analysis of Ole Røgeberg (2011) in conjunction with housing prices. He opines that having the belief that if prices would continually increase it would create a bubble, when it comes to a price rise in short-term due to meteoric demand. People buy expensive housing because they perceive the fact that those prices would continually rise. He explains that price has increased due to low interest rates, continual rise in population and the same time when supply side is sluggish and more cyclical which induces a temporary price rise for houses. If the shocks or changes in price expectation become absent, it will cause prices to revert back to old level which has not yet happened, due to the fact that people perceive that house prices would continually ramp up and subsequently create some more investment motivated demand growth. He has employed the Morten Josefsen’s model in order to demystify the housing price rise conundrum. The Figure 9 displays the Morten Josefsen’s model.

The bubble mechanism

When people have rising income and the same time price are climbing continually and that is

why they tend to go for huge mortgages because they believe they would be able to make a profit out of rising property prices and subsequently due to their expensive houses their debt ratios are high. When people cash in on one investment they use the profit from the first investment to finance the second unit and so the process continues which leads to higher the demand so greater the prices, which cannot be eternal and it is a bubble-like situation in fact. When they buy expensive houses with mountain-like mortgages they are convinced that someone else will buy their houses in the futuristic scenarios when the prices will be higher

6.2.1 Factor A: Increased pressure on demand from the 1990s onwards

He explains that the price rise in the market has happened because of the high demand. The drivers that affect this demand are demography and interest rates. He spells out the ex-post connections that in the early 1990s and further in 2003 when the real as well as the nominal interest rates dropped savagely it made people perceive that interest rates will be more likely to drop in the futuristic scenarios which implies the fact that the cost of capital will also drop. The figure 10 displays nominal and real interest rate in Norway and blue line is the nominal interest rates and red line is the real rate of interests

The second facet that he highlights in his paper is that, high growth of population in Norway will not lead to a demand shock if enough housing will be available for new citizens. However, it will not be the case when the population will drastically increase because then it will cause a demand shock which is in fact the scenario that has been evolved recently. This increase in demand has happened lately due to large influx of immigrants. The figure 11 depicts the change in population regarding last year.

6.2.2 Factor B: The main driver for long-term housing prices is the long-term cost on houses but the sluggish and cycle sensitive supply makes the demand to raise the price of housing temporarily.

When demand rises in the market and the same time when expectation is not considered then two questions will influence the consequences of increased demand

1. How expensive it will become in the long-run to get a land and construct a new house on it

2. What will happen while we are waiting for the long-term solution

The costs on the supply side can be divided into two segments

1. Land
2. Building costs (materials and work force money)

If the price of any of these were to increase, then the other one must be scarce. A reason for higher price in the future must accommodate the basis that one of these is expected to rise in the future.

The supply side (new construction) is sluggish and cycle sensitive due to the construction sector

Sluggish:

When the demand increases, it takes time before the supply side is able to respond in increased housing. The capacity in the construction sector cannot be increased in a very short period of time and that is why the prices are rising in the meantime.

The number of houses under construction doubled up from 1993 to 2006. The fact that a lot of new houses are under construction is a strong sign that the housing prices are higher than the building costs and that is why the housing prices will slump in the future.

Ole Røgeberg spells it out further that having considered the number of completed houses thereby he explains that Norway experienced a drop in the number in 2008 due to the financial crisis that caused a delay on the supply side.

Building costs in the short-term:

The construction sector has increased their activity as prices of houses were increasing which proves that the housing prices were higher than the building costs.

SSB has constructed a building cost index which depicts how the price of a basket of the materials and services which are warranted to construct a house has changed. Nominal prices have apparently increased but that doesn't necessarily mean that the costs have increased in

real terms. Therefore, it is important to look at the development of the costs relative to the inflation.

Ole Røgeberg elucidates that costs from 1990 onwards have not increased when it comes to the building relative to the inflation whilst they have increased somewhat from 2000 onwards. The interpretation of this is that, it is not the building costs that have led to increased housing prices from 1990 onwards. The increase in building costs cannot justify the increase in housing prices despite a slightly increase in building costs from 2000 onwards since the housing prices have increased a lot more than building costs. The building costs relative to general inflation have increased by 20% while the housing prices have increased a lot more.

Building costs in the long-term:

When the construction sector grows fast, it creates a pressure on demand side which increase the cost of the input factors in the construction sector in the short-term. Ole Røgeberg suggests that the building costs will plunge to the general price level in the future.

He further explains that there are two arguments that can defend this statement while one conviction that is contradicting it.

The arguments that defends his statement is that the Norwegian building cost is among the highest in Europe and the countries which have experienced this have encountered a drop in prices again. The building cost in UK was about 40% above the average in throughout EU before and they now are only 5% above average. The argument contradicts his suggestion is that they do not find any evidence of drop in building costs in the building cost index despite being the fact that the construction industry was ricocheted hard after the financial crisis.

The increase in the activity for new housing gives a temporary price pressure on building ready land which will fade away.

According to economic theory, the price of land is determined by the market value of the alternative use of land. The housing prices have increased as a consequence of builders who beat the alternative uses. The builders have ability to bid up the price because of the increased housing prices which causes the price of land to increase which again leads to increasing housing prices.

He elucidates that the access for a land which is ready for building is constrained by public regulations but if we exclude this factor then we can see that there are land where houses can be built even in the areas where the pressure is the strongest, for instance Oslo. The prices of land have increased dramatically in the whole Norway.

Supply and demand without any motives for believing in a further increase in price – what should we expect to see?

The long-term supply for housing is determined by two factors.

1. The price of land for housing will increase slightly by the total number of lands being used up
2. The building costs in the long-run are approximately fixed

These two ascertain the costs of building a house and makes the long-term supply curve for housing. The more people are willing to pay for houses the more houses they will get.

The demand side tells us how many houses people are willing to buy at different prices of houses.

The total number of new houses can increase drastically in the long-run with a relative weak rise in the price which is according to the previous discussion of Røgeberg that the building costs have not increased and land is available in the long-run.

A demand shock will stimulate the prices to rise despite being the fact that long-term prices will return to its old level.

People are now willing to pay more for one extra house than the costs of building one. This will cause the supply sector to construct more houses until the market reaches the equilibrium.

However, the supply will not increase in the short-term due to the fact that even though the supply must increase, it takes time for a land to be ready for houses to build on. Therefore, we will notice dramatic increase in house prices due to limited number of houses those are built in the short-run.

The first house can be sold at this very high price and then it will be important for constructors to enter the market and construct houses. There will be a competition for land which will trigger the price of land to increase drastically. As new houses will be built, the

demand will sag which will cause the prices of houses to plummet. As the prices will fall the constructors will be willing to pay lesser and lesser for land and subsequently the price of land will also plunge.

If people would understand that prices would eventually fall after a sudden price rise they would not be interested in buying in the first place. They would rather wait for the price to decrease which would trigger the price to slump faster. This is only theoretical since people presume that prices will continually rocket. Ole Røgeberg states that people are myopic because they perceive that the price we have today is the long-term price.

6.2.3 Factor C: Rise in housing prices increases demand for housing further as an investment object

A basic assumption in most markets is that higher the price of a good, lower the demand subsequently. On the other hand, if a good becomes cheaper, people would like to have more of it. In some markets, it is important to look at other determinants which vary these assumptions and the housing market is a good example of such market. When the price starts to mount, many people would start to believe that the price will increase further. The belief of further increase makes it even more convenient to possess a house. The house does not only become a place to live but also an investment object. A reasonable way of saving which causes the demand curve to shift outwards since it is based on expectation it can change rapidly.

When people will believe that prices will not heighten up continually then the price will start falling. For instance, if interest rates rise it will induce demand curve to shift or it can be the case that supply side becomes equal to the demand side. In both cases the extra demand will disappear.

This can cause a rapid house price drop which may wreak havoc on the community much more compared to prices just being stable.

The investment incentives are disincentivizing the housing market which amplify the rise in price during positive shocks and strengthen the price decrease during negative shocks.

Incentives for buying a house

There are three main factors that incentivizes people to buy a house with expectation of further rise in price in the market.

The tax benefit of using house as saving compared to other saving methods

Røgeberg uses the examples of investing in a fund compared to invest the money in housing.

An example:

1 million is invested in a fund and that fund grows by 10% per year. After 5 years the fund will become 1.6 million. When the money is withdrawn after the five years and approximately 30% tax will be charged on the profit which means that 1.4 million will be remained after tax. This would yield annually 7.4% profit or a total yield for five years of 43%.

Alternatively, 1 million is invested in the housing market. The housing prices grow at the same rate as the fund to make it comparable. The difference from the first example is that the profit of sales on the alternative investment is tax-free after five years. This would lead to a profit of 1.6 million which is an annual yield of 10% and a total profit of 43% for the five years. Because the yield of selling a house is tax-free compared to a yield from a fund investment, housing is preferred away better compared to funds. The growth in housing prices must have been 25% lower than the growth in the fund for people to prefer to invest in funds rather than houses.

Huge mortgages increase the yield on equity and dramatically inflate the housing prices.

The author explains that it is important to understand the issue of mortgages why we get bubbles.

It is beneficial to mortgage substantial amounts when prices are rising and that is why large investment is made in the housing market in the short-term. The media enables people to put confidence in a price rise by making the headlines appealing such as; “Now you can make a housing coup”, “The prices are rising”.

Why does it become more favourable to take a housing loan? It can be said in a nutshell that a person makes more profit due to housing prices development compared to how much he must pay in instalments for paying of his loan to the bank which makes it even more appealing to

take a loan because of the higher payoff. When it comes to fund, it is considered as a speculative investment and therefore banks do not easily sanction loan compared to the mortgages because then they take the pledged property and therefore they tend to issue housing loans since it is considered a normal loan without any speculation.

For instance, how loan affects profit can be put through an illustration. If house prices increase by 10% yearly and the same time assuming that housing price is 2 million and a person has 1 million of equity and borrows 1 million for buying a house. The real interest rate after tax benefit is 5% so in that sense the return on equity is 15%. If in case a house is bought at a price of 10 million and 90% is borrowed will have a return on equity of 55% yearly. Having compared the yield of fund, housing and housing with high debt over a period of 5 years there will be 43% profit on fund, 61% on housing and 362% when it comes to housing with high debt. This illustration demystifies that how increase in housing prices drives higher demand for houses (Røgeberg, 2011)

6.3 Reasons for no bubble in the Norwegian housing market

Some famous economist's claims that there is no bubble in Norway and prices are driven by fundamental factors which are in contradiction with Røgeberg's reasoning. Now we are presenting their views.

Idar Kreutzer who is CEO of FNO (Finans Norge) opines that the dramatic rise in housing prices in Norway is justifiable due to the fact that there are fewer houses those are built compared to the demand and by the curtesy of fundamental macro factors such as rise in disposable income, decreasing interest rates, low unemployment, rise in population and urbanization (Byberg, 2012).

Terje Halvorsen who is CEO of DnB Eiendom he claims that the high housing prices can be justified due to rise in disposable income of households. He explains that housing prices are high but as high as the growth of household's income. He expects that prices will rise further and debt relative to income is safer because people now spend less on loans relative to the 1990s. He presumes that interest rates will slump further in the futuristic scenarios (Mikalsen, 2015).

The Central Bank Governor Øystein Olsen elucidates that there is no bubble currently in Norway. He perceives that it is fundamental factors which drive the housing prices. The high demand for housing is driven by the fact that people in Norway have a good economy, low unemployment and at the same time low interest rates. When it comes to the supply side there are fewer houses those are built relative to the demographic needs. He dodges using the word bubble because it may be misleading and he puts the emphasis that when it comes to bubble it is akin to Spain and Ireland where they had a high number of houses those were built and where the market unexpectedly went wrong. He concludes that Norway is distantly far from that situation as far as he is concerned (Jacobsen, 2015).

6.4 A discussion based on counter arguments

It's quite intriguing to gain insight from the counter arguments of aforementioned legendary leaders who are from different walks of life. There are different opinions regarding Norwegian house prices where some are claiming that we have a bubble in the Norwegian house market whilst others defend the increase in house prices claiming that the fundamental factors are behind the price rise. Right at the outset, as we have explained that fundamental value is employed as a benchmark for prices and so we reiterate that any expectation driving price above this level is considered as a bubble which is according to the definition contributed by Ola H. Grytten. It is hard to measure bubble prophetically since we cannot know its presence before it burst so the most legitimate way could be presumably discussing the counter stances of the prominent people, organizations, economists, researchers and the like on the basis of fundamental theory of supply and demand from Sivitanidou, R.M (2011) perspective and bubble theory contributed by Allen and Gale and the like.

Role of credit expansion and financial liberalization:

From the graph presented by Ole Røgeberg, we can draw insights that how interest rates dropped just after the banking crisis in Norway and in 2003 which led the Norwegians to perceive that interest rates would stay low and therefore stimulated an increase in demand which is in line with Allen and Gale who explains that credit expansions due to finance availability which leads to higher demand and since supply is fixed and demand continually mounts up then the value of properties will rise and sometimes as Allen and Gale elucidates, it can rise above the fundamental value. Interest rates are therefore believed to have made a

great impact on the increased demand in Norway. Economists believing that no bubble is present do also agree with the fact that interest rate has contributed to the rise in prices. Due to laxity and the financial liberalization in terms of borrowing due to the credit expansion a concept explained by Allen and Gale, when central bank makes it available certain amount of money for local banks to make credit available for investors it drives investments. So when central bank wants to increase the level of investments and the same time optimism they drop down the interest rate which seems quite plausible since Ole Røgeberg states that due to drop in interest rates it put pressure on demand as it was the case of 1990s onwards because it motivated investors to invest so the demand increased and subsequently the prices. This scenario actually happened right after the crisis in 1989 when it was needed to dispel the pessimism from the market so people would tend to invest and consume due to low rate of interest as it is shown in the graph of the nominal and real interest rates contributed by Ole Røgeberg.

