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The Effect of Airbnb on Real Estate Prices

A Panel Data Regression Study on Variables Affecting Real Estate Prices

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Acknowledgements

Abstract

The real estate prices in Norway have increased steadily over the last 15 years. With the Norwegian housing policy encouraging the populations to own instead of renting, it is a hot topic. With the rise of Airbnb and its simplicity for hosts and visitors, the purpose of this study is to measure the effect of Airbnb rentals on real estate prices in Norway. The study further explores the effect of Airbnb in specific regions and how district and city regions affect differently. Airbnb is used as an income variable to emphasize the added income short-term rental provides households. The thesis is a panel data regression study on variables affecting real estate prices. Data for Airbnb, household income, unemployment, residences for sale, initiated constructed houses, completed constructed houses and house lend rate was used to explain the dynamics of real estate price. A balanced panel data set following 87 regions between 2016-2019 were used to estimate the within and first difference estimators for different fixed effects models. The *plm* and *panelr* packages in R were used to conduct the analysis (Croissant, Millo, & Tappe, 2019; Long, 2020). The thesis is written using R markdown and LaTeX.

According to our main models a 1% increase in Airbnb revenue leads to a 0.004% and 0.002% increase in the house prices index. The estimates are significantly different from zero on all classic significance levels. Results from the square meter price models shows a positive Airbnb effect of 0.004-0.005% for the significant estimates. Household income has most effect on prices. Our study could not statistically prove Airbnb revenue to be more important in small districts compared to bigger cities regarding house prices. This is likely a result of insufficient real estate data for minor municipalities. When estimating regression models for all regions the results stated that prices in Drammen and Rælingen increased most due to Airbnb. The thesis concludes there is *statistical support* for the *idea* of Airbnb increasing real estate prices.

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Chapter 1

1 Introduction

Real estate prices in Norway have increased rapidly the past 15 years. The only time prices have dropped significantly was during the financial crisis in 2008 (Eiendom Norge, s.a.; Statistisk sentralbyrå, s.a.-e). Prices have risen compared to the consumer price index and faster than consumer goods. This means that the *true* real estate prices adjusted for inflation have risen (Solheim, 2019). It is therefore harder to enter the market as a first-time buyer now than before. The price has also seen a faster rise than income and GDP the past 15 years. This indicates it is more expensive to buy real estate today than 15 years ago.

All types of residences which provides *roof over the head* are referred to as *houses* or *housing* if not stated otherwise. *Houses* must not be confused with detached houses (Enebolig in norwegian). *Real estate*, *houses*, *property* and *residences* are all words used to describe property regulated for living purposes.

Both authors of this thesis are graduate students entering or planning to enter the real estate market. It feels relevant and interesting to study the market price and its influencing factors in greater detail.

The innovative approach with this study is whether Airbnb is affecting the prices or not. Airbnb is an online marketplace where people rent out their homes short-term. Following the 2007 launch of Airbnb the service reached over 1000 hosts in Oslo by 2014 (Sørdal, 2010). This were around the time Airbnb became mainstream in Norway. In December 2019 the average income per available Airbnb unit in Oslo was 13 400 NOK according to data from Capia AS. Today Airbnb is the symbol of private accommodations in Norway and abroad. Airbnb designed a platform where hosts and guests book, communicate, rate and pay for rental properties making it a competitor to established hotel industries. It is a major part of sharing economy's growth which is predicted increasingly important in upcoming years.

The main thesis idea emerged when noticing different mayors in minor municipalities in Norway stating that house prices in their respected municipalities had increased because of Airbnb (Trygstad & Juell, 2018; Ytreberg, 2019). As far as our knowledge goes, it does not exist accepted research on Norwegian real estate prices backing these statements. This is most likely because Airbnb themselves do not publish their own booking history or data. This makes an interesting topic to investigate. A part of the master's thesis purpose is trying to contribute with research on a topic that gained attention recent years without relevant research to support opinions. The thesis focuses on deriving correct model specifications as a consequence of the lack of research on the subject. We use panel data regression models to research the topic.

When planning the thesis, we anticipated Airbnb to affect in some way or another. It was interesting to see how the different regions affected real estate prices in their respective regions. We are only aware of one previous Norwegian research paper from *Nordlandsforskning* stating Airbnb probably did not affect house prices. They admitted the data foundation was too weak to conclude on the matter (Vinogradov & Strømmen-Bakhtiar, 2017).

For selected regions, we expected to find a clear connection between Airbnb and housing prices. Price of real estate in several popular tourist destinations in Norway has experienced a large increase in recent years. In 2018 house prices in Lofoten went up by more than 10% (EiendomsMegler1, s.a.). The average for the country was 1.1%. The main problem with the data foundation in this thesis is the real estate data. The project failed to collect individual real estate data for all municipalities in Norway. It is not available open source or could be provided from Eiendomsverdi during the projects time perspective. We settled on merged data for district municipalities of all counties in Norway. Resulting in popular tourist municipalities like Lofoten being added together with the rest of the district municipalities of the county. This takes away some of the effects we were expecting to see and should be solved for further research. The data foundation is still strong as a consequence of complete data for 68 individual regions and 19 merged district regions in Norway. We use the county structure previous to 2020.

The models used explains which variables contributes to shifts in real estate prices. The analysis chapter is divided into fixed effects models for the country and an Airbnb section looking at the different region effects. The main hypothesis is that house prices are significantly affected by

Airbnb in Norway. The sub hypothesis is Airbnb affects significantly more for districts than city municipalities. The models explaining the country uses an average of the effects from all regions. The Airbnb region effects uses linear regression models for each region. It explains how Airbnb affects price in the specific location.

There are other factors that affects price of real estate. Jacobsen and Naug (2004) found four explanatory factors for housing prices; Interest rates, unemployment, household income and new construction. After going through similar research, we settled on a balanced panel data set. With quarterly observations for 87 regions from January 2016 to October 2019. The following explanatory variables are used:

- Airbnb revenue per available unit

- Median household income after taxes

- Unemployment in percent

- Residences for sale

- Initiated constructing detached houses with rent possibility

- Completed constructed detached houses with rent possibility

- Average house lend rate

Housing construction and population growth are examples of factors that affects the prices but were not included in the models. A construction deficit will increase prices and a surplus will lower them (Mæhlum, Pettersen, & Xu, 2018). This market mechanism arises because number of homes should equal number of households in the long-term. Everyone essentially needs a place to live. When demand is higher than supply prices rise. The supply is also influenced by other factors than price. Construction costs, development companies access to credit and building regulations are central to the developer's industry. Following the enlargement of the EU in 2004, Norway experienced a population growth due to labour immigration. This caused more people needing residences and households consisting of fewer people. The consequence is the total number of households has increased over the years. A building deficit is caused by fewer homes

being built relative to the demand the last 15 years. Increasing real estate prices during the time period would probably been affected by this.

With few factors affecting prices, it would be easier modelling it econometrically. In theory it should therefore be easier to explain prices in districts versus big cities. This is not the case in reality considering it is not possible to measure all aspects affecting price independent of location. Naturally there will be more influencing factor for cities than districts. Additional factors may be access to schools, workplaces, shops, public transport and social events. Despite not being able to collect data on everything that affects, we collected 52 different variables possibly affecting prices. They were then tested upon each other resulting in the key variables mentioned above. Using all variables would result in overfitting the models.

The data regarding Airbnb and real estate were given to us by permission and cannot be distributed further without permission. Both Capia AS and Eiendomsverdi AS distributes the data for commercial use and should be considered *private*. The study use panel data regression models which can be explored in chapter 4. We also use some variables on logarithmic form to interpret the parameters as elasticities. The theory gathered are presented in chapter 2 and a thorough review of the data in chapter 3. The procedure used is presented in chapter 4. The coefficient estimates, standard errors and associated p-values are all presented in chapter 5 along with R-square values, F-statistics and degrees of freedom for the various models. Chapter 6 concludes the thesis along with a discussion section of findings.

Chapter 2

2 Theory

In this chapter relevant theory and topics surrounding real estate prices will be explored. Findings and results from previous research on the topic will be included.

2.1 The real estate market in Norway

The real estate market in Norway are characterized by the fact that a large portion of households owns a residence. 76,8% owns the residence they live in, while 20,3% rents according to numbers from 2018 (Statistisk sentralbyrå, 2019a). A residence is both a consumer good and a capital or asset object. For the majority, residences makes up the largest portion of the fortune (NOU 2002:2, p. 17). It is also the highest single purchase in life. A great amount of people involved in the renting market uses this as a temporary solution until they can buy their own resident. According to SSB the municipalities with low ownership rates are typical student municipalities (Revold, 2019). In addition, just 48% in the lowest income quartile owns their own resident.

Prices is an important part of the real estate market. The market is complex with different submarkets. Although it looks like the moderate real estate price inflation is a national phenomenon this is not the case (Himmelberg, Mayer, & Sinai, 2005; Senneset, Andersen, & Lund, 2012). The real estate markets are local because the price trends differ within all municipalities. An example for this is high end property compared to normal property being two completely different markets. To fully understand the fluctuations in real estate prices it is important to look at real estate policy. However, understanding ability to pay is important for individuals making investments associated with debt. The real estate market and its connected price dynamics are a field that has a wide collection of studies. After the finance crisis there have been several studies on housing bubbles questioning Norway's attendance in one (Grytten, 2009; Vale, Kutluay, & Yildiz, 2015). However, most concluded this were not the case since house prices never dropped dramatically.

2.2 Housing bubble

With the seemingly never-ending rise in real estate price over the recent years, the question of a bubble acceded. When this theoretically bubble burst the real estate market will experience a considerable downturn. The definition of a bubble is when a market value is significantly higher than the real value (Grytten, 2009). A bubble occurs when the prices keep rising because investors buy to gain by reselling. The well-known Dutch tulip mania is considered the first economic bubble of recent times (Hayes, 2019). Prices of the tulip flower skyrocketed before quickly hitting rock bottom. After the finance crisis a number of countries got a considerable drop in the real estate market. The prices in the US dropped with nearly 40% from 2006 to 2009 (Grytten, 2009). However, the real estate market in the US had problems before the crisis. For this reason one can wonder if this were the reason for the financial crisis and not the other way around (Andreassen, 2009). After the crisis there was speculations if countries were in a bubble, yet it did not seem to be the case for Norway. Norway saw a small decree in real estate prices after the crisis, however they increased relatively fast. For this reason, we assume other factors are shifting prices upwards in Norway.

2.3 Previous research

There is a wide collection of studies on real estate prices. The studies use different factors and methods to explain the change in prices. We will now mention some of the studies found relevant for the thesis.

2.3.1 User-cost theory

The Nakajima (2011) article review how average national real estate prices changes in the US. He uses a theory that deals with user cost and rent. The theory is based upon two elements: how user cost is specified, and how user cost and rent are equal. User cost are specified as the cost the buyer are responsible for by owning a residence in one year instead of renting. If the price of real estate is to high compared to rent, potential buyers will want to rent. As a result, the demand will go down and the prices will decrease back to the rent line. He uses five key components that affects the residence cost and comes to the following connection between user cost and rent:

"Rent = User cost = (Interest rate + Property tax rate – (Mortgage interest rate + Property tax rate) × Tax deduction rate + Maintenance cost rate – expected rate of capital gain) × Real estate price" (Nakajima, 2011, s. 26)

In the analyses he looks closer at three of the factors; rent fees, interest rates and expected changes in house prices. From 1997 to 2007 he found that rent and interest rate shifts the house prices up with 3.3% per year, equivalent to 39% for the time period. The actual annual growth rate was 4.2% and the theory accounted for 80% of the change. He further stated that the unexplained part could be due to changes in expectations. The increasing real estate prices is consistent with the increase in rent fees, declining interest rate and expectation of future price growth.

Himmelberg et al. (2005) also uses user cost theory. They have an additional risk premium in their model. Applying the model on 25 years of history across a broad collection of real estate markets in the US. They found that changes in the key factors can affect cities differently. In cities where the supply is inelastic the prices will be higher relative to rent, and changes in interest rate will affect the house prices. They conclude that the evidence does not indicate prices cannot change if key factors change. An unpredicted raise in interest rate or a negative shock in the economy would lower the demand for real estate. Consequently it would slow down the growth or decline the prices. NOU 2002:2 (p. 20) utilize this formula to compute the user cost in Norway:

"User cost = interest expenses + maintenance cost – tax benefit of owning a house – capital gain"

From the articles findings it is reasonable to expect that a change in one of these four factors will cause a change in the price.

2.3.2 The VAR model

Sutton (2002) utilizes a *small-scale* vector autoregressive (VAR) model to look at complex behaviour between real estate prices, national income, interest rate and stock market wealth. He performs the analysis on six countries with similar trends in prices. The model makes it possible to examine the dynamic impact on a small number of key factors that affects the value of a residence. Like the demand for other goods, the national income and changes in stock markets are

two of the factors included when the demand for residences are positively related to a household's income and wealth. He concludes that an increase in GNP will lead to an increasing real estate price. A 1% rise will increase the house price with 1-4% after three years. Decreasing interest rates will also cause an increase in house prices independent of short or long-term rate changes. The model also indicates a positive relationship between the stock market and real estate prices. When a great response on the real estate prices occur after a shift in the stock price, this can reflect a tendency to predict a growth in the national income. He further concludes this does not explain the whole change in real estate prices but that stock prices none the less are a factor that affects.

2.4   Norwegian real estate policy

In Norway one is almost expected to own your own residence eventually. This is probably a consequence of the real estate policy the country has fronted through the years. Followed is a translated excerpt from the governments last post regarding real estate policy:

> Even if the prices now are high, we must not forget the most important part: Norwegian real estate policy are a success. Eight out of ten owns their own residence – this is far higher than our neighbour countries. Also, among immigrants in Norway the ownership rate is high. Amongst young souls between 25 and 30 years the portion that owns themselfs have increased from 34 % in 2004 to 42 % in 2016. (Mæland, 2019)

Further it has been said:

"In Norway, most owns their one residence, and we have few homeless. This is the result of a great housing policy - A policy where as many as possible can own their own residence"(Mæland, 2019).

Boligsparing for unge (BSU) is an arrangement that lets young people between 18 and 33 save for a residence with good terms. The arrangement gives you favourable tax reductions and high interest rates. This leads to people saving at a young age. Norwegians that bought a residence had in November 2019 an average debt of 342% of their own income (Wig, 2019).

Sørvoll (2011) states that real estate policy has changed from being state regulated to becoming a liberal market in Norway. The country controls through building regulations, property tax, municipal housing, minimum equity requirements and BSU among others. Tax on residences are relatively low in Norway relative to other countries. This has made real estate an investment opportunity for many. According to NOU 2011:15 (p. 24) residence owners get subsidized indirectly with 55 billion NOK a year. This can indirectly lead to continuing rising prices.

2.5 Equilibrium in the real estate market

The market price is found where the demand is equal to supply. This is called the equilibrium. When the market is constant, none of the participants in the market change. The market price will therefore be constant. On a short-term basis the supply will be inelastic as illustrated in figure 1. This happens because it is highly time consuming to change the supply since building residences takes time.

Source: NOU 2002:2 (p 18)
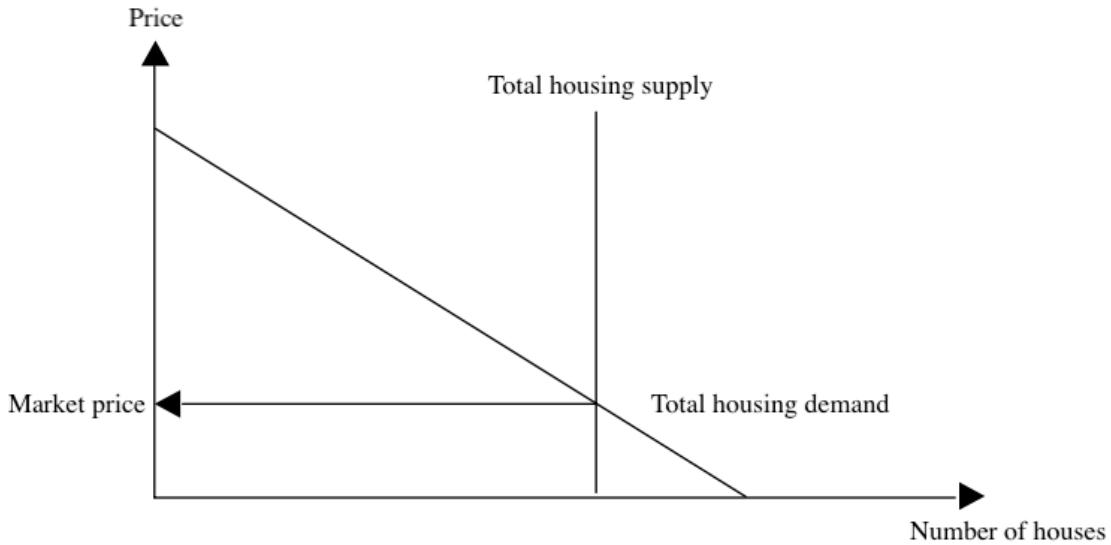
Figure 1: Short-term real estate market equilibrium