The effect of leverage and risk-shifting facilitation

Røgeberg emphasizes the fact that people are interested in substantial mortgages because then they attain higher payoff which leads to increase in demand and ultimately housing prices which is in consistent with Allen and Gale's theory that people tends to borrow money to invest in risky assets due to the fact that they invest to make payoff which is above the benchmark. People tends to borrow substantially and we perceive the fact that it is due to risk shifting issue which is highlighted by Allen and Gale why people tend to borrow huge amounts because banks are the one that faces the real risk and that is why consumers are willingly interested to invest because they perceive that the property is expensive which could be above the benchmark which is the fundamental value. The consumers are eminently motivated to realize huge mortgages because of the limited liability. For instance, if households contribute 15% of equity into a loan then their ultimate loss would be 15% and not the price of the house which leads to higher demand and automatically higher prices for the properties.

We infer the fact, that the price of real estate assets rises due to risk shifting and also the same time because of fixed supply when people knows that the bank is the one that bears the literal risk then they tend to go for huge mortgages in the risky asset which is even justified by the Allen and Gale's arguments whereby the authors emphasizes that price of risky asset ramps

up due to risk shifting and fixed supply which is the case when it comes to real estate properties. Due to this risk shifting as explained by Allen and Gale's theory, as borrowers must pay 1.33 and the lenders are expected to get 0.83 so in this case when borrowers defaults then $1.33 - 0.83 = 0.5$ is expected to be shifted to the borrower from the lender which incentivizes borrowers to go for substantial loans because of the limited liability and risk shifting conundrum. So in the sense, investors or households tend to invest in real estate market in the wake of higher payoff of 0.67 compared to the safe asset of 0.17 as it is elucidated by Allen and Gale's model.

As debt is driving prices to rise it might create an expectation of a further price rise which again leads to an investment motivated growth in demand and thereby a new temporary rise in price which is explained in a crystal-like fashion by the model of Morten Josefsen given in the article of Ole Røgeberg.

The bubble mechanism which is explained by Ole Røgeberg that people tends to borrow substantially due to the fact that people believes that they can recoup their investments out of high property prices which stimulates their high debt ratios. We believe that people borrow heavily because of the risk shifting issue which is explained by the Allen and Gale that the price of the risky asset heightens up because of risk shifting issue and fixed supply involvement. We decipher that people demands rises dramatically when the supply is fixed due to their potential to materialize high amount of loans and subsequently price rises which is justified by the law of demand.

As it is explained in the bubble mechanism by Røgeberg, people tends to go for huge leverages due to credit expansion which makes it easier for them to finance one investment and the realized profit of the first unit they use to invest in the second investment and the process continues which leads to rising demand and so prices subsequently. Allen and Gale explain that when people can finance due to credit expansion it gives rise to the demand and so the prices and defaults can be dodged. On the other hand, when credit expansion is controlled then the demand would be lowered down and so the prices which would lead to defaults. This implies that this bubble mechanism can go on as long as there is cheap credit in the market but a sudden externality making for example to interest rate to rise will break the sequence of bubble mechanism and people would tend to default as explained by Allen and Gale. This might be a portent of a bubble recording the words of Siv Jensen in our

introduction part regarding that it is not a question about if the interest rates will rise but rather when.

Morten Balzertsen and Norges Bank Governor Øystein Olsen shows their concerns that Norwegians are holding higher debt than ever before, which is roughly twice relative to their disposable incomes which is quite unsustainable and if interest rates drops it would cause more vulnerability. Another concern shared by Steinar who perceives that it is a bubble like situation. On the other hand, Terje Halvorsen is quite optimist and he argues that high housing prices can be justified by high growth in households income which reveals the fact that households now spends lesser on loans relative to the 1990s when interest rates were higher than the contemporary rates.

If the words of Steinar Juel gets materialized would cause susceptibility to the Norwegian economy and that is why we perceive that we shouldn't afford to take his words unheeded. It is also worth heeding the concerns of Røgeberg who argues that when people go for huge mortgages and that leads to high housing prices it spearheads bubble like situation. However, it is also quite justifiable that contemporary rates are much lower than 1990s and therefore the optimism of Halvorsen seems eminently reasonable either.

Discussion of supply drivers

Furthermore, Røgeberg explains that when a demand shock happens that causes the short-term price to rise, however, the supply side cannot easily meet this increased shock in the short-term which is also in line with the construction lag of 6-12 months explained by Sivitanidou, R.M (2011). The construction sector would find it profitable to construct and therefore start to build more houses which eventually will lead to decrease in demand in the long-run which will cause prices to fall again in the future. There are two types of prices in this scenario which is the short-term price which is the increased price due to the demand shock and the long-term price which is the price we get in the long-run when supply is meeting the demand.

Ola Røgeberg states that there is land available but a land ready for building is constrained by public regulations which make the supply side sluggish. As we can see in the article of dagens næringsliv that the minister Kari Gjesteby is putting emphasis to do something with slack

supply side and also the public restrictions whereas they struggle to accelerate the process of housing construction. The process is referred to as the pipeline effect by Sivitanidou, R.M (2011) and it is reasonable to believe that this effect is slowing down the supply side making the demand to reach new heights and subsequently the housing prices.

If we are to believe that investment motivated growth is behind the rise in price whereas debt is used to finance higher and higher housing prices, it would become very difficult for young people to participate in this investment motivated demand growth that the supply side is supposedly causing due to difficulties to get substantial loans. These concerns about youth is not able to enter the market is also shared by Hanna Marcussen and therefore increasing the supply is of great concern. However, the rocketing prices of housing are justifiable due to slackening supply-side at the moment.

From short-term price to long term price

Ole Røgeberg spells out that prices would revert back to old level again which is the price close to the fundamental value which can also be seen as the actual price that Sivitanidou, R.M (2011) explains about. According to him, prices have not reverted back to old level in Norway because of people's myopic behaviour who perceives short-term prices increase to be the long-term price. According to his explanation it is justifiable to believe that the expectation is driving the prices to increase further and that is why the prices continues to rise because people perceive that the expectation price (ex ante price) to be the actual price using Sivitanidou, R.M (2011) perspective. If this is the case then there is a portent of bubble in the housing market because the prices are rising because of the self-augmenting price rise that Ola H. Grytten refers to in his definition of a housing bubble.

Based on the 2011 numbers presented in the article of Lansing and Jurgilas the percentage of people believing that price would rise in the future was as high as 70% in 2011 up from 10% in 2008 which backs the argument that people believe in price rise which might make them use the house market as an investing opportunity rather than normal consumption for housing to live in.

It is also given in the same article that Shiller found out that people tend to predict ex ante returns based on ex post market trends which is another example of this. Ole Røgeberg and Lansing and Jurgilas explains the media's role to influence people to believe that prices would

rise with appealing headlines such as “real estate gold rush” from the fortune magazine in US that induced people to presume housing market a place where they can make a lot of profit.

Ole Røgeberg uses the same argument about how media uses pleasant titles such as “now you can make a housing coup” and “the prices are rising” which is in fact cajoles people to perceive housing market pretty rosy and viable bonanza.

Another reason for why prices should revert back to its fundamental value is the fact that emphasized by Allen and Gale when investors uses their own money then the risk shifting issue is not applied so we perceive that since they use their own money so they cannot invest as much money as they want, as in the case of borrowing money then every investor can borrow and demand would rise and so prices. But in the case of when investors are investing their own money then demand would not increase that much and so prices compared to when there would be risk shifting problem and consumers can borrow and which leads to higher demand for houses and the higher housing prices. So in the sense when there is no risk shifting problem the value of safe asset should be equal to the value of the risky asset which is the real estate asset.

So we perceive that, since the investor would use their own money then demand is going to be limited because not everyone can invest compared to when investors can borrow and that is why we don't consider there will be expectation when people uses their own money and in this context where expectation will not be present then the value of asset should be equal to the fundamental value which is in line with the discussion of Røgeberg in the above paragraph that prices should revert back to the old level in the absence of expectation. Since not many people would demand for houses because of using their own money then we perceive that demand should be equal to the supply and price would not rise and so should the value of safe asset be equal to the value of risky asset.

The role of PR ratio, a portent of a bubble or not?

Based on Favilukis, Ludvigson and Van Nieuwerburgh in the article of Lansing and Jurgilas they explains that the high run-up in US house prices happened because of the lax credit expansion which is in fact enthused households to perceive lower risk and subsequently they expected lower risk premium which inflated the fundamentals price rent ratio. However, that is not a bubble. This gives support to Øystein Olsen and Idar Kreutzer when they claim that,

factors such as low interest rates are behind the extremely high prices but still no-bubble can be justified in the housing market.

On the other hand, from Grytten's perspective, price to rent ratio has been a good indicator that accounts for bubble in housing prices. He contributed his arguments that the price-rent ratio has had the same multitude of price to rent ratio currently as three periods in Norway before, during the periods of financial depression, which could also be the case that such high price to rent might cause a crisis this time as well and therefore should not be ignored.

Another fact brought up by Lansing and Jurgilas that at the outset of 2006 when price-rent ratio was mounted up, it went back to the threshold level which was the period right before the economic boom. Employing the perspective of Grytten, we can see that what happened in the US is in sync with Gryttens warnings and that is why it is worth taking note of whether high price-rent ratios may turn differently in contemporary scenarios in Norway. Since it happened in US and in Norway before and that is why high price to rent ratios can be an indication or a portent of a housing bubble.

Fundamentals factors behind?

Øystein Olsen explained in his arguments that the Norway has experienced the most noticeable growth since 2000 whereas unemployment has been kept low even during the financial crisis. In periods of economic growth there is more welfare and subsequently more goods and services are demanded. Therefore, it can be justifiable to say that the enormous rise in price is due to incredible rise in the growth of the economy. Some prominent economists like Øystein Olsen and Idar Kreutzer state that the fundamental factors such as low unemployment, low interest rates and rise in disposable income are behind this price rise.

Looking at the housing market from the perspective of the growth in Norway since 2000 onwards, it may seem reasonable to see the increased demand and subsequently the rise in price as a result of people having high welfare and using this welfare to buy a good which is housing. It is also justifiable to believe that housing is of higher importance in Norway due to its colder climate where much of the day is spent inside the house compared to Spain where the climate is warmer and thereby people spend more time outside. Therefore, Norwegians consider their house as an important asset to invest in and therefore willing to spend money and also able to do so because of the increased welfare. Housing, thus, becomes a necessary good that many people want and therefore prices rises because of the high demand for

housing.

International monetary fund 2012 in the article of Lansing and Jurgilas states that there is no doubt that fundamental factor such as high income, population growth, favourable tax terms that triggers demand to rise and subsequently causing the prices to rise. Geir O. Geving shares his concern and states that prices have reached to unhealthy levels due to the low interest rates, huge increasing in purchasing power in the competition for buying the few houses on the housing market.

However, according to International monetary fund there are non-fundamental factors such as optimistic price expectation which plays a substantial role in the varied price development and property prices in Norway which are even mispriced by 15-20%. The high price development due to credit expansion always leads towards to financial depression as it happened in the case of the US real estate during the mid 2000s. It becomes justifiable to heed the definition of Grytten which gives an indication or portent of bubble because people tend to have optimistic stances regarding the price rise in the bubble-like situation.

Øystein Olsen states that high prices are justifiable due to few houses those are built compared to demographic needs. Kari Gjestedal is putting emphasis on this scarcity of houses in the market and how that has led to rise in price. Therefore, from this argument it becomes reasonable to believe that the lack of houses combined with the increased purchasing power and the increased demand is what is driving high prices and not speculative factors as Ole Røgeberg explains.

However, it is worth noticing the fact explained in the BBC article that Norway is facing some difficulties due to the drop in oil prices. The unemployment has mounted up particularly in the most oil concentrated areas of Norway which has led to a drop in housing prices in this region. Stavanger has been hit hard by the plunge in oil prices and subsequently the house prices slumped last year. However, the prices have started to rise again this year and therefore one might wonder whether the fundamental factors are behind this price rise whilst the situation in Stavanger has not changed much since last year. The rise in housing prices in Norway this year has been the strongest since 2003 and that seems to be no limit of how high the housing prices can climb.

We find it as an obvious fact that prices rises during booms but considering the situation in oil

concentrated areas in Norway where many people have lost their jobs due to drop in oil prices we find it a difficult to perceive that only fundamentals can rise prices when many people have lost their jobs, however, the house prices still rises. Broadly speaking, if the situation of Stavanger of higher unemployment and so on should spread to the rest of the country and prices will continue to rise one may apparently wonder whether only fundamental prices are driving prices.

We have discussed above that housing prices in Oslo were rising in 2015 and there were very few houses built relative to the demand as Kari Gjestedal explained. It should be noticed that Oslo is not hit as hard as Stavanger due to not being that oil concentrated but what will happen to the housing prices in Oslo if the economic situation would worsen is a question that is worth asking. If the growth in demand is investment motivated as Røgebergs claim then we may find ourselves soon or later in the situation whereby expectation fades and prices starts to fall. Then we would be in a situation where we can perceive that fundamentals have not been behind the price rise and when the expectation fades and subsequently the vacuumed bubble in the real estate will bust.