The equilibrium in long-term will have an elastic supply curve. This yields a rising curve. The change in demand will lead to a smaller shift in price on long-term compared to short-term.
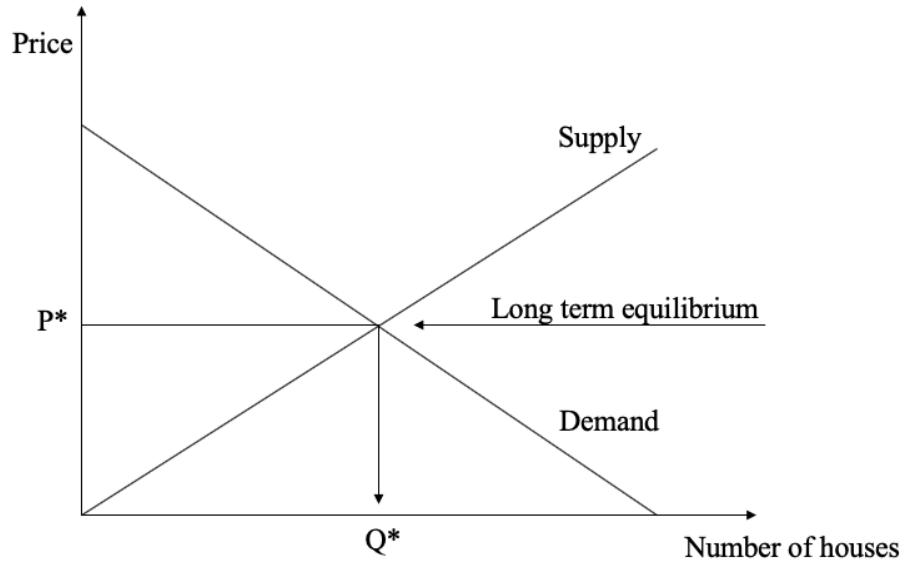
Figure 2: Long-term real estate market equilibrium

2.6 Residences and debt

Norway has the highest debt per citizen of the Nordic countries in 2018, with a debt of 695 000 NOK (Røstadsand, 2020). The debt rate was 233.1% in quarter four 2019 and the rate has increased steadily over the last 30 years (Statistisk sentralbyrå, s.a.-d). In order to buy a residence in Norway almost everyone files for a loan. With the high proportion of people owning residences there is no surprise that real estate constitutes the largest component of a household's wealth. Furthermore, loans secured by real estate represents the largest debt component with 80% of total debt (Røstadsand, 2020). A residence is a form of saving either through real investments, unrealized capital gains or loan repayments. A Norwegian household approximately saves 48 000 NOK a year without capital gains. Most of these savings occur in the shape of loan repayments or real investment in residences. Increasing value gives possibilities to increase limits of the loan. Loans have in some ways replaced traditional bank savings as a tool to achieve consistent consumption over time (Røstadsand, 2020).

2.7   Real estate prices

On short-term basis the real estate prices will as mentioned be determined by the theory of price formation. The market price for housings will thus be dependent on the total offer of housing available and the overall housing demand (NOU 2002:2, pp. 18-19). The existing owners are the suppliers and the people looking to buy represents the demand.

The price demanders pay deepens on what they are willing to pay and the household's ability to pay. The household's ability to pay is connected to factors like income and rent. The willingness to pay will be affected by more factors than just ability. Factors such as need and preferences according to other consumer goods and investments. However, these factors are difficult to measure as they are individually. A household with children would likely be willing to pay a higher price for a residence that is close to a good school. This might not be prioritized by young adults without children.

Presented below is an illustration of factors that decides the price of houses. A change in these factors will potentially lead to a change in price. The illustration is based on Kvinge, Langset, and Nørve (2012, p. 26) figure. Additional factors that affects demand is added to the figure. These are marked with a *.

House lend rate
Tax benefit
Expectations
Income
Unemployment*
Residential mortgage
landing regulations*

Demand

House price

Supply

GDP*
Population
Centralization of the
population
Commute/travel costs

Risk, salary level, interest rate,
tax rules, access to labour and
capital, productivity, land costs,
availability of land, quality-
related government
requirements, competition,
capacity

Figure 3: Factors that affect real estate prices

2.7.1 Income

The monthly salary has increased with 3.7% from September 2018–2019 according to numbers from SSB (Johnsen, 2020). This is the highest wage increase in several years. The growth in salary has been 2.4% and 2.9% respectively the previous two years. Oslo has the highest average monthly salary among the counties. The increase was 3.9% from 2018 to 2019. In the different counties the larger municipalities often have the highest salary level measured after numbers of jobs. In relation to age and gender the average monthly salary are lower for women than men in all age sections. The salary increases by age until retirement. Household income is the most important factor regarding purchasing power of real estate. It is also one of the most important factors deciding the size of a possible loan. Income is therefore an element that affects prices. When income increases most articles find increasing real estate prices (Andreassen, 2009; Jacobsen & Naug, 2004; Jansen, 2011; Nakajima, 2011; Sutton, 2002). Economic theory expects higher purchasing power to result in higher prices. Jacobsen and Naug (2004) found that when income rises by 1% the house price will rise with 0.5% the first year and then 1.75% long-term.

2.7.2 Loan and house lend rate

The bank requires 15% equity when applying for a property loan in Norway. With extra security it is possible to get up to 100% of the property financed from the bank. Normally this security is guaranteed through a surety that have pledged the bought house. Other residences or assets can also be used as security. Normally the loan cannot be equivalent to more than five times the salary before tax.

According to published articles they find an effect between the mortgage rate and house prices (Andreassen, 2009; Himmelberg et al., 2005; Jacobsen & Naug, 2004; Jansen, 2011; Nakajima, 2011; Sutton, 2002). The rate is an important factor for many homebuyers. If the rate is low its affordable to buy a more expensive residence. This is because the payments decrease when rate lowers. Some elements can lead to a rate change. If unemployment for example increases the central bank can cut the rate to make living expenses more affordable (Andreassen, 2009).

2.7.3 Unemployment

The work force in Norway consist of 70.5% of the population that potentially could work. SSB operates with this number for people in the age of 15 to 74 years (Statistisk sentralbyrå, s.a.-a). The people outside the workforce are persons studying, retired, unable to work and homemakers. From the workforce 3.5% were unemployed on average for the period January to March 2019 (Statistisk sentralbyrå, 2020f). Unemployment has decreased with 12 000 persons from November 2019 to February 2020.

When unemployment is low more people buy residences and get loans. As a result, the house prices will rise. The opposite happens if unemployment increase (Jacobsen & Naug, 2004; Jacobsen, Solberg-Johansen, & Haugland, 2006; Larsen & Sommervoll, 2004). The degree of unemployment will affect the Norwegian housing policy and amount of people needing help with grants, housing allowances and loans from the *Norwegian State Housing Bank*. If the portion of municipal social housings gets higher simultaneously with unemployment, this will likely cause lower prices.

2.7.4 Population

The Norwegian population has increased almost continuously the last 200 years. The population has now reached over 5.3 million people (Statistisk sentralbyrå, s.a.-b). The change in population is due to factors like immigration, emigration, life expectancy and births. Even though the fertility to women has decreased there is still a birth surplus in the population. We also live longer than before which yields an increasing population. Another cause is net immigration. One of six persons has an immigration background according to numbers from 2017 (Dzamarija, 2017). The net immigration was 25 000 in 2019. This is an increase by over seven thousand compared to 2018 (Statistisk sentralbyrå, s.a.-c).

It is natural to look at households when discussing house demand and prices. On average there are 2.16 persons per private household in Norway (Statistisk sentralbyrå, 2019b). According to numbers from 2019 there are 2 439 242 households (Statistisk sentralbyrå, s.a.-b). As with population number of households have increased. There are approximately 300 000 additional households compared to 10 years ago.

2.7.5 Gross domestic product (GDP)

GDP is the sum of all goods and services that are produced minus cost of production in a country (Dette er Norge-redaksjonen, 2017). It indicates a country's conditions and development. Norway is one of the richest countries in the world per inhabitant because of oil and gas. In Europe GDP was 46% higher than the world average in 2017. Norway had the fourth highest GDP per citizen. In 2019 the GDP in Norway was 661 498 NOK per inhabitant (Statistisk sentralbyrå, s.a.-d). The volume growth removes the effect of the price change and was in 2019 1.2%. This was a 0.1% point decrease from the previous year (Statistisk sentralbyrå, s.a.-d). According to Dijk, Franses, Paap, and Dijk (2009) the house price and GDP moves together. They find GDP to move almost twice as fast compared to prices long run in rural areas. This cluster reacts faster to changes in GDP than others.

2.7.6 Housing construction

Construction of housing is as mentioned not that important short-term (Jacobsen & Naug, 2004; Jacobsen et al., 2006; Jansen, 2011; Senneset et al., 2012). However, over time constructions of new residences can affect the price positively.

Willingness to pay along with construction costs are elements that affect the price on new residences (Andreassen, 2009; Jacobsen et al., 2006; NOU 2002:2, pp. 33-37). The price is also dependent on prices for similar used property. Because of acquired maintenance for old properties and higher standard on new ones the price will vary. An important factor when constructing new houses is availability of land. Land prices is therefore a factor that affects price for developers. Land prices is affected by several factors and is harder to measure than building costs. The land as residences itself is only worth what potential buyers are willing to pay. Land outside city centres and other attractive areas are often less expensive because of availability. When demand in these areas increase prices rise. Construction investments is dependent on projects profitability. Construction time of infrastructure in new areas is also relevant to construction cost. The developer usually sets a risk premium when insecure of the time and cost perspective of the project. The price on second-hand real estate is crucial for the price of new houses as well as developer's willingness to start constructing.

2.7.7 Personal preferences

Personal preferences are difficult to measure. This involves everything a specific person values in relation to residences. For some it is more important to live central than for others. Some value access to public transportation and other values parking space for their cars. Personal preferences involve that all people have different needs, willingness to pay and value traits with the residence differently. This is something the models cannot pick up and is to be considered random error.

2.8 Sharing economy

There has always been a division between individuals in the foreseeable past. Organizations like cinemas and fitness centres have recently run businesses based on sharing their products with consumers (Kathan, Matzler, & Veider, 2016). *Sharing economy* is something that occurred after internet entered the world. The Internet has contributed to new *products* being shared in new ways becoming more available than before (Kathan et al., 2016). Internet made it possible to offer platforms where people could connect, offer and rent products and services. Airbnb, Uber and Netflix are examples of different companies that contributed to sharing economy as we know it today. The term is used for commercial services that offers a digital sharing platform. The government has defined the following:

"Sharing economy is meant economic activity mediated through digital platforms that facilitate the provision or exchange of services and expertise, assets and property, resources or capital, without transferring ownership rights and primarily between individuals". (NOU 2017: 4, p. 9)

Sharing economy makes it possible to utilize resources that otherwise not could been used. This creates a win-win situation where the sharer provides an extra income and the consumer do not take the full cost of purchasing the product (Muñoz & Cohen, 2017).

Although sharing economy brings several positive aspects there are also negative aspects to consider. Quattrone, Proserpio, Quercia, Capra, and Musolesi (2016) believe it promotes economic self-interest instead of a genuine desire to share. They are concerned sharing economy is greedy and exploitative.

The Norwegian Hospitality Association has strongly criticized Airbnb for being a major threat to the hotel industry. The main problem is hotels contributes with jobs and large tax revenues while Airbnb do not (Kristoffersen & Budalen, 2019).

2.8.1   Airbnb

The business idea of Airbnb was to offer cheap bed and breakfast solutions to travellers. Today there are over 7 million accommodation options available in 191 countries (Airbnb, s.a.). The platform makes it possible to have a selection of different rental properties available. The hosts are rated to maintain good quality among accommodations. Airbnb also offers activities and experiences to influence what guests do in the places they visit (Airbnb, s.a.)

Airbnb is often referred to as a disruptive innovation. A disruptive innovation is a pioneering innovation that significantly disrupts an existing market (Guttentag, 2013). Airbnb met a need consumers initially did not know existed. It is the collection of private rentals on a digital platform that is ground-breaking. Not short-term rental of rooms and housing between privates. This resulted in more people engaging in short-term rentals because off the easiness and availability through the platform.

As shortly mentioned there have been discussions regarding tax on Airbnb income. Legal problems quickly arise when *grey zones* in the law are taken advantage off by big technology companies like Airbnb (Kristoffersen & Budalen, 2019). 2017 was the last year no special tax laws regulated short-term rental in Norway. This meant that hosts could compete with hotels on the same tax regulations as long-term rental. When using more than 50% of the residence there are no taxes regarding long-term rental in Norway (Skatteetaten, s.a.-a). For 2018 the law changed to 10 000 NOK in tax-free income on short-term rentals. Any amount over 10 000 NOK is taxed with 22% (Skatteetaten, s.a.-b). This was considered fair when companies also payes 22% tax on their profits. Up until 2020 Airbnb was not obligated to report how much income each host made from rentals. This meant that a high amount of people did not pay the obligated taxes (Øksnes, 2020). The income is now reported the same way as income from regular jobs. This should result in a fairer competition in the short-term rental market.

Other criticisms of Airbnb have been security of damage claims for destructions in rental places. In Svalbard, housing shortages have been a result of short-term rentals to tourists rather than long-term rentals to locals (Baglo, 2018; Solset, 2019).

2.9 Econometrics

Econometrics is the foundation of what the analysis section is based upon. It is also the foundation for economic measurement and analysis but likewise important in other fields of social science. Econometrics is used in accounting, finance, marketing, political research, history research and sociology (Hill, Griffiths, & Lim, 2018, pp. 1-2). Economic models deal with supply and demand, macroeconomic behaviour and international trade. In other words, econometrics is the tool you need to be a practicing economist who can do calculations and analyses of empirical data (Hill et al., 2018, pp. 1-2).

The key words in econometrics are variables, and how their relationship is to one another. Econometrics also provides an opportunity to predict future values when relationship of variables is estimated. The effect of how much a change in one variable affects the additional variables is part of why econometrics is important. Econometrics also makes it possible to test hypotheses concerning the relationship between variables (Hill et al., 2018, pp. 1-2). Statistically inference is used to evaluate an estimated model. In summary, econometrics is how to apply theory and data from economics, business and social science together with tools from statistics to be able to predict outcomes, test hypotheses and explain relationships between variables (Hill et al., 2018, pp. 1-2).

Chapter 3

3 Data

In this chapter the data collected for the paper will be described and discussed. The data originally contained of 52 individual variables. They were gathered, sorted, cleaned and merged using statistical software and appropriate guidelines and methods. The procedure was necessary in order to evaluate different model specifications when having data from different sources on similar variables. The analysis settled using 12 of the original variables.

3.1 Sources

The thesis uses three main sources for the data. Capia AS delivered the Airbnb data collected from AirDNA. Trough Capia we had access to key numbers for Airbnb activity in Norway from 2016-2019. Anders Lund from Eiendomsverdi AS arranged the data needed from the real estate market. This includes the house price index and residences for sale used in the models. The data was provided quarterly for 87 regions from 2003-2019. These regions became the region structure foundation for the thesis. The rest of the data was collected from Statistisk Sentrallbyrå. SSB makes it possible to download a variety of public data. The majority of the independent variables utilized is SSB data.

3.2 Region structure

The thesis uses the Norwegian county and municipality structure previous to 2020. The datasets containing 422 municipalities were merged down to 87 regions. The main rule for the structure is: Major municipalities are presented individually, and the smaller municipalities are merged together as one for each county. As a result, the individual effects of the merged municipalities are compromised. This is something that could be improved for further research on the topic. The complete taxonomy for all municipalities is found in appendix A1. The fact that the analysis uses data from all municipalities in Norway is both exiting and unique in this context.

3.3   Time periods

With different data sources spanning over different time periods all variables needed to be arranged on the same level. The different sources provided annual, quarterly and monthly data. All data was individually broken down into monthly observations to be able to merge into a final data set. For annual data the observations were repeated 12 times making all months for the respective year equal. Similarly, the observations for quarterly data was repeated 2 times making all observations in a quarter equal with exception of square meter price data. This alternative use *best data available* as it would be inaccurate to create a gliding mean for the missing data between two quarters or years.

3.4   Missing observations and issues

Dealing with data of this size resulted in a great amount of missing observations across the different variables and regions. We dealt with NA's by replacing them with zero. This in itself is not usually a problem if there are enough individuals with observations. The problem with *zero observations* occurs when scaling variables with different measurements to the same form. In this case price, quantity and percentage variables are all used in the same models. The easiest method of scaling is using the logarithmic transformation of the observations but the logarithm of zero is undefined. Due to this, the models did not perform when using data from 2003–2019. The start date for the different variables vary. This means that all observations previous to the respective date start is set to zero. All variables observations ended in 2019. In this case the solution was using quarterly data from 2016-2019 for the final models. Most of the data were left out, but in return the majority of the observations were valid.

3.5   Wide to long

All data were originally in a wide format with columns representing different time periods. In order to arrange the data together we created a transformed three-column version of each variable. This new structure consisted of time period, region and value. As a result, they were left joined with respect to time period and region.

3.6 Final appearance

An excerpt of the final appearance is presented below:

Table 1: Extract of final appearance data

municipality	year	quarter	house_P_index	AIRrevprUn	HouseHinc	t
Tromsø	2016	1	255	28691	509000	1
Tromsø	2016	2	260	11617	509000	2
Tromsø	2016	3	259	18662	509000	3
Tromsø	2016	4	259	29549	509000	4
Tromsø	2017	1	269	46978	520000	5
Tromsø	2017	2	274	20554	520000	6
Tromsø	2017	3	272	22218	520000	7
Tromsø	2017	4	265	35817	520000	8
Tromsø	2018	1	270	52609	529000	9
Tromsø	2018	2	277	25049	529000	10
Tromsø	2018	3	276	26601	529000	11
Tromsø	2018	4	271	42788	529000	12
Tromsø	2019	1	277	61341	542225	13
Tromsø	2019	2	286	29344	542225	14
Tromsø	2019	3	284	40212	542225	15
Tromsø	2019	4	279	52999	542225	16

3.7 Variables used in the models

The variables used in the different models are presented below. The complete time period of the variables will be displayed in the figures. Note that we are only showing 12 of the 87 regions in order to distinguish them.