Therefore, the fact raised by Marius Jurgilas and Kevin J. Lansing cannot be ignored that when the features of bubbles looms its nasty head on the horizon then high housing prices are justified by means of fundamental arguments. Thus, it becomes necessary to be concerned and if their arguments would go unheeded then it would inflict its nasty implication on the Norwegian economy.

6.5 Conclusion of comparative analysis

It is inevitable to not recognize that some of the rise in the prices in the housing market which has happened due to the enormous growth in Norway especially from the 2000 onwards. Housing is a good that is also a need and the increased purchasing power in Norway has made people potentially capable to pay for expensive houses and which results in high demand and subsequently high house prices due to shortage in supply. These arguments seem quite reasonable and the cause to be fundamental factors which drives the housing prices. However, the rise in housing prices compared to real construction cost seems somewhat abnormal. Ole Røgeberg states that there is no reason to anticipate housing prices to increase if construction cost is not expected to increase. Despite Norwegians purchasing power having

increased, there is a limit to how much prices should rise which is the fundamental value explained by Allen and Gale as the benchmark for housing prices. If the high purchasing power and the ability to take huge mortgages with cheap credit in form of credit expansion have made the participants to bid above this benchmark then we are facing a bubble in the Norwegian housing market.

Norway today is facing difficulties as we have discussed and therefore it would not be only fundamental characters which account for this much meteoric price rise, if the situation does not improve. We find it hard to believe that this price rise should be due to fundamental factors only and maybe it comes as a result of investment motivated growth in demand. Furthermore, if the economic situation in Norway would worsen then we can stand in front of a bubble that will bust.

We find arguable possible portents or hints of bubbles in the Norwegian housing market in Norway today and we therefore put confidence in the minister Kari Gjestedal's warnings that something should be done in order to build houses faster enough in order to meet the housing demand so that apparently prices would start normalizing.

Since the house prices are still rising in Stavanger despite encountering the doldrums in oil sector which has subsequently triggered a haemorrhage of jobs, a further futuristic detailed investigation of Stavanger region can clarify this meteoric house price rise and may better reveal the house price conundrum.

7.0 Fundamental analysis

7.1 Fundamental factors in the housing market

Fundamental house prices are determined when we have a demand function with fundamental explanatory variables. These variables are the need for housing, purchasing power, the cost of capital (interest rate), the confidence in the future economic situation (measured by the unemployment) by the combination of the supply of new dwellings and the cost of building the dwellings. Recent studies indicate that income, interest rate, unemployment and supply (costs) are the most important drivers of the housing price. This would mean that higher the real income, greater the fundamental house price. The lower the real interest rate, higher the demand and subsequently greater the house prices. The more people are unemployed the more economic uncertainty which would lead to less demand and so lower house prices. Variable

costs in form of material costs and labour costs are represented by the supply of new dwellings, i.e. the number of completed dwellings (Vale, Kutluay and Yildiz, 2015). In addition, we have used population as an additional explanatory variable based on the reasoning of Røgeberg (2011) who explained that population has been a very important driver when it comes to house prices.

7.2 Fundamental model

We interpret fundamental house prices as housing prices driven by only the fundamental determinants. We are basing our fundamental model discussed by Vale, Kutluay and Yildiz and Ole Røgeberg as fundamental explanatory variables such as unemployment, building completed, real disposable income, real interest rate and population whereas our dependent variable is the housing price index. The model is given below.

$$hpri = unemp + buildcomp + realdispinc + realinrate + pop$$

- hpri = house price index
- unemp = unemployment rate
- buildcomp = buildings completed
- realdispinc = real disposable income
- realinrate = real interest rate
- pop = population

Our outputs are mentioned below that we have gotten after having run the regression in R Studio.

| | Estimate | Std. Error | t-value | P(> t) |
|-------------|------------|------------|---------|--------------|
| Intercept | -4.847e+02 | 2.331e+01 | -20.794 | < 2e-16 *** |
| unemp | -8.535e+00 | 1.250e+00 | -6.827 | 1.66e-08 *** |
| buildcomp | 4.703e-04 | 4.821e-04 | 0.975 | 0.33445 |
| realdispinc | -3.298e-04 | 3.421e-01 | -0.001 | 0.99923 |
| realinrate | -2.839e+00 | 9.986e-01 | -2.843 | 0.00664 ** |
| pop | 1.359e-04 | 3.848e-06 | 35.303 | < 2e-16 *** |

Signif. codes:

0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.714 on 46 degrees of freedom

Multiple R-squared: 0.9787, Adjusted R-squared: 0.9764

F-statistic: 423 on 5 and 46 DF, p-value: < 2.2e-16

7.2.1 Interpretation of fundamental model

As we can see from our results that unemployment is significant, so we perceive the fact that unemployment is driving the housing prices. The relationship between unemployment and housing prices is negative which explains that higher the unemployment rate lower the housing prices. We presume that when unemployment rate rises then it affects the demand due to higher uncertainty so people would not tend to demand housing when they are unemployed. So lower the demand lesser the housing prices. Having other factors fixed when unemployment is assumed to rise by 1% then it is estimated that housing price index would fall by 8.535 points.

Based on our results the relationship between house price index and buildings completed is positive which is contrary to our expectation. Actually we presumed the negative relationship between house price index and buildings completed because if there are more buildings which are completed that should put less pressure on the prices which would trigger prices to drop. This also contradicts the reasoning's of Øystein Olsen, Idar Kreutzer and when they are claiming that prices are high today due to low number of houses built. Their reasoning's are very logical in a perspective of supply and demand theory unless expectation is driving prices which are included in the drivers of demand from the Sivitanidou theory but also a driver of housing bubbles

The relationship between real disposable income and housing prices index is negative and it is not significant. So in the sense, higher the real disposable income lower the house price index. This is not in line with what we expected because we perceived when real disposable income increases and so the purchasing power so it leads to rise in real purchasing capacity. So in the sense, when real disposable income rises then it would encourage people to demand for housing and subsequently rise in demand would lead to increase in housing price index.

The relationship between real interest rate and housing price index is inverse so it implies the fact that higher the real interest rate, lowers the housing price index. In the sense, when real interest rate rises then households tend to demand lesser for housing prices and due to that effect housing prices drops. This explanatory variable is statistically significant as expected. Based on our results when real interest rate escalates by one percent it is assumed that house price index drops by 2.839 points.

The relationship between the population and house price index is positive and it is statistically significant based on our results. This positive relationship suggests that higher the population, greater the house price index. If we assume population to rise by 10000 then it is estimated that house price index would rise by 1.4 points. Ole Røgeberg explains that we have observed the highest growth in population from 2006-2011 out of the last 65 years and it has caused the demand to rise and therefore we had expected that population should be significant and have a positive sign since rise in demand would influence prices.

As we can see that both R squared and adjusted R squared are very high. We are employing adjusted R squared compared to R squared because it is a better indicator of explained variation by the regression because R squared is penalized for adding variables by chance and therefore gives a better indication of how much of the variation in housing prices that is explained by the explanatory variables. The adjusted R squared of 97.64% variation in housing prices is explained by the regression. However, it is not always a good sign when R squared is too high because it may also mean that regression is failing to give causal interpretation which is explained by Wooldridge (2014).

This high adjusted R squared is perceived to be doubtful since both building completed and real disposable income are not statistically significant which can lead to biased estimates of the true variation in housing price index. This can be due to the variables in the error terms which are correlated with the explanatory variables in the model or the fact that the model is consistently overestimating or underestimating the variables. We will therefore run autocorrelation and heteroscedasticity tests below to investigate this.

7.2.1.1 Test for heteroscedasticity in fundamental model

We are taking the approach of Woolridge (introductory to econometrics) to interpret the

results of heteroscedasticity and autocorrelation. Having used the assumption of TS. 4 explained by Woolridge which implies the fact that $\text{Var}(u_t|X)$ must not depend on X which suggests that u_t and X are independent and the same time $\text{Var}(u_t)$ must be fixed across time, therefor we were interested to investigate whether TS. 4 does hold or not for our model, and if it does not hold it implies the fact that errors are heteroskedastic (Woolridge, 2014).

$$H_0 = \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$$

$$H_A \text{ not } H_0$$

We have tested for heteroscedasticity in R and the results are shown below:

| | | |
|-----------------------|--------|---------------|
| Chisquare = 0.5194828 | Df = 1 | p = 0.4710624 |
|-----------------------|--------|---------------|

This shows that the model's p-value is far above the significance level of 0.05 which indicates that we fail to reject the null hypothesis which means that the model does not contain any heteroscedasticity in the model.

7.2.1.2 Test for autocorrelation in fundamental model

Having used the assumption TS. 5 that there is no serial correlation imply the fact that:

$$\text{Corr}(u_t, u_s) = 0 \text{ for all } t \neq s$$

We have tested for autocorrelation in R and the results are shown below:

| lag | Autocorrelation | D-W Statistic | p-value |
|-----|-----------------|---------------|---------|
| 1 | 0.5802808 | 0.8373075 | 0 |

Alternative hypothesis: $\rho \neq 0$

We have $n = 52$ based on our degrees of freedom so we get to $d_L = 1.39290$ and $d_U = 1.72228$. Since D-W Statistic $< d_L$ which means that $\text{Corr}(u_t, u_{t-1}) > 0$ and the errors term in our model contains serial correlation. Having applied the wisdom of Woolridge when our model contains autocorrelation which highlights the fact that our estimators are still unbiased but not

BLUE (best linear unbiased estimators) (Woolridge, 2014).

7.3 Alternative model adding non-fundamental factors

From the above discussion we can see that the model based on only fundamental factors is not optimal since real disposable income and buildings completed variables are not significant and it does contain autocorrelation. This means that the fundamental factors that we have chosen to capture ceteris paribus interpretation failed to give causal interpretation of each explanatory variables since two variables are not significant

From the discussion in comparative analysis we highlighted that Ole Røgeberg's opinions about that the increased demand which has led to higher housing prices in Norway is investment motivated. Since he emphasizes the effect of debt on housing prices, the demand drivers of interest rate and population and the construction cost that has not increased at the same pace as housing prices and therefore cannot justify the impressive growth in housing prices. Therefore, we got interested in including these variables in a second model to see whether non-fundamental factors along with fundamental factors can give better interpretation of what drives the house price index.

The model:

$$hpr = unemp + realconstcost + realinrate + debt + pop$$

hpri = house price index

unemp = unemployment rate

realconstcost = real construction cost

realinrate = real interest rate

debt = debt

pop = population

Our output from the R studio is mentioned below.

| | Estimate | Std. Error | t value | Pr(> t) |
|-------------|------------|------------|---------|--------------|
| (Intercept) | -1.574e+02 | 1.230e+02 | -1.280 | 0.207120 |
| unemp | -6.682e+00 | 1.880e+00 | -3.555 | 0.000889 *** |

| | | | | |
|---------------|------------|-----------|--------|-------------|
| realconstcost | -4.928e-01 | 3.437e-01 | -1.434 | 0.158410 |
| realintrate | -2.151e+00 | 9.727e-01 | -2.212 | 0.031995 * |
| debt | 3.596e-05 | 1.207e-05 | 2.978 | 0.004620 ** |
| pop | 6.482e-05 | 3.306e-05 | 1.961 | 0.055949 . |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.301 on 46 degrees of freedom

Multiple R-squared: 0.9823, Adjusted R-squared: 0.9803

F-statistic: 509.8 on 5 and 46 DF, p-value: < 2.2e-16

7.3.1 Interpretation of alternative model adding non fundamental factors

In this model, the relationship between unemployment and the house price index is negative which implies the fact that higher the unemployment rate, lower the house price index. So the ceteris paribus effect of unemployment on house price index is that when unemployment rises by 1% then house price index fall by 6.68 points. This variable is statistically significant which highlights the fact that it is in line with our expectation since higher unemployment would give more uncertainty among households and then they would demand less for houses which leads to drop in prices.

As we can see from the results that the relationship between house price index and real construction cost is inverse which is not in line with our expectations based on Ole Røgeberg's reasoning. However, the fact that the variable is not statistically significant, it is in sync with our expectation based on Røgeberg's reasoning. He explained that high housing prices cannot be justified because they have increased away higher than the cost to build new houses

Our third variable real interest rate is statistically significant. The relationship between real interest rate and house price index is inverse which means higher the real interest rate, lower the house price index. The ceteris paribus interpretation of this variable is that when real interest rate rises by 1 percent then house price index drops by 2.151 points. Røgeberg states that interest rate is one of two main drivers for housing price rising from the 1990s onwards

that caused the demand to rise. He further emphasized that both real and nominal interest rates were dropped. So it implies the fact that we can justify his arguments based on our results.

Our fourth explanatory variable is debt which is statistically significant. The relationship between debt and house price index is positive. If we assume debt to rise by NOK 100 000 then it is estimated that house price index would increase by 3,6 points. The interesting fact is that Røgeberg states that the demand for housing has increased because of investment motivated growth. The author gives an example of how the profit from a sale of a house increases with the level of debt. He further spells out that this profit is used to take up a loan to buy a bigger house. This sequence would naturally increase housing prices and therefore it is worth wondering whether housing prices in Norway are driven by the level of debt and thereby the increased demand is due to investment motivated actions leading the demand to rise. Since debt is highly significant at .1% significant level which implies the fact that its ceteris paribus interpretation on house price index is quite meaningful which gives high degree of confidence in this variable based on our model and Ole Røgeberg's reasoning.