Table 2: Variables used in the different models

Type	Variable	Model
Dependent	House price index	1
Dependent	Square meter price detached houses	2
Dependent	Square meter price apartments	3
Dependent	Square meter price small houses	4
Independent	Airbnb revenue per available unit	1,2,3,4
Independent	Median household income after taxes	1,2,3,4
Independent	Unemployment in percent	1,2,3,4
Independent	Residences for sale	1,2,3,4
Independent	Initiated constructing detached houses with rent possibility	1,2,3,4
Independent	Completed constructed detached houses with rent possibility	1,2,3,4
Independent	Average house lend rate	1,2,3,4
Independent	GDP per inhabitant	1,2,3,4

3.7.1 House price index

The house price index is the dependent variable of the main model. The house price index is an index for all residences sold in Norway. The variable was provided quarterly from 2003-2019 by Eiendomsverdi AS. They are behind the biggest real estate data base in Norway and is equally owned by DNB, Nordea, SpareBank1 and Eika Boligkreditt. Eiendomsverdi is the leading provider of real estate index data available in Norway. The index value for Oslo, Bergen, Trondheim and Stavanger was delivered for different parts of the cities. The mean of the respective values was used to create one value for each city to fit the region structure. The variable is presented with index values with all regions being equal to 100 in Q1 2003. The models use the logarithmic transformation of the values. Below follows a descriptive presentation of the index data:
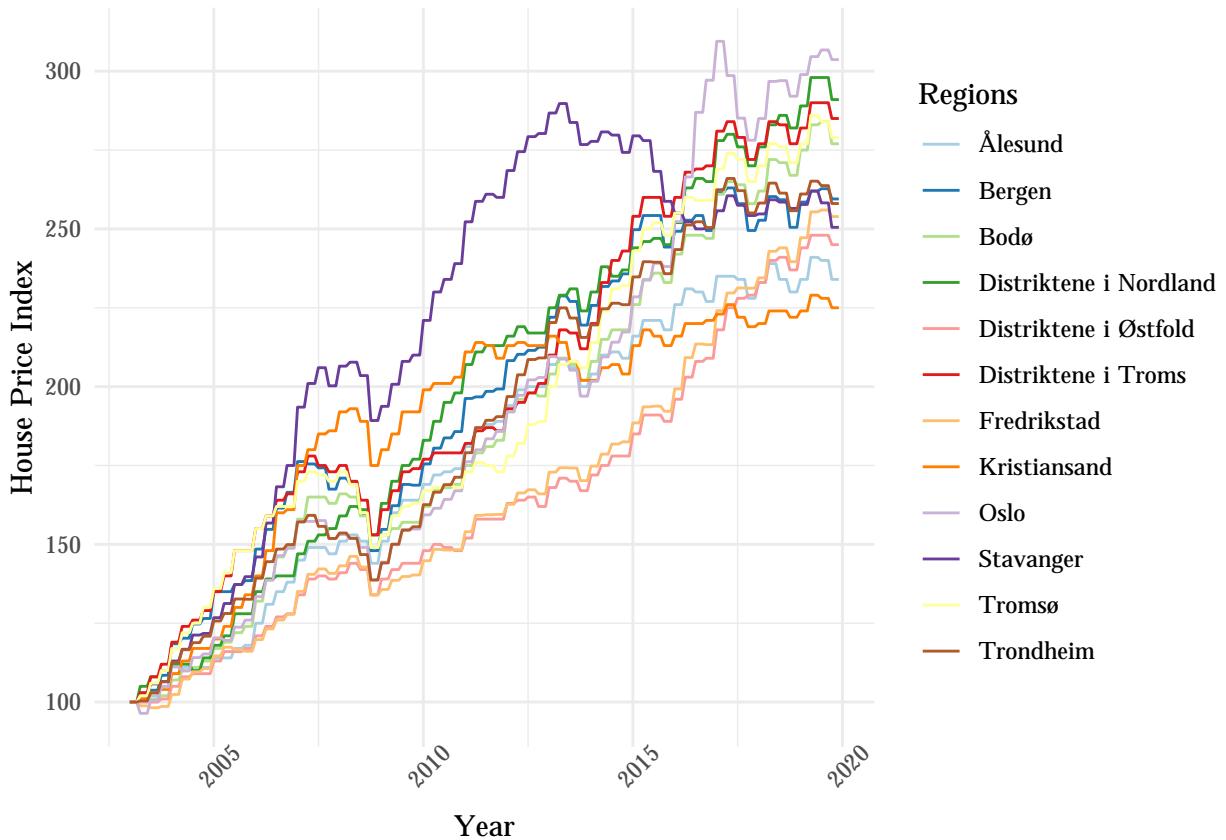
Figure 4: House price index 2003-2019

Oslo has the highest index value at the end of 2019. More surprisingly, the districts of Nordland and Troms has the second and third highest value of the 12 regions. Stavanger had the fastest growth up to 2012 but are found in the middle by the end of 2019. Tromsø is among the five most expensive regions.

3.7.2   Square meter price

The different square meter price variables are the dependent variables for model two, three and four. The data is collected from table 05963 through SSB (Statistisk sentralbyrå, 2020b). The values are presented nominal and are not seasonal or calendar adjusted. The values are estimated trough the mean sales price of the total usable square meter count for each detached house, apartment and small house. SSB experience that square meter price is strongly affected by the size of the sales object (Takle, 2012). The data foundation is from Finn.no, real estate brokers and the real estate federations of Norway. The prices are not adjusted for inflation and are real time average values. We use square meter price for detached houses, apartments and small houses in their respective models. Unfortunately, SSB only provides data for the largest municipalities in Norway resulting in regions without observations being removed before conducting the analysis. This means the data for the respective models have less observations and uses a unbalanced panel data set. The models use the logarithmic transformation of the values. Below follows a descriptive presentation.
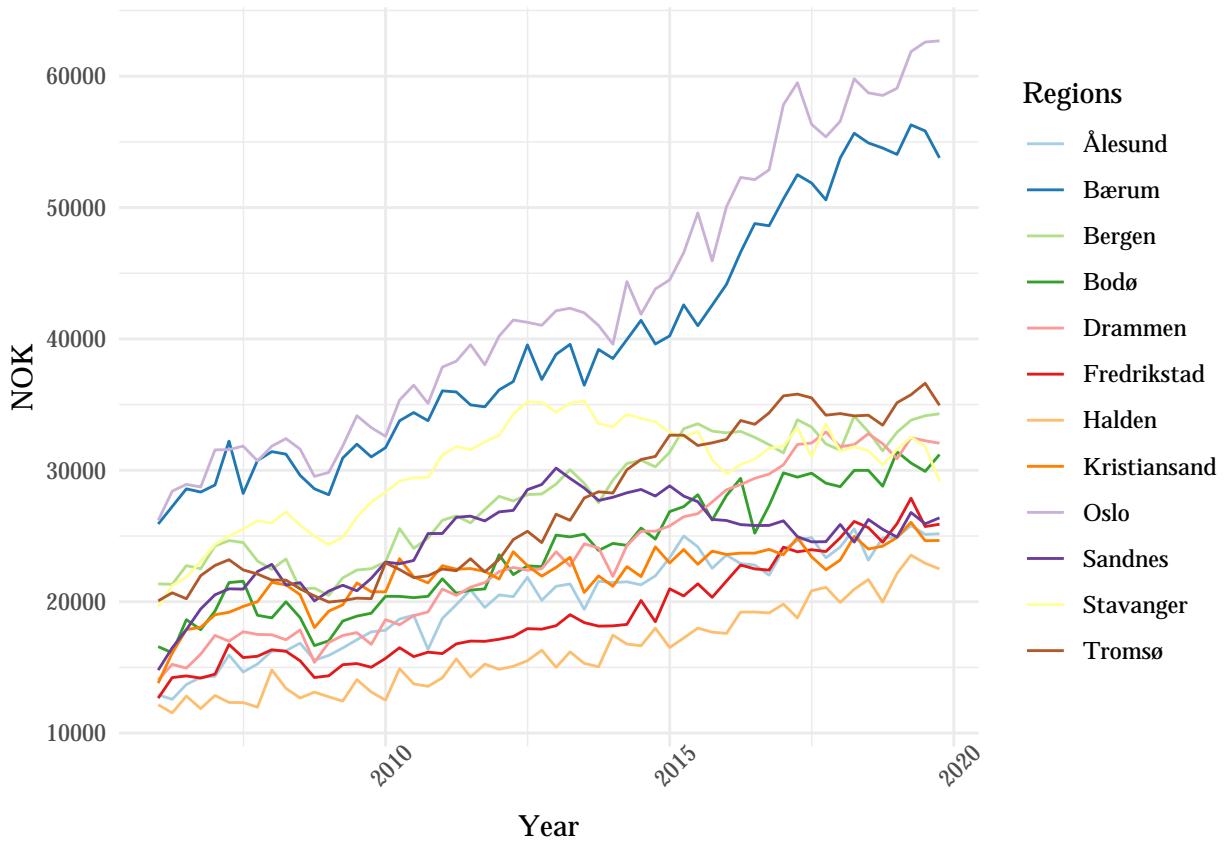
Figure 5: Square meter price detached houses 2006-2019

The square meter prices for detached houses has the lowest average price of these three types of real estate. Oslo is the most expensive city in square meter price as well. Tromsø has the second highest square meter price at the end of 2019. Bergen is the third highest. As all the figures shows, the different prices are strongly correlated while on different levels. This indicates that they are strongly affected by factors that affects all regions or are experiencing the same levels of individual effects.
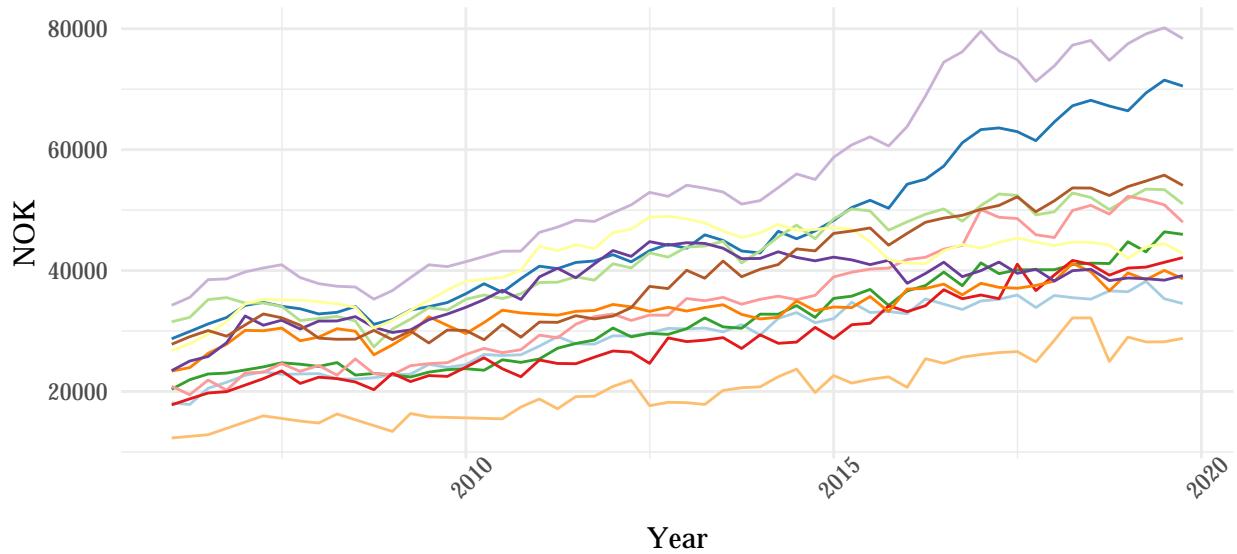
Figure 6: Square meter price apartments 2006-2019

The square meter price for apartments are significantly higher than the prices for detached houses. Oslo peaked around an average of about 80 000 NOK per square meter. This means that a normal 30 square meter apartment would cost 2.4 million NOK. A large amount of money for a small apartment.
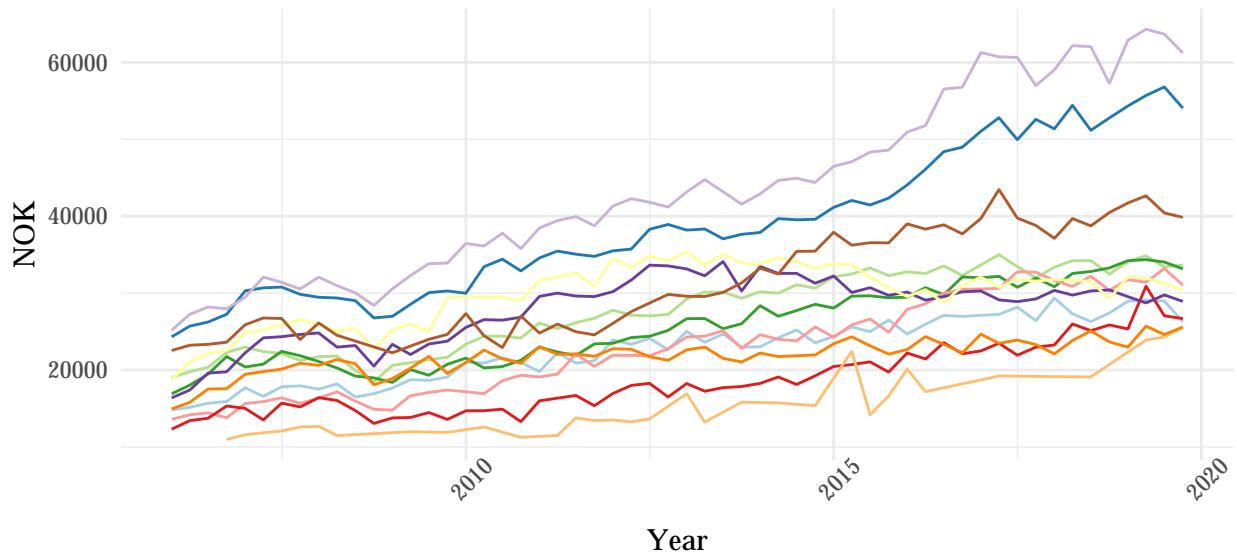
Figure 7: Square meter price small houses 2006-2019

The average square meter price for small houses are barely higher than detached houses. This could be because detached houses and small houses are often seen side by side in the same neighbourhoods and are similar in many ways. Tromsø is closer to Oslo in price regarding small houses than any of the other figures. An advantage with small houses is that more buyers gets involved in the available space while remaining most of the advantages with a detached house. This can include gardens, garage, storage space, multiple stores and onwards. This results in prices often being higher per square meter compared to detached houses.

3.7.3   Airbnb revenue per available unit

Monthly Airbnb was provided from 2016-2019. Airbnb do not publish their data hence the data was provided by Capia AS. The data is estimates delivered from AirDNA who specializes in monitoring web page traffic. As this is secondary data, the data is not 100% correct but possibly the best source available. The data delivered from AirDNA is furtherly cleaned by Capia to remove outliers and units not operational. The models use the average Airbnb revenue per available and operational units for each region as an explanatory variable. This variable becomes an extra income variable for the regions. The data uses the sum of the revenue in the months included in each quarter.

A possible source of error connected to the data is blocked days in the hosts calendar may be recorded as reserved and reserved days may be recorded blocked. Only active units are included in the statistics. The number of available rooms will not necessarily reflect the real supply. This could affect the income variable used. The location of the units is provided by AirDNA and is based on public figures from Airbnb to ensure correct geographic dividing. The models use the logarithmic transformation of the variable values. We are adding 1 NOK to all the variable values to avoid the logarithmic zero issue for regions having zero income observations in Q1 2016. Below follows a descriptive presentation of the Airbnb data:
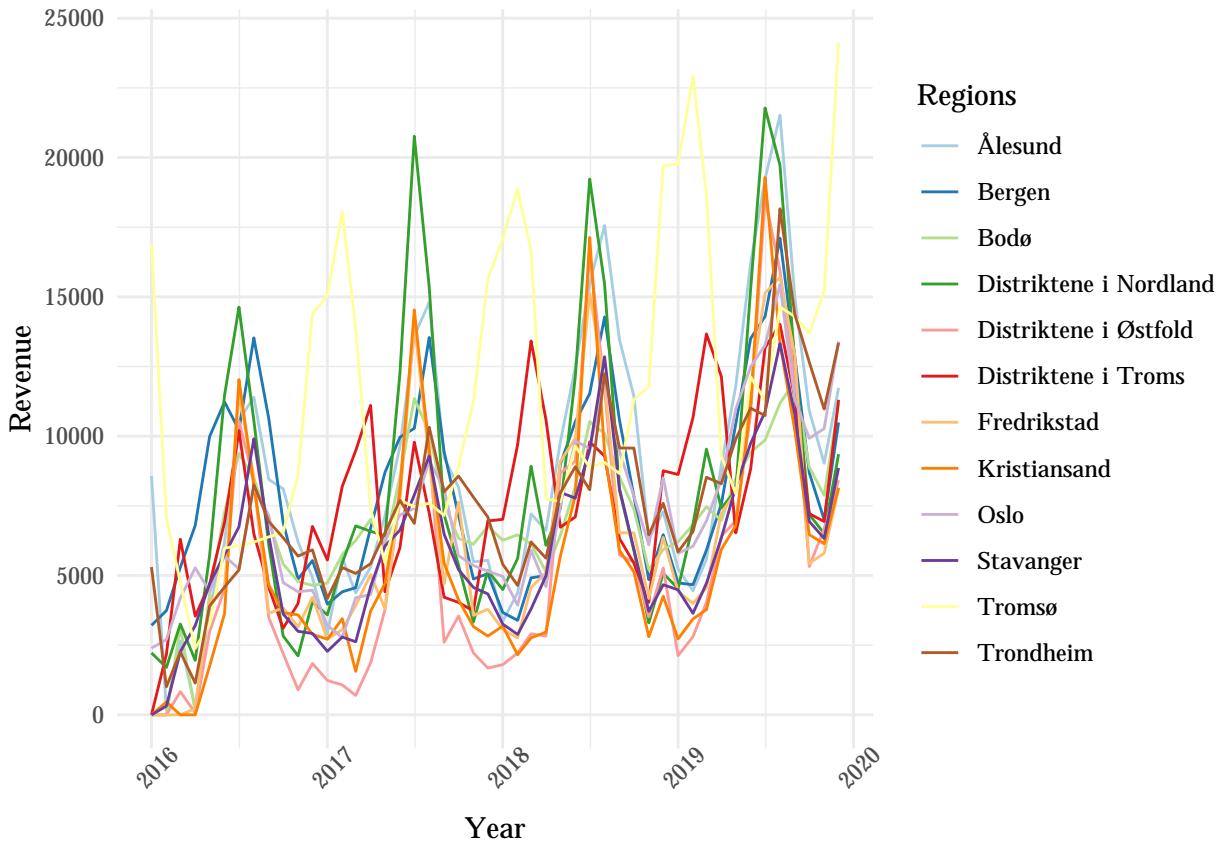
Figure 8: Airbnb revenue per available unit 2016-2019