Our last explanatory variable is population and the relationship between this variable and the house price index is positive. So in the sense, higher the population greater the house price index. The variable is statistically significant. Having assumed that population rises by 10 000, it is predicted that house price index would rise by 0.65 points. This is the second variable mentioned by Røgeberg as the main driver for the increased demand in Norway from 1990s onwards. He explains that population should not increase housing prices as long as there are enough houses to deal with the extra demand that is caused by rise in population. However, the fact that supply side in Norway has been sluggish and there has been an impressive increase in population in the end of last decade we should expect to see that this variable is statistically significant as it is from our model. This means that the supply side cannot respond speedily to meet the increased demand. This fact can justify that the number of few houses built is causing the prices to rise like Idar Kreutzer and Øystein Olsen are explaining. However, it is significant only at 5% level whereas debt has higher significance level and gives an even better explanation of the increase in housing prices.

7.3.1.1 Test for heteroscedasticity in alternative model adding non fundamental factors

We have run the test for heteroscedasticity and results are shown below:

$$H_0 = \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$$

$$H_A \text{ not } H_0$$

$$\text{Chisquare} = 0.487381 \quad \text{Df} = 1 \quad \text{p} = 0.4850979$$

As we can see from the output the p-value is above the significance level of 0.05. This means that we fail to reject the null hypothesis which is stated above. So in the sense our model has a constant variance.

7.3.1.2 Test for autocorrelation in alternative model adding non fundamental factors

We have tested for autocorrelation in R and the results are shown below:

$$\text{Corr}(u_t, u_s) = 0 \text{ for all } t \neq s$$

| lag | Autocorrelation | D-W Statistic | p-value |
|-----|-----------------|---------------|---------|
| 1 | 0.6239918 | 0.7452665 | 0 |

Alternative hypothesis: $\rho \neq 0$

Based on our degrees of freedom which is 46 and subsequently our n is 52 so we get to $dL = 1.39290$ and $dU = 1.72228$. Since D-W Statistic is less than dL that emphasize the fact that $\text{Corr}(u_t, u_{t-1}) > 0$ and the errors term in our model contains serial correlation. Therefore our estimators are not BLUE but are unbiased yet.

7.4 Discussion of the models

Since every model has very high F-statistic that implies the fact that each model is jointly significant. However, the R-squared is too high in each model that gives justifiable reasons to perceive that explanatory variables are not explaining the house price index perfectly. We perceive that since we have autocorrelation that may be because that it must be other factors in our error term that should be included in the models which heightens up the R-squared by picking variables by chance and therefore causing serial correlation. It may also mean that if explanatory variables are correlated with the error terms and subsequently causing

endogeneity which in fact violates Gauss Markov's assumption (MLR) 4 which implies that our estimators are presumably not equal to the true values (Woolridge, 2014).

However, the purpose of this thesis was not to come up with a perfect model explaining house prices but rather it was about what factors drive housing prices and whether the fundamental drivers or speculative drivers and investigating some portents of housing bubble.

7.5 Conclusion of fundamental analysis

We find fundamental variables such as real interest rate, population, unemployment significant which gives an indication that these fundamental factors are behind the increase in house price index. This might come as a result of the boom in Norway which increased the welfare and low economic uncertainty due to low unemployment. Øystein Olsen justifies the high house price because of the low unemployment and low interest rates which is quite reasonable because it is in sync with our model. However, it is a paradox that real disposable income is not significant which we expected because of the boom that Norway has gone through during the last 16 years. Furthermore, much emphasis has put on the low number of buildings in the Norwegian housing market but according to our model this variable is not driving the house price index since it is insignificant. Based on our result, population is significant which supports Røgeberg arguments who explain that Norway has experienced the strongest growth of population during the last 65 years.

When it comes to the second model where we have also included the non-fundamental factor such as debt, the result is quite different. Unemployment is highly significant which is as expected since it gives less uncertainty to the households and is in line with Øystein Olsen argument that it is an important variable that drives demand and so housing prices rises.

An interesting observation is that the construction cost variable is not statistically significant which is in sync with Ole Røgeberg's arguments that high growth in housing prices cannot be justified by real construction cost. This backs his words when he explains that real construction cost has increased but not to the same extent as housing prices. Another important aspect of this model is that debt is very significant which backs up the factor C in Ole Røgeberg's arguments that the high debt is driving the housing prices to increase. This puts confidence into his reasoning based on our results that there is an investment motivated growth in demand which subsequently increases house prices. We find that real interest rate

and population which are the main drivers of increased demand and which led to investment motivated growth in demand due to high amount of debt people used whilst expecting that someone else will even take bigger loan to buy the same house in the futuristic scenarios and which Ole Røgeberg's refers as bubble mechanism and that process fuelled high housing prices.

8.0 Conclusion

As discussed many times in this thesis that there are no doubts that fundamentals are behind the substantial price rise in Norway but to what extent? We cannot afford to ignore the other factors that drives prices when we know from our results that debt is driving the prices and therefore there are reasons to be concerned just as Siv Jensen when she is worried about the Norwegian's household's debt level. The increase of interest rates is warned by Siv Jensen to come in the future and then it is reason to be concerned whether the households with high debt will be able to bear the increase of interest rates. If households will start to default due to not being able to cope with increased cost of capital we can find ourselves in a situation where many people would find themselves to be forced to sell their properties and subsequently a substantial drop in prices would happen. If the increase in housing prices today also is due to expectation by means of bubble mechanism as explained by Ole Røgeberg and this would fade over time due to price drop if interest rate increases as warned by Siv Jensen then we can find ourselves in a bubble like situation.

Therefore, it is possible that the boom in Norway where fundamental factors gave rise to the prices and at the same time low interest rates has led us into a situation of speculating on the increased prices with cheap credit which have presumably caused a substantial rise in prices in the housing market.

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10.0 Appendix

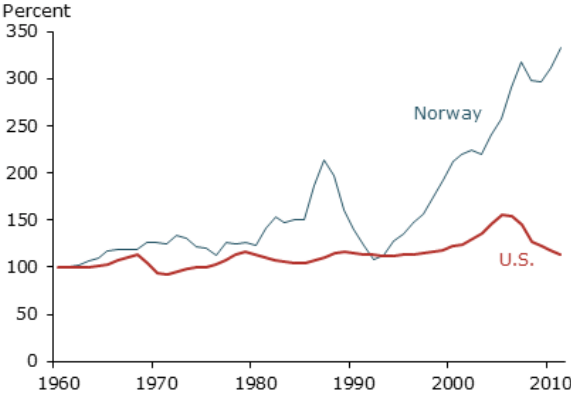
10.1 Figures

Figure 1: Norwegian household expectation for home prices



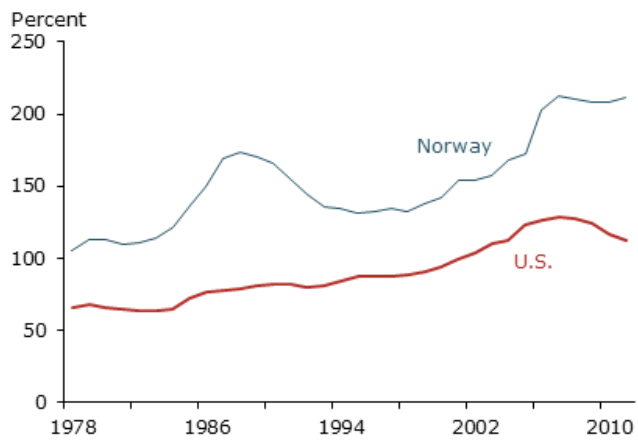
Source: (Lansing & Jurgilas 2013)

Figure 2: Ratio of house price to rent



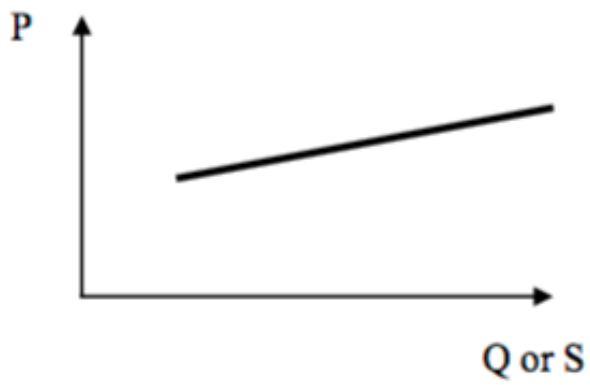
Source: (Lansing & Jurgilas 2013)

Figure 3: Ratio of household debt to income



Source: (Lansing & Jurgilas 2013)

Figure 4: The long-run aggregate supply



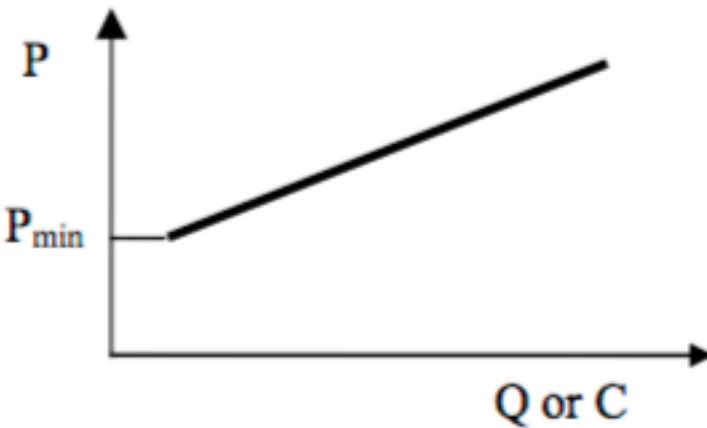
Source: (Sivitanidou, 2011)

Figure 5: The short-run aggregate supply



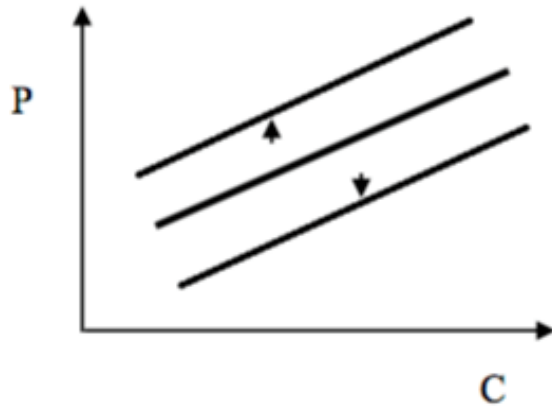
Source: (Sivitanidou, 2011)

Figure 6: New constructions (completions)



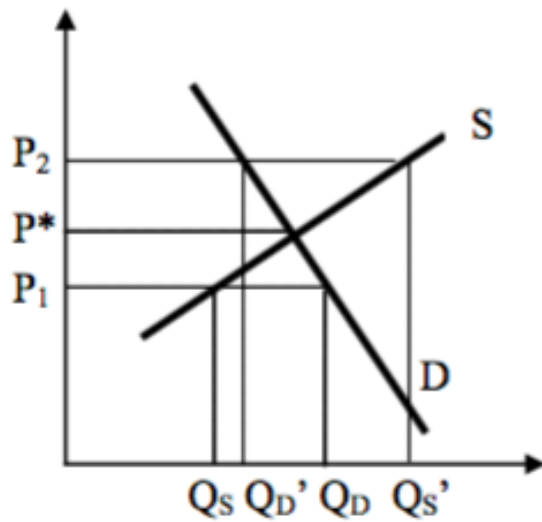
Source: (Sivitanidou, 2011)

Figure 7: Effects of exogenous shifters on new construction



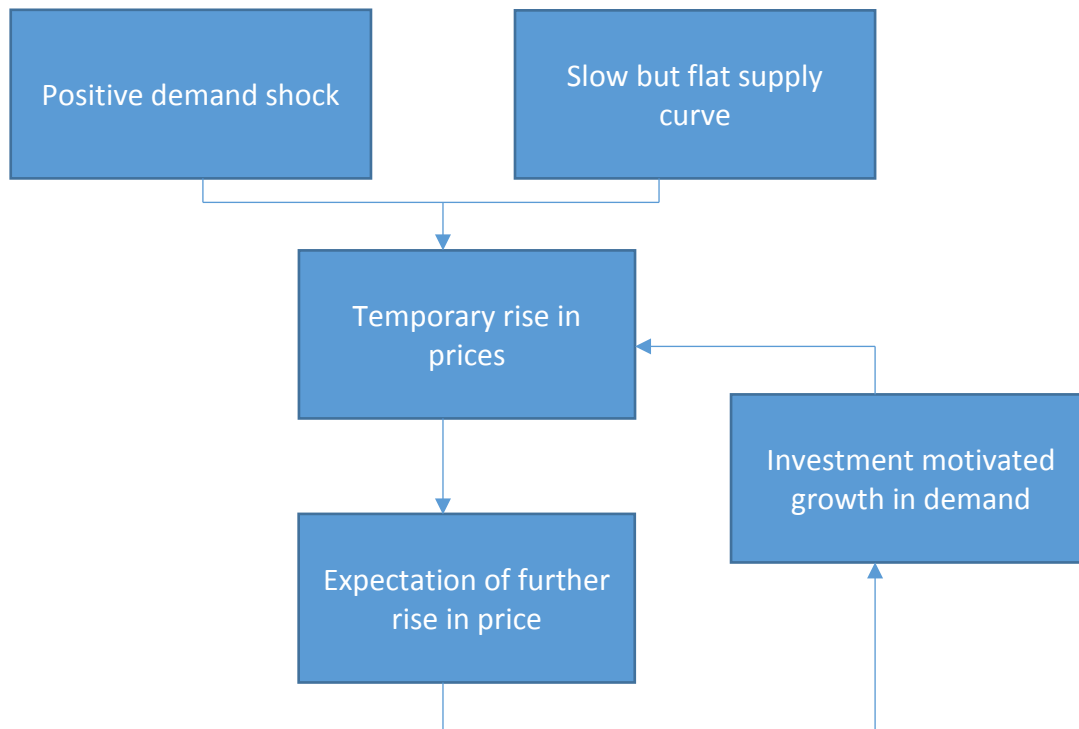
Source: (Sivitanidou, 2011)