In this figure we clearly see the seasonal effects of Airbnb revenue for some of the regions. The figure shows the monthly data and not the summarized quarterly data. Tromsø is for instance very popular during the winter months, meanwhile the districts in Nordland has their high season during summer. The rest of the regions seems to be following the same trend having their peak during the summer. Most of the regions seems to have increased their average income per unit with around 5000-7000 NOK over the past four years. Tromsø and districts in Norland are earning most per available Airbnb unit.

3.7.4 Median household income

Household income is one of the most important drivers for the house price. The variable used are table 49678 from the SSB database (Statistisk sentralbyrå, 2020g). The values are median household income after taxes. The data was a yearly estimate collected between 2005-2017. The values for 2018-2019 was estimated using the mean increase for the previous years. Household income is one of the explanatory variables in all of the models. The models use the logarithmic transformation of the values. Below follows a descriptive presentation of household income data:
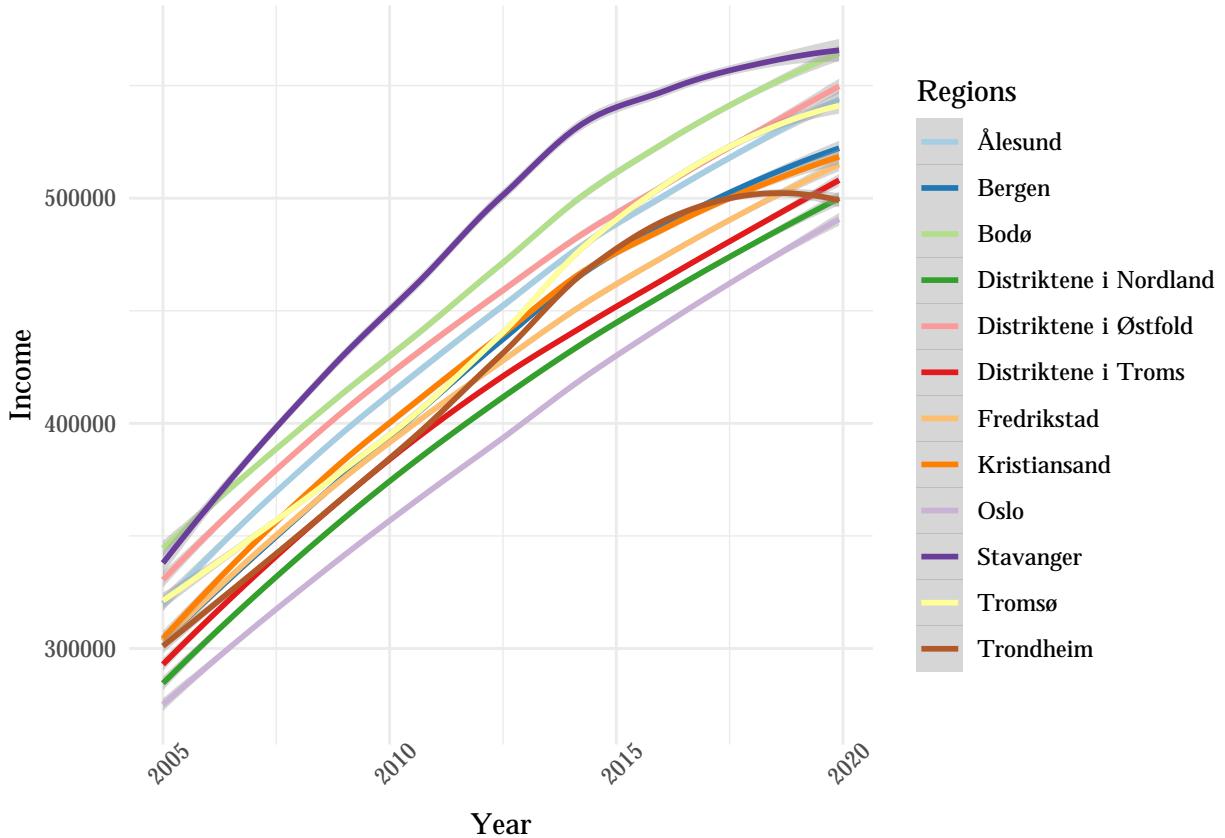
Figure 9: Median household income 2005-2019

We see that household income are strongly correlated for the regions during the period. Stavanger has the highest income during the period with Bodø having second highest Oslo has the lowest income in this figure. It is most likely a result of high population and great variety in earnings. A Kernel smoother was used in the figure.

3.7.5 Unemployment in percent

The unemployment variable used in the models is collected from table 10540 through SSB (Statistisk sentralbyrå, 2020e). The values are in percent an represents the population between 15 and 74 years that are unemployed. The data dose not differ between genders. The values were collected monthly from 2003-2019. The missing observations trough some of the years and regions were replicated using the Zoo package in R (Zeileis, Grothendieck, & Ryan, 2018). This package inserts the last observed value until new observations occurs. Unemployment is one of the explanatory variables in all models. The models utilize the logarithmic transformation of the values. Below follows a descriptive presentation of unemployment data:
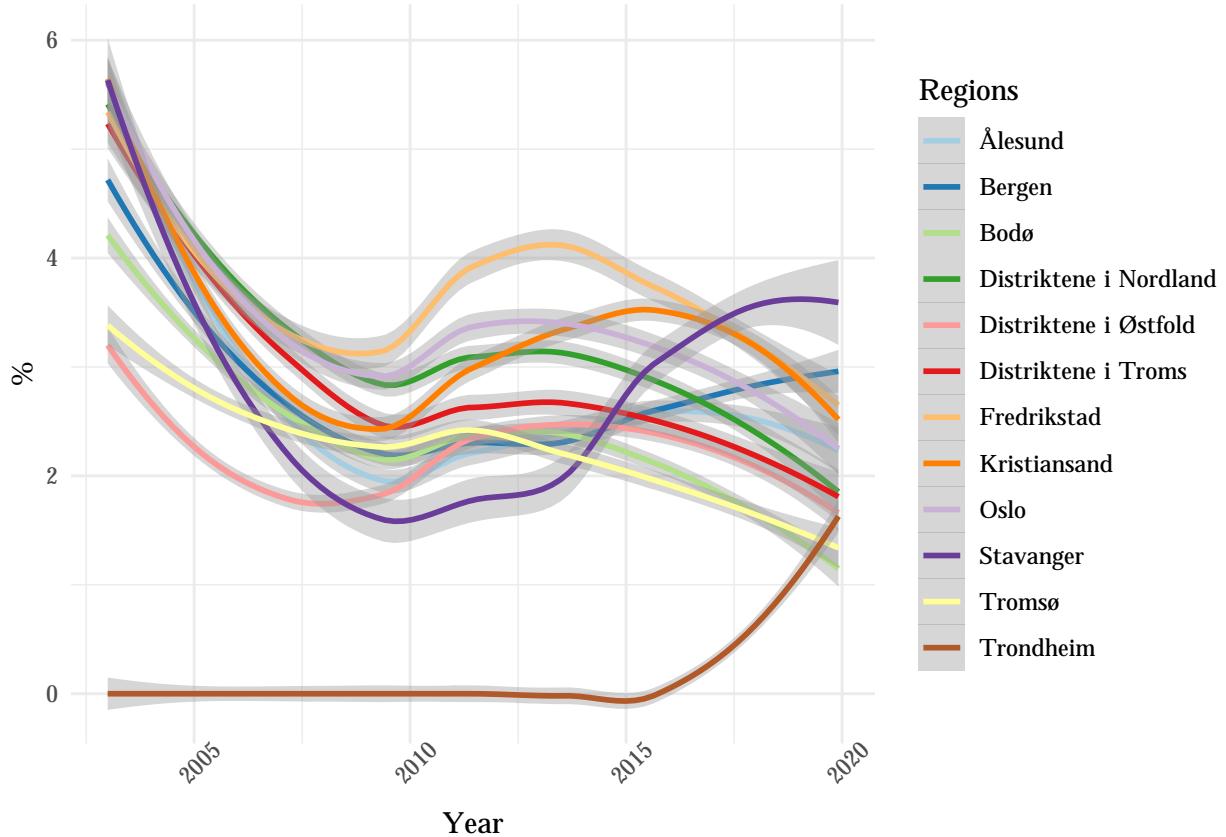
Figure 10: Unemployment in percent 2003-2019