Figure 8: Market price determination



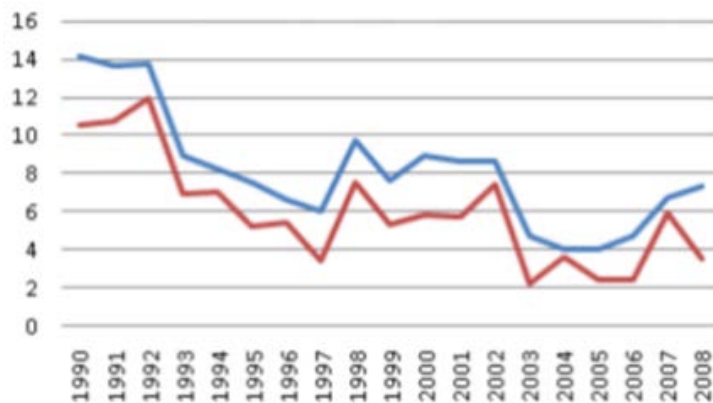
Source: (Sivitanidou, 2011)

Figure 9: Morten Josefsen model



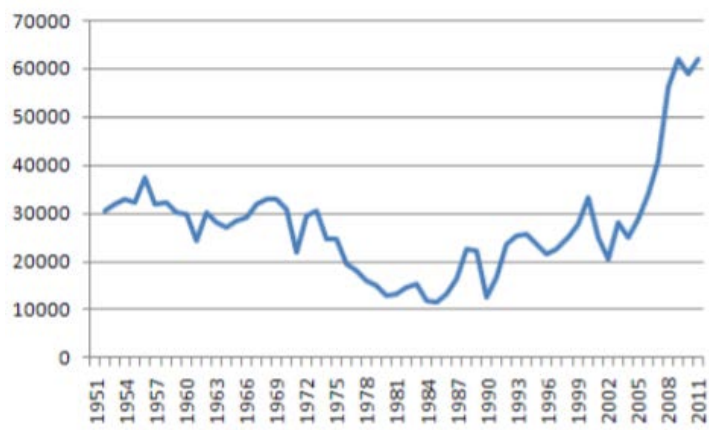
Source: (Røgeberg 2011)

Figure 10: Nominal and real interest rate in Norway (blue line being the nominal interest rates and red line being the real rate of interests)



Source: (Røgeberg, 2011)

Figure 11: The change in population regarding last year



Source: (Røgeberg, 2011)

Figure 12: Dagbladet regarding housing prices



Source: (Røgeberg 2011)

Tables

House price index

| | | | |
|-------------------|-------|--------|-------|
| The whole country | Total | 2003K1 | 83.3 |
| The whole country | Total | 2003K2 | 83.9 |
| The whole country | Total | 2003K3 | 83.7 |
| The whole country | Total | 2003K4 | 84.7 |
| The whole country | Total | 2004K1 | 91.0 |
| The whole country | Total | 2004K2 | 92.4 |
| The whole country | Total | 2004K3 | 92.6 |
| The whole country | Total | 2004K4 | 93.6 |
| The whole country | Total | 2005K1 | 97.5 |
| The whole country | Total | 2005K2 | 100.2 |
| The whole country | Total | 2005K3 | 101.1 |
| The whole country | Total | 2005K4 | 101.2 |
| The whole country | Total | 2006K1 | 107.5 |
| The whole country | Total | 2006K2 | 112.8 |
| The whole country | Total | 2006K3 | 116.5 |
| The whole country | Total | 2006K4 | 117.9 |
| The whole country | Total | 2007K1 | 125.3 |
| The whole country | Total | 2007K2 | 130.0 |
| The whole country | Total | 2007K3 | 129.8 |
| The whole country | Total | 2007K4 | 126.9 |
| The whole country | Total | 2008K1 | 129.9 |
| The whole country | Total | 2008K2 | 131.5 |
| The whole country | Total | 2008K3 | 127.0 |
| The whole country | Total | 2008K4 | 118.1 |
| The whole country | Total | 2009K1 | 123.0 |
| The whole country | Total | 2009K2 | 129.5 |
| The whole country | Total | 2009K3 | 131.8 |
| The whole country | Total | 2009K4 | 131.8 |
| The whole country | Total | 2010K1 | 136.3 |
| The whole country | Total | 2010K2 | 141.3 |
| The whole country | Total | 2010K3 | 140.6 |
| The whole country | Total | 2010K4 | 140.5 |
| The whole country | Total | 2011K1 | 147.7 |
| The whole country | Total | 2011K2 | 151.8 |
| The whole country | Total | 2011K3 | 152.3 |
| The whole country | Total | 2011K4 | 151.6 |
| The whole country | Total | 2012K1 | 157.0 |
| The whole country | Total | 2012K2 | 162.1 |
| The whole country | Total | 2012K3 | 163.0 |
| The whole country | Total | 2012K4 | 161.9 |

| | | | |
|-------------------|-------|--------|-------|
| The whole country | Total | 2013K1 | 166.9 |
| The whole country | Total | 2013K2 | 171.4 |
| The whole country | Total | 2013K3 | 168.2 |
| The whole country | Total | 2013K4 | 163.6 |
| The whole country | Total | 2014K1 | 167.5 |
| The whole country | Total | 2014K2 | 173.8 |
| The whole country | Total | 2014K3 | 174.0 |
| The whole country | Total | 2014K4 | 173.1 |
| The whole country | Total | 2015K1 | 179.5 |
| The whole country | Total | 2015K2 | 185.3 |
| The whole country | Total | 2015K3 | 184.6 |
| The whole country | Total | 2015K4 | 181.0 |

Buildings completed dwellings

| time | Buildings completed. Dwellings |
|--------|--------------------------------|
| 2003K1 | 5576 |
| 2003K2 | 4696 |
| 2003K3 | 4623 |
| 2003K4 | 6437 |
| 2004K1 | 5617 |
| 2004K2 | 5534 |
| 2004K3 | 5607 |
| 2004K4 | 6788 |
| 2005K1 | 6731 |
| 2005K2 | 6926 |
| 2005K3 | 6761 |
| 2005K4 | 9126 |
| 2006K1 | 7435 |
| 2006K2 | 6521 |
| 2006K3 | 5261 |
| 2006K4 | 9158 |
| 2007K1 | 8015 |
| 2007K2 | 6730 |
| 2007K3 | 6862 |
| 2007K4 | 9525 |
| 2008K1 | 6842 |
| 2008K2 | 7396 |
| 2008K3 | 6806 |
| 2008K4 | 7596 |
| 2009K1 | 7645 |
| 2009K2 | 4939 |
| 2009K3 | 3902 |
| 2009K4 | 5223 |

| | |
|--------|------|
| 2010K1 | 4757 |
| 2010K2 | 3699 |
| 2010K3 | 3957 |
| 2010K4 | 5613 |
| 2011K1 | 5153 |
| 2011K2 | 3863 |
| 2011K3 | 4597 |
| 2011K4 | 6433 |
| 2012K1 | 5246 |
| 2012K2 | 6110 |
| 2012K3 | 7289 |
| 2012K4 | 7634 |
| 2013K1 | 6324 |
| 2013K2 | 6572 |
| 2013K3 | 6912 |
| 2013K4 | 8667 |
| 2014K1 | 6356 |
| 2014K2 | 7420 |
| 2014K3 | 6191 |
| 2014K4 | 8113 |
| 2015K1 | 6519 |
| 2015K2 | 7972 |
| 2015K3 | 5968 |
| 2015K4 | 7801 |

Disposable income

| transaction | time | Current prises (NOK million) |
|-------------------|--------|------------------------------|
| DISPOSABLE INCOME | 2003K1 | 186418 |
| DISPOSABLE INCOME | 2003K2 | 191980 |
| DISPOSABLE INCOME | 2003K3 | 195356 |
| DISPOSABLE INCOME | 2003K4 | 198106 |
| DISPOSABLE INCOME | 2004K1 | 196667 |
| DISPOSABLE INCOME | 2004K2 | 203867 |
| DISPOSABLE INCOME | 2004K3 | 200712 |
| DISPOSABLE INCOME | 2004K4 | 205957 |
| DISPOSABLE INCOME | 2005K1 | 211577 |
| DISPOSABLE INCOME | 2005K2 | 227689 |
| DISPOSABLE INCOME | 2005K3 | 218022 |
| DISPOSABLE INCOME | 2005K4 | 226587 |
| DISPOSABLE INCOME | 2006K1 | 205012 |
| DISPOSABLE INCOME | 2006K2 | 208215 |
| DISPOSABLE INCOME | 2006K3 | 212371 |
| DISPOSABLE INCOME | 2006K4 | 215332 |
| DISPOSABLE INCOME | 2007K1 | 221153 |
| DISPOSABLE INCOME | 2007K2 | 222227 |
| DISPOSABLE INCOME | 2007K3 | 228847 |
| DISPOSABLE INCOME | 2007K4 | 230536 |
| DISPOSABLE INCOME | 2008K1 | 236307 |
| DISPOSABLE INCOME | 2008K2 | 236544 |
| DISPOSABLE INCOME | 2008K3 | 243905 |
| DISPOSABLE INCOME | 2008K4 | 248947 |
| DISPOSABLE INCOME | 2009K1 | 244129 |
| DISPOSABLE INCOME | 2009K2 | 253823 |
| DISPOSABLE INCOME | 2009K3 | 258666 |
| DISPOSABLE INCOME | 2009K4 | 264683 |
| DISPOSABLE INCOME | 2010K1 | 262733 |
| DISPOSABLE INCOME | 2010K2 | 264123 |
| DISPOSABLE INCOME | 2010K3 | 267680 |
| DISPOSABLE INCOME | 2010K4 | 272122 |

| | | |
|-------------------|--------|--------|
| DISPOSABLE INCOME | 2011K1 | 275134 |
| DISPOSABLE INCOME | 2011K2 | 278360 |
| DISPOSABLE INCOME | 2011K3 | 284048 |
| DISPOSABLE INCOME | 2011K4 | 284938 |
| DISPOSABLE INCOME | 2012K1 | 292432 |
| DISPOSABLE INCOME | 2012K2 | 294076 |
| DISPOSABLE INCOME | 2012K3 | 294949 |
| DISPOSABLE INCOME | 2012K4 | 302753 |
| DISPOSABLE INCOME | 2013K1 | 310207 |
| DISPOSABLE INCOME | 2013K2 | 311333 |
| DISPOSABLE INCOME | 2013K3 | 314501 |
| DISPOSABLE INCOME | 2013K4 | 318751 |
| DISPOSABLE INCOME | 2014K1 | 322753 |
| DISPOSABLE INCOME | 2014K2 | 328406 |
| DISPOSABLE INCOME | 2014K3 | 331653 |
| DISPOSABLE INCOME | 2014K4 | 335965 |
| DISPOSABLE INCOME | 2015K1 | 341709 |
| DISPOSABLE INCOME | 2015K2 | 345274 |
| DISPOSABLE INCOME | 2015K3 | 345781 |
| DISPOSABLE INCOME | 2015K4 | 351740 |

Population at the beginning of the quarter

| time | Population at the beginning of the quarter |
|-------------|---|
| 2003K1 | 4552252 |
| 2003K2 | 4557998 |
| 2003K3 | 4565107 |
| 2003K4 | 4572924 |
| 2004K1 | 4577457 |
| 2004K2 | 4582562 |
| 2004K3 | 4589608 |
| 2004K4 | 4599202 |
| 2005K1 | 4606363 |
| 2005K2 | 4612656 |
| 2005K3 | 4621299 |
| 2005K4 | 4631799 |
| 2006K1 | 4640219 |
| 2006K2 | 4649302 |
| 2006K3 | 4660387 |
| 2006K4 | 4671871 |
| 2007K1 | 4681134 |
| 2007K2 | 4691507 |
| 2007K3 | 4704573 |
| 2007K4 | 4721620 |
| 2008K1 | 4737171 |
| 2008K2 | 4753373 |
| 2008K3 | 4769073 |
| 2008K4 | 4787021 |
| 2009K1 | 4799252 |
| 2009K2 | 4812196 |
| 2009K3 | 4825552 |
| 2009K4 | 4842676 |
| 2010K1 | 4858199 |
| 2010K2 | 4873212 |
| 2010K3 | 4887958 |
| 2010K4 | 4908147 |

| | |
|--------|---------|
| 2011K1 | 4920305 |
| 2011K2 | 4937265 |
| 2011K3 | 4952982 |
| 2011K4 | 4973029 |
| 2012K1 | 4985870 |
| 2012K2 | 5002942 |
| 2012K3 | 5017518 |
| 2012K4 | 5038137 |
| 2013K1 | 5051275 |
| 2013K2 | 5063709 |
| 2013K3 | 5077798 |
| 2013K4 | 5096300 |
| 2014K1 | 5109056 |
| 2014K2 | 5124383 |
| 2014K3 | 5137679 |
| 2014K4 | 5156451 |
| 2015K1 | 5165802 |
| 2015K2 | 5176998 |
| 2015K3 | 5189435 |
| 2015K4 | 5205434 |

Unemployment

| age | time | Unemployment rate (LFS), seasonally adjusted |
|-------------|--------|--|
| 15-74 years | 2003K1 | 4.0 |
| 15-74 years | 2003K2 | 4.2 |
| 15-74 years | 2003K3 | 4.4 |
| 15-74 years | 2003K4 | 4.3 |
| 15-74 years | 2004K1 | 4.2 |
| 15-74 years | 2004K2 | 4.2 |
| 15-74 years | 2004K3 | 4.4 |
| 15-74 years | 2004K4 | 4.4 |
| 15-74 years | 2005K1 | 4.4 |
| 15-74 years | 2005K2 | 4.6 |
| 15-74 years | 2005K3 | 4.6 |
| 15-74 years | 2005K4 | 4.4 |
| 15-74 years | 2006K1 | 3.8 |
| 15-74 years | 2006K2 | 3.8 |
| 15-74 years | 2006K3 | 3.4 |
| 15-74 years | 2006K4 | 2.8 |
| 15-74 years | 2007K1 | 2.6 |
| 15-74 years | 2007K2 | 2.5 |
| 15-74 years | 2007K3 | 2.5 |
| 15-74 years | 2007K4 | 2.4 |
| 15-74 years | 2008K1 | 2.4 |
| 15-74 years | 2008K2 | 2.4 |
| 15-74 years | 2008K3 | 2.5 |
| 15-74 years | 2008K4 | 2.9 |
| 15-74 years | 2009K1 | 3.0 |
| 15-74 years | 2009K2 | 3.2 |
| 15-74 years | 2009K3 | 3.2 |
| 15-74 years | 2009K4 | 3.2 |
| 15-74 years | 2010K1 | 3.6 |
| 15-74 years | 2010K2 | 3.7 |
| 15-74 years | 2010K3 | 3.5 |
| 15-74 years | 2010K4 | 3.6 |

| | | |
|-------------|--------|-----|
| 15-74 years | 2011K1 | 3.1 |
| 15-74 years | 2011K2 | 3.4 |
| 15-74 years | 2011K3 | 3.2 |
| 15-74 years | 2011K4 | 3.3 |
| 15-74 years | 2012K1 | 3.1 |
| 15-74 years | 2012K2 | 3.2 |
| 15-74 years | 2012K3 | 3.1 |
| 15-74 years | 2012K4 | 3.5 |
| 15-74 years | 2013K1 | 3.5 |
| 15-74 years | 2013K2 | 3.5 |
| 15-74 years | 2013K3 | 3.5 |
| 15-74 years | 2013K4 | 3.5 |
| 15-74 years | 2014K1 | 3.4 |
| 15-74 years | 2014K2 | 3.2 |
| 15-74 years | 2014K3 | 3.7 |
| 15-74 years | 2014K4 | 3.7 |
| 15-74 years | 2015K1 | 4.1 |
| 15-74 years | 2015K2 | 4.3 |
| 15-74 years | 2015K3 | 4.6 |
| 15-74 years | 2015K4 | 4.6 |

Interest rates

| financial corporation | sector | time | Interest rates on outstanding loans |
|-----------------------|------------|--------|-------------------------------------|
| Banks | Households | 2003K1 | 7.62 |
| Banks | Households | 2003K2 | 6.76 |
| Banks | Households | 2003K3 | 5.08 |
| Banks | Households | 2003K4 | 4.62 |
| Banks | Households | 2004K1 | 4.25 |
| Banks | Households | 2004K2 | 4.05 |
| Banks | Households | 2004K3 | 4.06 |
| Banks | Households | 2004K4 | 4.00 |
| Banks | Households | 2005K1 | 3.94 |
| Banks | Households | 2005K2 | 3.82 |
| Banks | Households | 2005K3 | 3.95 |
| Banks | Households | 2005K4 | 4.02 |
| Banks | Households | 2006K1 | 4.04 |
| Banks | Households | 2006K2 | 4.21 |
| Banks | Households | 2006K3 | 4.33 |
| Banks | Households | 2006K4 | 4.61 |
| Banks | Households | 2007K1 | 5.21 |
| Banks | Households | 2007K2 | 5.51 |
| Banks | Households | 2007K3 | 6.02 |
| Banks | Households | 2007K4 | 6.59 |
| Banks | Households | 2008K1 | 6.96 |
| Banks | Households | 2008K2 | 7.31 |
| Banks | Households | 2008K3 | 7.71 |
| Banks | Households | 2008K4 | 7.40 |
| Banks | Households | 2009K1 | 5.21 |
| Banks | Households | 2009K2 | 4.40 |
| Banks | Households | 2009K3 | 4.21 |
| Banks | Households | 2009K4 | 4.29 |
| Banks | Households | 2010K1 | 4.47 |
| Banks | Households | 2010K2 | 4.58 |
| Banks | Households | 2010K3 | 4.66 |
| Banks | Households | 2010K4 | 4.64 |

| | | | |
|-------|------------|--------|------|
| Banks | Households | 2011K1 | 4.61 |
| Banks | Households | 2011K2 | 4.60 |
| Banks | Households | 2011K3 | 4.82 |
| Banks | Households | 2011K4 | 5.03 |
| Banks | Households | 2012K1 | 5.02 |
| Banks | Households | 2012K2 | 4.86 |
| Banks | Households | 2012K3 | 4.86 |
| Banks | Households | 2012K4 | 4.90 |
| Banks | Households | 2013K1 | 4.88 |
| Banks | Households | 2013K2 | 5.01 |
| Banks | Households | 2013K3 | 5.02 |
| Banks | Households | 2013K4 | 4.95 |
| Banks | Households | 2014K1 | 4.91 |
| Banks | Households | 2014K2 | 4.76 |
| Banks | Households | 2014K3 | 4.71 |
| Banks | Households | 2014K4 | 4.53 |
| Banks | Households | 2015K1 | 4.19 |
| Banks | Households | 2015K2 | 4.08 |
| Banks | Households | 2015K3 | 3.84 |
| Banks | Households | 2015K4 | 3.66 |

Construction cost index

| type of employment | time | Construction cost index |
|---------------------------|-------------|--------------------------------|
| Total | 2003M01 | 110.6 |
| Total | 2003M02 | 111.2 |
| Total | 2003M03 | 111.5 |
| Total | 2003M04 | 111.4 |
| Total | 2003M05 | 111.3 |
| Total | 2003M06 | 111.3 |
| Total | 2003M07 | 111.3 |
| Total | 2003M08 | 111.7 |
| Total | 2003M09 | 111.9 |
| Total | 2003M10 | 112.0 |
| Total | 2003M11 | 112.0 |
| Total | 2003M12 | 112.7 |
| Total | 2004M01 | 113.1 |
| Total | 2004M02 | 113.3 |
| Total | 2004M03 | 113.7 |
| Total | 2004M04 | 114.2 |
| Total | 2004M05 | 114.5 |
| Total | 2004M06 | 114.9 |
| Total | 2004M07 | 115.3 |
| Total | 2004M08 | 115.5 |
| Total | 2004M09 | 115.7 |
| Total | 2004M10 | 115.8 |
| Total | 2004M11 | 116.0 |
| Total | 2004M12 | 117.0 |
| Total | 2005M01 | 117.3 |
| Total | 2005M02 | 117.6 |
| Total | 2005M03 | 118.1 |
| Total | 2005M04 | 118.2 |
| Total | 2005M05 | 118.6 |
| Total | 2005M06 | 118.6 |
| Total | 2005M07 | 118.8 |
| Total | 2005M08 | 119.1 |
| Total | 2005M09 | 119.2 |
| Total | 2005M10 | 119.5 |
| Total | 2005M11 | 120.5 |
| Total | 2005M12 | 120.5 |

| | | |
|-------|---------|-------|
| Total | 2006M01 | 120.8 |
| Total | 2006M02 | 121.1 |
| Total | 2006M03 | 121.5 |
| Total | 2006M04 | 121.8 |
| Total | 2006M05 | 122.4 |
| Total | 2006M06 | 122.7 |
| Total | 2006M07 | 123.0 |
| Total | 2006M08 | 123.5 |
| Total | 2006M09 | 123.6 |
| Total | 2006M10 | 125.1 |
| Total | 2006M11 | 126.8 |
| Total | 2006M12 | 127.1 |
| Total | 2007M01 | 128.3 |
| Total | 2007M02 | 128.7 |
| Total | 2007M03 | 129.1 |
| Total | 2007M04 | 131.1 |
| Total | 2007M05 | 132.1 |
| Total | 2007M06 | 132.4 |
| Total | 2007M07 | 132.6 |
| Total | 2007M08 | 133.2 |
| Total | 2007M09 | 133.5 |
| Total | 2007M10 | 134.3 |
| Total | 2007M11 | 136.4 |
| Total | 2007M12 | 136.8 |
| Total | 2008M01 | 137.4 |
| Total | 2008M02 | 138.0 |
| Total | 2008M03 | 138.4 |
| Total | 2008M04 | 139.0 |
| Total | 2008M05 | 139.3 |
| Total | 2008M06 | 139.5 |
| Total | 2008M07 | 139.9 |
| Total | 2008M08 | 140.7 |
| Total | 2008M09 | 140.7 |
| Total | 2008M10 | 141.4 |
| Total | 2008M11 | 142.4 |
| Total | 2008M12 | 142.1 |

| | | |
|-------|---------|-------|
| Total | 2009M01 | 142.1 |
| Total | 2009M02 | 142.3 |
| Total | 2009M03 | 142.3 |
| Total | 2009M04 | 142.3 |
| Total | 2009M05 | 142.3 |
| Total | 2009M06 | 142.5 |
| Total | 2009M07 | 142.7 |
| Total | 2009M08 | 143.6 |
| Total | 2009M09 | 144.0 |
| Total | 2009M10 | 144.4 |
| Total | 2009M11 | 144.6 |
| Total | 2009M12 | 144.7 |
| Total | 2010M01 | 144.9 |
| Total | 2010M02 | 145.8 |
| Total | 2010M03 | 146.3 |
| Total | 2010M04 | 147.1 |
| Total | 2010M05 | 147.7 |
| Total | 2010M06 | 147.8 |
| Total | 2010M07 | 147.8 |
| Total | 2010M08 | 148.2 |
| Total | 2010M09 | 148.3 |
| Total | 2010M10 | 149.0 |
| Total | 2010M11 | 149.8 |
| Total | 2010M12 | 149.9 |
| Total | 2011M01 | 150.7 |
| Total | 2011M02 | 151.2 |
| Total | 2011M03 | 151.8 |
| Total | 2011M04 | 152.2 |
| Total | 2011M05 | 153.0 |
| Total | 2011M06 | 153.3 |
| Total | 2011M07 | 153.3 |
| Total | 2011M08 | 153.5 |
| Total | 2011M09 | 153.5 |
| Total | 2011M10 | 154.3 |
| Total | 2011M11 | 155.1 |
| Total | 2011M12 | 155.2 |

| | | |
|--------------|----------------|--------------|
| Total | 2012M01 | 155.7 |
| Total | 2012M02 | 156.2 |
| Total | 2012M03 | 156.7 |
| Total | 2012M04 | 157.1 |
| Total | 2012M05 | 157.5 |
| Total | 2012M06 | 157.6 |
| Total | 2012M07 | 157.8 |
| Total | 2012M08 | 158.5 |
| Total | 2012M09 | 158.6 |
| Total | 2012M10 | 159.0 |
| Total | 2012M11 | 159.8 |
| Total | 2012M12 | 159.8 |
| Total | 2013M01 | 160.5 |
| Total | 2013M02 | 161.0 |
| Total | 2013M03 | 161.0 |
| Total | 2013M04 | 161.3 |
| Total | 2013M05 | 162.1 |
| Total | 2013M06 | 162.2 |
| Total | 2013M07 | 162.4 |
| Total | 2013M08 | 163.3 |
| Total | 2013M09 | 163.2 |
| Total | 2013M10 | 163.5 |
| Total | 2013M11 | 164.2 |
| Total | 2013M12 | 164.3 |

| | | |
|--------------|----------------|--------------|
| Total | 2014M01 | 164.8 |
| Total | 2014M02 | 165.7 |
| Total | 2014M03 | 165.7 |
| Total | 2014M04 | 167.5 |
| Total | 2014M05 | 168.0 |
| Total | 2014M06 | 168.1 |
| Total | 2014M07 | 168.3 |
| Total | 2014M08 | 168.7 |
| Total | 2014M09 | 168.8 |
| Total | 2014M10 | 169.0 |
| Total | 2014M11 | 169.6 |
| Total | 2014M12 | 169.7 |
| Total | 2015M01 | 170.2 |
| Total | 2015M02 | 170.9 |
| Total | 2015M03 | 171.0 |
| Total | 2015M04 | 171.7 |
| Total | 2015M05 | 172.2 |
| Total | 2015M06 | 172.2 |
| Total | 2015M07 | 172.4 |
| Total | 2015M08 | 172.6 |
| Total | 2015M09 | 172.6 |
| Total | 2015M10 | 173.0 |
| Total | 2015M11 | 173.3 |
| Total | 2015M12 | 173.3 |

Consumer price index (Base year=1998)

| consumption group | time | Consumer Price Index (1998=100) |
|-------------------|---------|---------------------------------|
| All-item index | 2003M01 | 114.5 |
| All-item index | 2003M02 | 114.6 |
| All-item index | 2003M03 | 113.8 |
| All-item index | 2003M04 | 112.9 |
| All-item index | 2003M05 | 112.3 |
| All-item index | 2003M06 | 112.0 |
| All-item index | 2003M07 | 111.6 |
| All-item index | 2003M08 | 111.9 |
| All-item index | 2003M09 | 112.5 |
| All-item index | 2003M10 | 112.4 |
| All-item index | 2003M11 | 112.6 |
| All-item index | 2003M12 | 112.6 |
| All-item index | 2004M01 | 112.4 |
| All-item index | 2004M02 | 112.6 |
| All-item index | 2004M03 | 113.1 |
| All-item index | 2004M04 | 113.3 |
| All-item index | 2004M05 | 113.4 |
| All-item index | 2004M06 | 113.4 |
| All-item index | 2004M07 | 113.3 |
| All-item index | 2004M08 | 113.0 |
| All-item index | 2004M09 | 113.7 |
| All-item index | 2004M10 | 114.0 |
| All-item index | 2004M11 | 114.0 |
| All-item index | 2004M12 | 113.8 |
| All-item index | 2005M01 | 113.6 |
| All-item index | 2005M02 | 113.7 |
| All-item index | 2005M03 | 114.2 |
| All-item index | 2005M04 | 114.8 |
| All-item index | 2005M05 | 115.2 |
| All-item index | 2005M06 | 115.3 |
| All-item index | 2005M07 | 114.9 |
| All-item index | 2005M08 | 115.1 |
| All-item index | 2005M09 | 116.0 |
| All-item index | 2005M10 | 116.0 |
| All-item index | 2005M11 | 116.0 |
| All-item index | 2005M12 | 115.9 |

| | | |
|----------------|---------|-------|
| All-item index | 2006M01 | 115.6 |
| All-item index | 2006M02 | 116.6 |
| All-item index | 2006M03 | 116.9 |
| All-item index | 2006M04 | 117.9 |
| All-item index | 2006M05 | 117.9 |
| All-item index | 2006M06 | 117.7 |
| All-item index | 2006M07 | 117.4 |
| All-item index | 2006M08 | 117.3 |
| All-item index | 2006M09 | 119.0 |
| All-item index | 2006M10 | 119.1 |
| All-item index | 2006M11 | 119.0 |
| All-item index | 2006M12 | 118.5 |
| All-item index | 2007M01 | 117.0 |
| All-item index | 2007M02 | 117.5 |
| All-item index | 2007M03 | 118.2 |
| All-item index | 2007M04 | 118.2 |
| All-item index | 2007M05 | 118.3 |
| All-item index | 2007M06 | 118.2 |
| All-item index | 2007M07 | 117.9 |
| All-item index | 2007M08 | 117.8 |
| All-item index | 2007M09 | 118.6 |
| All-item index | 2007M10 | 118.9 |
| All-item index | 2007M11 | 120.8 |
| All-item index | 2007M12 | 121.8 |
| All-item index | 2008M01 | 121.3 |
| All-item index | 2008M02 | 121.9 |
| All-item index | 2008M03 | 122.0 |
| All-item index | 2008M04 | 121.9 |
| All-item index | 2008M05 | 122.0 |
| All-item index | 2008M06 | 122.2 |
| All-item index | 2008M07 | 123.0 |
| All-item index | 2008M08 | 123.1 |
| All-item index | 2008M09 | 124.9 |
| All-item index | 2008M10 | 125.4 |
| All-item index | 2008M11 | 124.7 |
| All-item index | 2008M12 | 124.4 |

| | |
|-----------------------|-------|
| All-item inde:2009M01 | 124.0 |
| All-item inde:2009M02 | 125.0 |
| All-item inde:2009M03 | 125.1 |
| All-item inde:2009M04 | 125.4 |
| All-item inde:2009M05 | 125.7 |
| All-item inde:2009M06 | 126.4 |
| All-item inde:2009M07 | 125.7 |
| All-item inde:2009M08 | 125.4 |
| All-item inde:2009M09 | 126.4 |
| All-item inde:2009M10 | 126.2 |
| All-item inde:2009M11 | 126.6 |
| All-item inde:2009M12 | 126.9 |
| All-item inde:2010M01 | 127.1 |
| All-item inde:2010M02 | 128.7 |
| All-item inde:2010M03 | 129.3 |
| All-item inde:2010M04 | 129.6 |
| All-item inde:2010M05 | 128.9 |
| All-item inde:2010M06 | 128.8 |
| All-item inde:2010M07 | 128.1 |
| All-item inde:2010M08 | 127.8 |
| All-item inde:2010M09 | 128.6 |
| All-item inde:2010M10 | 128.7 |
| All-item inde:2010M11 | 129.0 |
| All-item inde:2010M12 | 130.4 |
| All-item inde:2011M01 | 129.7 |
| All-item inde:2011M02 | 130.2 |
| All-item inde:2011M03 | 130.6 |
| All-item inde:2011M04 | 131.3 |
| All-item inde:2011M05 | 131.0 |
| All-item inde:2011M06 | 130.5 |
| All-item inde:2011M07 | 130.2 |
| All-item inde:2011M08 | 129.4 |
| All-item inde:2011M09 | 130.6 |
| All-item inde:2011M10 | 130.5 |
| All-item inde:2011M11 | 130.5 |
| All-item inde:2011M12 | 130.6 |

| | | |
|----------------|---------|-------|
| All-item index | 2012M01 | 130.4 |
| All-item index | 2012M02 | 131.7 |
| All-item index | 2012M03 | 131.6 |
| All-item index | 2012M04 | 131.7 |
| All-item index | 2012M05 | 131.7 |
| All-item index | 2012M06 | 131.1 |
| All-item index | 2012M07 | 130.5 |
| All-item index | 2012M08 | 130.0 |
| All-item index | 2012M09 | 131.2 |
| All-item index | 2012M10 | 131.9 |
| All-item index | 2012M11 | 132.0 |
| All-item index | 2012M12 | 132.4 |
| All-item index | 2013M01 | 132.1 |
| All-item index | 2013M02 | 133.0 |
| All-item index | 2013M03 | 133.4 |
| All-item index | 2013M04 | 134.2 |
| All-item index | 2013M05 | 134.3 |
| All-item index | 2013M06 | 133.8 |
| All-item index | 2013M07 | 134.4 |
| All-item index | 2013M08 | 134.2 |
| All-item index | 2013M09 | 134.9 |
| All-item index | 2013M10 | 135.1 |
| All-item index | 2013M11 | 135.3 |
| All-item index | 2013M12 | 135.1 |

| | | |
|----------------|---------|-------|
| All-item index | 2014M01 | 135.1 |
| All-item index | 2014M02 | 135.8 |
| All-item index | 2014M03 | 136.1 |
| All-item index | 2014M04 | 136.6 |
| All-item index | 2014M05 | 136.7 |
| All-item index | 2014M06 | 136.4 |
| All-item index | 2014M07 | 137.4 |
| All-item index | 2014M08 | 137.0 |
| All-item index | 2014M09 | 137.7 |
| All-item index | 2014M10 | 137.8 |
| All-item index | 2014M11 | 137.9 |
| All-item index | 2014M12 | 137.9 |
| All-item index | 2015M01 | 137.8 |
| All-item index | 2015M02 | 138.4 |
| All-item index | 2015M03 | 138.8 |
| All-item index | 2015M04 | 139.3 |
| All-item index | 2015M05 | 139.6 |
| All-item index | 2015M06 | 140.0 |
| All-item index | 2015M07 | 139.9 |
| All-item index | 2015M08 | 139.7 |
| All-item index | 2015M09 | 140.6 |
| All-item index | 2015M10 | 141.2 |
| All-item index | 2015M11 | 141.7 |
| All-item index | 2015M12 | 141.1 |

Debt

| NOK and foreign exchange | borrower sector | time | Gross domestic debt |
|--------------------------|-----------------|---------|---------------------|
| NOK | Households etc. | 2003M01 | 978786 |
| NOK | Households etc. | 2003M02 | 984769 |
| NOK | Households etc. | 2003M03 | 993058 |
| NOK | Households etc. | 2003M04 | 1001419 |
| NOK | Households etc. | 2003M05 | 1010372 |
| NOK | Households etc. | 2003M06 | 1018171 |
| NOK | Households etc. | 2003M07 | 1026458 |
| NOK | Households etc. | 2003M08 | 1034996 |
| NOK | Households etc. | 2003M09 | 1048266 |
| NOK | Households etc. | 2003M10 | 1059107 |
| NOK | Households etc. | 2003M11 | 1069993 |
| NOK | Households etc. | 2003M12 | 1077708 |
| NOK | Households etc. | 2004M01 | 1083515 |
| NOK | Households etc. | 2004M02 | 1090325 |
| NOK | Households etc. | 2004M03 | 1103609 |
| NOK | Households etc. | 2004M04 | 1116121 |
| NOK | Households etc. | 2004M05 | 1127049 |
| NOK | Households etc. | 2004M06 | 1137749 |
| NOK | Households etc. | 2004M07 | 1145991 |
| NOK | Households etc. | 2004M08 | 1154718 |
| NOK | Households etc. | 2004M09 | 1166382 |
| NOK | Households etc. | 2004M10 | 1179563 |
| NOK | Households etc. | 2004M11 | 1191829 |
| NOK | Households etc. | 2004M12 | 1204949 |

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|-----|-----------------|---------|---------|
| NOK | Households etc. | 2005M01 | 1216585 |
| NOK | Households etc. | 2005M02 | 1223179 |
| NOK | Households etc. | 2005M03 | 1236655 |
| NOK | Households etc. | 2005M04 | 1251957 |
| NOK | Households etc. | 2005M05 | 1266839 |
| NOK | Households etc. | 2005M06 | 1283240 |
| NOK | Households etc. | 2005M07 | 1296040 |
| NOK | Households etc. | 2005M08 | 1308276 |
| NOK | Households etc. | 2005M09 | 1325065 |
| NOK | Households etc. | 2005M10 | 1341571 |
| NOK | Households etc. | 2005M11 | 1357540 |
| NOK | Households etc. | 2005M12 | 1374847 |
| NOK | Households etc. | 2006M01 | 1384849 |
| NOK | Households etc. | 2006M02 | 1392582 |
| NOK | Households etc. | 2006M03 | 1410694 |
| NOK | Households etc. | 2006M04 | 1423597 |
| NOK | Households etc. | 2006M05 | 1440200 |
| NOK | Households etc. | 2006M06 | 1457379 |
| NOK | Households etc. | 2006M07 | 1467355 |
| NOK | Households etc. | 2006M08 | 1481213 |
| NOK | Households etc. | 2006M09 | 1498186 |
| NOK | Households etc. | 2006M10 | 1513966 |
| NOK | Households etc. | 2006M11 | 1532430 |
| NOK | Households etc. | 2006M12 | 1544631 |
| NOK | Households etc. | 2007M01 | 1553047 |
| NOK | Households etc. | 2007M02 | 1562944 |
| NOK | Households etc. | 2007M03 | 1578568 |
| NOK | Households etc. | 2007M04 | 1592374 |
| NOK | Households etc. | 2007M05 | 1613502 |
| NOK | Households etc. | 2007M06 | 1633042 |
| NOK | Households etc. | 2007M07 | 1648582 |
| NOK | Households etc. | 2007M08 | 1661512 |
| NOK | Households etc. | 2007M09 | 1679179 |
| NOK | Households etc. | 2007M10 | 1696291 |
| NOK | Households etc. | 2007M11 | 1715866 |
| NOK | Households etc. | 2007M12 | 1725984 |

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|-----|-----------------|---------|---------|
| NOK | Households etc. | 2008M01 | 1733874 |
| NOK | Households etc. | 2008M02 | 1745996 |
| NOK | Households etc. | 2008M03 | 1754769 |
| NOK | Households etc. | 2008M04 | 1765697 |
| NOK | Households etc. | 2008M05 | 1780686 |
| NOK | Households etc. | 2008M06 | 1793556 |
| NOK | Households etc. | 2008M07 | 1801658 |
| NOK | Households etc. | 2008M08 | 1810198 |
| NOK | Households etc. | 2008M09 | 1820638 |
| NOK | Households etc. | 2008M10 | 1824611 |
| NOK | Households etc. | 2008M11 | 1831289 |
| NOK | Households etc. | 2008M12 | 1836410 |
| NOK | Households etc. | 2009M01 | 1840571 |
| NOK | Households etc. | 2009M02 | 1850591 |
| NOK | Households etc. | 2009M03 | 1862986 |
| NOK | Households etc. | 2009M04 | 1873966 |
| NOK | Households etc. | 2009M05 | 1885133 |
| NOK | Households etc. | 2009M06 | 1898876 |
| NOK | Households etc. | 2009M07 | 1909683 |
| NOK | Households etc. | 2009M08 | 1916487 |
| NOK | Households etc. | 2009M09 | 1931277 |
| NOK | Households etc. | 2009M10 | 1945246 |
| NOK | Households etc. | 2009M11 | 1957396 |
| NOK | Households etc. | 2009M12 | 1960841 |
| NOK | Households etc. | 2010M01 | 1970486 |
| NOK | Households etc. | 2010M02 | 1976455 |
| NOK | Households etc. | 2010M03 | 1983232 |
| NOK | Households etc. | 2010M04 | 1994525 |
| NOK | Households etc. | 2010M05 | 2007806 |
| NOK | Households etc. | 2010M06 | 2019073 |
| NOK | Households etc. | 2010M07 | 2019148 |
| NOK | Households etc. | 2010M08 | 2027214 |
| NOK | Households etc. | 2010M09 | 2043020 |
| NOK | Households etc. | 2010M10 | 2056784 |
| NOK | Households etc. | 2010M11 | 2072262 |
| NOK | Households etc. | 2010M12 | 2077659 |

| | | | |
|-----|-----------------|---------|---------|
| NOK | Households etc. | 2011M01 | 2088139 |
| NOK | Households etc. | 2011M02 | 2095941 |
| NOK | Households etc. | 2011M03 | 2107954 |
| NOK | Households etc. | 2011M04 | 2122552 |
| NOK | Households etc. | 2011M05 | 2137078 |
| NOK | Households etc. | 2011M06 | 2151117 |
| NOK | Households etc. | 2011M07 | 2160787 |
| NOK | Households etc. | 2011M08 | 2172941 |
| NOK | Households etc. | 2011M09 | 2193126 |
| NOK | Households etc. | 2011M10 | 2208071 |
| NOK | Households etc. | 2011M11 | 2225152 |
| NOK | Households etc. | 2011M12 | 2231981 |
| NOK | Households etc. | 2012M01 | 2243257 |
| NOK | Households etc. | 2012M02 | 2253874 |
| NOK | Households etc. | 2012M03 | 2228059 |
| NOK | Households etc. | 2012M04 | 2237610 |
| NOK | Households etc. | 2012M05 | 2258903 |
| NOK | Households etc. | 2012M06 | 2276710 |
| NOK | Households etc. | 2012M07 | 2289672 |
| NOK | Households etc. | 2012M08 | 2301598 |
| NOK | Households etc. | 2012M09 | 2315674 |
| NOK | Households etc. | 2012M10 | 2334158 |
| NOK | Households etc. | 2012M11 | 2354256 |
| NOK | Households etc. | 2012M12 | 2362531 |
| NOK | Households etc. | 2013M01 | 2374295 |
| NOK | Households etc. | 2013M02 | 2384995 |
| NOK | Households etc. | 2013M03 | 2394609 |
| NOK | Households etc. | 2013M04 | 2410449 |
| NOK | Households etc. | 2013M05 | 2426511 |
| NOK | Households etc. | 2013M06 | 2444769 |
| NOK | Households etc. | 2013M07 | 2453057 |
| NOK | Households etc. | 2013M08 | 2468234 |
| NOK | Households etc. | 2013M09 | 2486021 |
| NOK | Households etc. | 2013M10 | 2504386 |
| NOK | Households etc. | 2013M11 | 2520735 |
| NOK | Households etc. | 2013M12 | 2541299 |

| | | | |
|-----|-----------------|---------|---------|
| NOK | Households etc. | 2014M01 | 2549341 |
| NOK | Households etc. | 2014M02 | 2557565 |
| NOK | Households etc. | 2014M03 | 2571970 |
| NOK | Households etc. | 2014M04 | 2586494 |
| NOK | Households etc. | 2014M05 | 2602638 |
| NOK | Households etc. | 2014M06 | 2616590 |
| NOK | Households etc. | 2014M07 | 2629687 |
| NOK | Households etc. | 2014M08 | 2641738 |
| NOK | Households etc. | 2014M09 | 2660080 |
| NOK | Households etc. | 2014M10 | 2679658 |
| NOK | Households etc. | 2014M11 | 2691688 |
| NOK | Households etc. | 2014M12 | 2700224 |
| NOK | Households etc. | 2015M01 | 2709229 |
| NOK | Households etc. | 2015M02 | 2719736 |
| NOK | Households etc. | 2015M03 | 2738929 |
| NOK | Households etc. | 2015M04 | 2751260 |
| NOK | Households etc. | 2015M05 | 2773061 |
| NOK | Households etc. | 2015M06 | 2790583 |
| NOK | Households etc. | 2015M07 | 2804801 |
| NOK | Households etc. | 2015M08 | 2815264 |
| NOK | Households etc. | 2015M09 | 2832250 |
| NOK | Households etc. | 2015M10 | 2849644 |
| NOK | Households etc. | 2015M11 | 2863325 |
| NOK | Households etc. | 2015M12 | 2869007 |

Own calculations

Consumer price index

| Time | Consumer price index(calculated) |
|--------|----------------------------------|
| 2003K1 | 114,3 |
| 2003K2 | 112,4 |
| 2003K3 | 112 |
| 2003K4 | 112,5 |
| 2004K1 | 112,7 |
| 2004K2 | 113,4 |
| 2004K3 | 113,3 |
| 2004K4 | 113,9 |
| 2005K1 | 113,8 |
| 2005K2 | 115,1 |
| 2005K3 | 115,3 |
| 2005K4 | 116 |
| 2006K1 | 116,4 |
| 2006K2 | 117,8 |
| 2006K3 | 117,9 |
| 2006K4 | 118,9 |
| 2007K1 | 117,6 |
| 2007K2 | 118,2 |
| 2007K3 | 118,1 |
| 2007K4 | 120,5 |
| 2008K1 | 121,7 |
| 2008K2 | 122 |
| 2008K3 | 123,7 |
| 2008K4 | 124,8 |
| 2009K1 | 124,7 |
| 2009K2 | 125,8 |
| 2009K3 | 125,8 |
| 2009K4 | 126,6 |

| | |
|--------|-------|
| 2010K1 | 128,4 |
| 2010K2 | 129,1 |
| 2010K3 | 128,2 |
| 2010K4 | 129,4 |
| 2011K1 | 130,2 |
| 2011K2 | 130,9 |
| 2011K3 | 130,1 |
| 2011K4 | 130,5 |
| 2012K1 | 131,2 |
| 2012K2 | 131,5 |
| 2012K3 | 130,6 |
| 2012K4 | 132,1 |
| 2013K1 | 132,8 |
| 2013K2 | 134,1 |
| 2013K3 | 134,5 |
| 2013K4 | 135,2 |
| 2014K1 | 135,7 |
| 2014K2 | 136,6 |
| 2014K3 | 137,4 |
| 2014K4 | 137,9 |
| 2015K1 | 138,3 |
| 2015K2 | 139,6 |
| 2015K3 | 140,1 |
| 2015K4 | 141,3 |

Real disposable income

| Time | Real Disposable income (calc) |
|--------|-------------------------------|
| 2003K1 | 163095 |
| 2003K2 | 170801 |
| 2003K3 | 174425 |
| 2003K4 | 176094 |
| 2004K1 | 174505 |
| 2004K2 | 179777 |
| 2004K3 | 177151 |
| 2004K4 | 180823 |
| 2005K1 | 185920 |
| 2005K2 | 197818 |
| 2005K3 | 189091 |
| 2005K4 | 195334 |
| 2006K1 | 176127 |
| 2006K2 | 176753 |
| 2006K3 | 180128 |
| 2006K4 | 181103 |
| 2007K1 | 188055 |
| 2007K2 | 188009 |
| 2007K3 | 193774 |
| 2007K4 | 191316 |
| 2008K1 | 194172 |
| 2008K2 | 193889 |
| 2008K3 | 197175 |
| 2008K4 | 199477 |
| 2009K1 | 195773 |
| 2009K2 | 201767 |
| 2009K3 | 205617 |
| 2009K4 | 209070 |
| 2010K1 | 204621 |
| 2010K2 | 204588 |
| 2010K3 | 208799 |
| 2010K4 | 210295 |

| | |
|--------|--------|
| 2011K1 | 211316 |
| 2011K2 | 212651 |
| 2011K3 | 218331 |
| 2011K4 | 218343 |
| 2012K1 | 222890 |
| 2012K2 | 223632 |
| 2012K3 | 225842 |
| 2012K4 | 229185 |
| 2013K1 | 233590 |
| 2013K2 | 232165 |
| 2013K3 | 233830 |
| 2013K4 | 235763 |
| 2014K1 | 237843 |
| 2014K2 | 240414 |
| 2014K3 | 241378 |
| 2014K4 | 243629 |
| 2015K1 | 247078 |
| 2015K2 | 247331 |
| 2015K3 | 246810 |
| 2015K4 | 248931 |

Real interest rate

| Time | Real interest rate |
|--------|--------------------|
| 2003K1 | 6,67 |
| 2003K2 | 6,01 |
| 2003K3 | 4,54 |
| 2003K4 | 4,11 |
| 2004K1 | 3,77 |
| 2004K2 | 3,57 |
| 2004K3 | 3,58 |
| 2004K4 | 3,51 |
| 2005K1 | 3,46 |
| 2005K2 | 3,32 |
| 2005K3 | 3,43 |
| 2005K4 | 3,47 |
| 2006K1 | 3,47 |
| 2006K2 | 3,57 |
| 2006K3 | 3,67 |
| 2006K4 | 3,88 |
| 2007K1 | 4,43 |
| 2007K2 | 4,66 |
| 2007K3 | 5,1 |
| 2007K4 | 5,47 |
| 2008K1 | 5,72 |
| 2008K2 | 5,99 |
| 2008K3 | 6,23 |
| 2008K4 | 5,93 |
| 2009K1 | 4,18 |
| 2009K2 | 3,5 |
| 2009K3 | 3,35 |
| 2009K4 | 3,39 |
| 2010K1 | 3,48 |
| 2010K2 | 3,55 |
| 2010K3 | 3,63 |
| 2010K4 | 3,59 |
| 2011K1 | 3,54 |
| 2011K2 | 3,51 |
| 2011K3 | 3,7 |
| 2011K4 | 3,85 |

| | |
|--------|------|
| 2012K1 | 3,83 |
| 2012K2 | 3,7 |
| 2012K3 | 3,72 |
| 2012K4 | 3,71 |
| 2013K1 | 3,67 |
| 2013K2 | 3,74 |
| 2013K3 | 3,73 |
| 2013K4 | 3,66 |
| 2014K1 | 3,62 |
| 2014K2 | 3,48 |
| 2014K3 | 3,43 |
| 2014K4 | 3,28 |
| 2015K1 | 3,03 |
| 2015K2 | 2,92 |
| 2015K3 | 2,74 |
| 2015K4 | 2,59 |

Real construction cost index (calculated)

| | |
|--------|-------|
| 2003K1 | 97,2 |
| 2003K2 | 99 |
| 2003K3 | 99,6 |
| 2003K4 | 98,6 |
| 2004K1 | 100,6 |
| 2004K2 | 101 |
| 2004K3 | 101,9 |
| 2004K4 | 102,1 |
| 2005K1 | 103,4 |
| 2005K2 | 103 |
| 2005K3 | 103,2 |
| 2005K4 | 103,6 |
| 2006K1 | 104 |
| 2006K2 | 103,8 |
| 2006K3 | 104,7 |
| 2006K4 | 106,2 |
| 2007K1 | 109,4 |
| 2007K2 | 111,6 |
| 2007K3 | 112,7 |
| 2007K4 | 112,7 |
| 2008K1 | 113,3 |
| 2008K2 | 114,2 |
| 2008K3 | 113,5 |
| 2008K4 | 113,8 |
| 2009K1 | 114 |
| 2009K2 | 113,2 |
| 2009K3 | 114 |
| 2009K4 | 114,2 |
| 2010K1 | 113,5 |
| 2010K2 | 114,3 |
| 2010K3 | 115,5 |
| 2010K4 | 115,6 |
| 2011K1 | 116,1 |
| 2011K2 | 116,7 |
| 2011K3 | 117,9 |
| 2011K4 | 118,7 |

| | |
|--------|-------|
| 2012K1 | 119,1 |
| 2012K2 | 119,7 |
| 2012K3 | 121,2 |
| 2012K4 | 120,7 |
| 2013K1 | 121,1 |
| 2013K2 | 120,7 |
| 2013K3 | 121,2 |
| 2013K4 | 121,3 |
| 2014K1 | 121,9 |
| 2014K2 | 122,9 |
| 2014K3 | 122,9 |
| 2014K4 | 122,8 |
| 2015K1 | 123,4 |
| 2015K2 | 123,2 |
| 2015K3 | 123,1 |
| 2015K4 | 122,6 |

Debt

| time | Debt |
|--------|---------|
| 2003K1 | 985538 |
| 2003K2 | 1009987 |
| 2003K3 | 1036537 |
| 2003K4 | 1068936 |
| 2004K1 | 1092483 |
| 2004K2 | 1126973 |
| 2004K3 | 1155697 |
| 2004K4 | 1192114 |
| 2005K1 | 1225473 |
| 2005K2 | 1267345 |
| 2005K3 | 1309794 |
| 2005K4 | 1357986 |
| 2006K1 | 1396042 |
| 2006K2 | 1440392 |
| 2006K3 | 1482251 |
| 2006K4 | 1530342 |
| 2007K1 | 1564853 |
| 2007K2 | 1612973 |
| 2007K3 | 1663091 |
| 2007K4 | 1712714 |
| 2008K1 | 1744880 |
| 2008K2 | 1779980 |
| 2008K3 | 1810831 |
| 2008K4 | 1830770 |
| 2009K1 | 1851383 |
| 2009K2 | 1885992 |
| 2009K3 | 1919149 |
| 2009K4 | 1954494 |

| | |
|--------|---------|
| 2010K1 | 1976724 |
| 2010K2 | 2007135 |
| 2010K3 | 2029794 |
| 2010K4 | 2068902 |
| 2011K1 | 2097345 |
| 2011K2 | 2136916 |
| 2011K3 | 2175618 |
| 2011K4 | 2221735 |
| 2012K1 | 2241730 |
| 2012K2 | 2257741 |
| 2012K3 | 2302315 |
| 2012K4 | 2350315 |
| 2013K1 | 2348633 |
| 2013K2 | 2427243 |
| 2013K3 | 2469104 |
| 2013K4 | 2522140 |
| 2014K1 | 2559625 |
| 2014K2 | 2601907 |
| 2014K3 | 2643835 |
| 2014K4 | 2690253 |
| 2015K1 | 2722631 |
| 2015K2 | 2771635 |
| 2015K3 | 2817438 |
| 2015K4 | 2860659 |