From the figure we see Trondheim missing observations before 2016. The different regions also seem strongly correlated with a downward trend from 2003-2009 and 2012–2019. In aftermath of the financial crisis we see that unemployment was increasing. Stavanger and Bergen are not moving in the same direction as the other regions. This could be a reaction to fewer oil related jobs in Norway the last decade. A Kernel smoother was used to visualize the changes.

3.7.6 Residences for sale

Residences for sale are one of the quantity variables for the models. This is an explanatory variable and are implemented to keep track of the supply of real estate. The variable was provided quarterly from 2003-2019 by Eiendomsverdi. Because we utilize traditional price models it is important to include this as one of the independent variables to evaluate how supply is affecting price. The models use the logarithmic transformation of the values. Below follows a descriptive presentation:
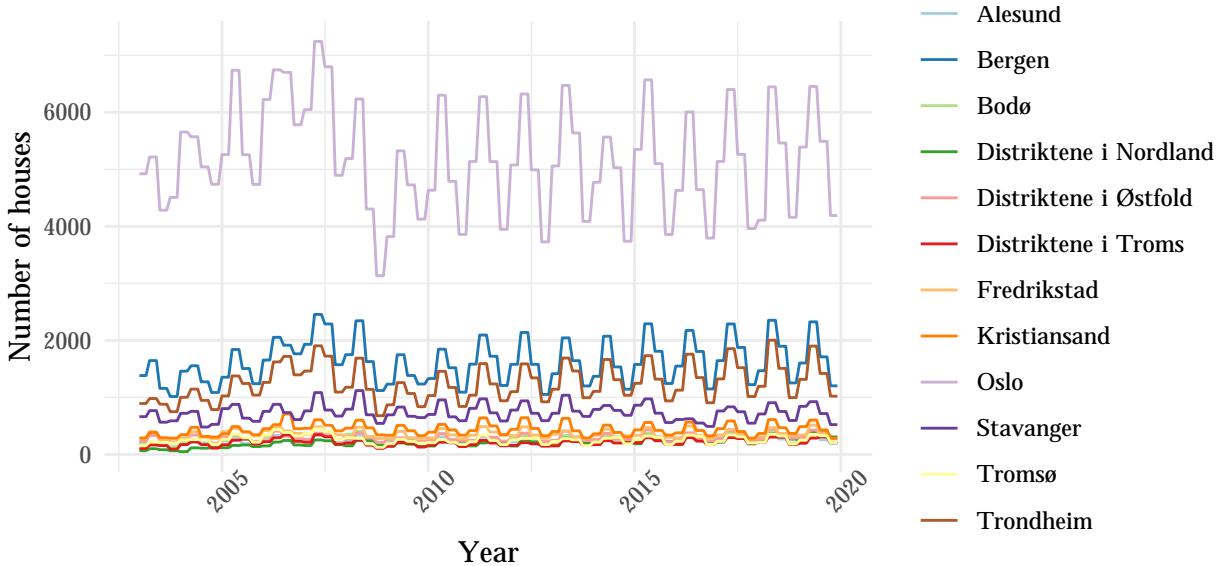
Figure 11: Residences for sale 2003-2019

The first thing to point out is how stable the real estate market has been the last 17 years. With a small exception from 2005–2010 the number of residences sold each year almost seems to repeat itself. We also see that there are more people buying during the summer months compared to winter.

3.7.7   Initiated constructing of detached houses with rent possibility

When implementing the variables of supply of new residentials we used detached houses with rent possibility. The data represent initiated constructing of detached houses with separate dorm or basement flats providing extra income for the houseowners. The data is collected from SSB table 05889 and is quarterly data provided between 2003-2019 (Statistisk sentralbyrå, 2020a). We decided using this variable as it is most relevant in combination with Airbnb and short-term rental income. It is an explanatory variable in all the models. The models do not use the logarithmic transformation of the values due to natural zero observations. Below follows a descriptive presentation of the data:
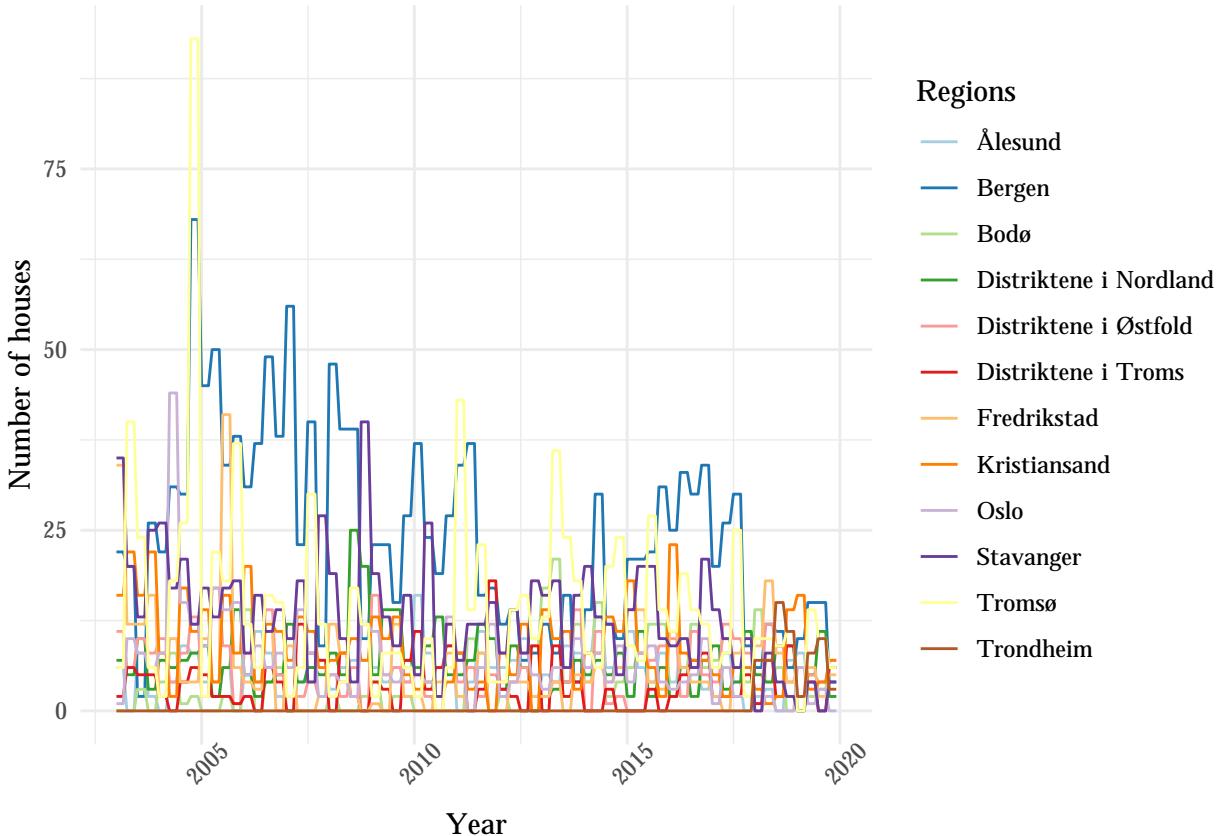
Figure 12: Initiated constructing detached houses with rent possibility 2003-2019

It seems to have been built more of this type of houses previous to 2015. This is particularly true for Tromsø and Bergen, but also for districts of Nordland. The majority of the regions are overlapping one another throughout the period. The values vary around 0-20 houses per quartal for most regions. Bergen, Tromsø, Kristiansand and Fredrikstad has the highest peaks during the period of the analysis.

3.7.8 Completed constructed detached houses with rent possibility

The *completed constructed detached houses with rent possibility* variable is an extension of the variable above. The data represent the reported amount of completed houses. It is collected from SSB table 05889 and is provided quarterly between 2003-2019 (Statistisk sentralbyrå, 2020a). This is likewise an explanatory variable and we do not use the logarithmic transformation of the values. Below follows a descriptive presentation:
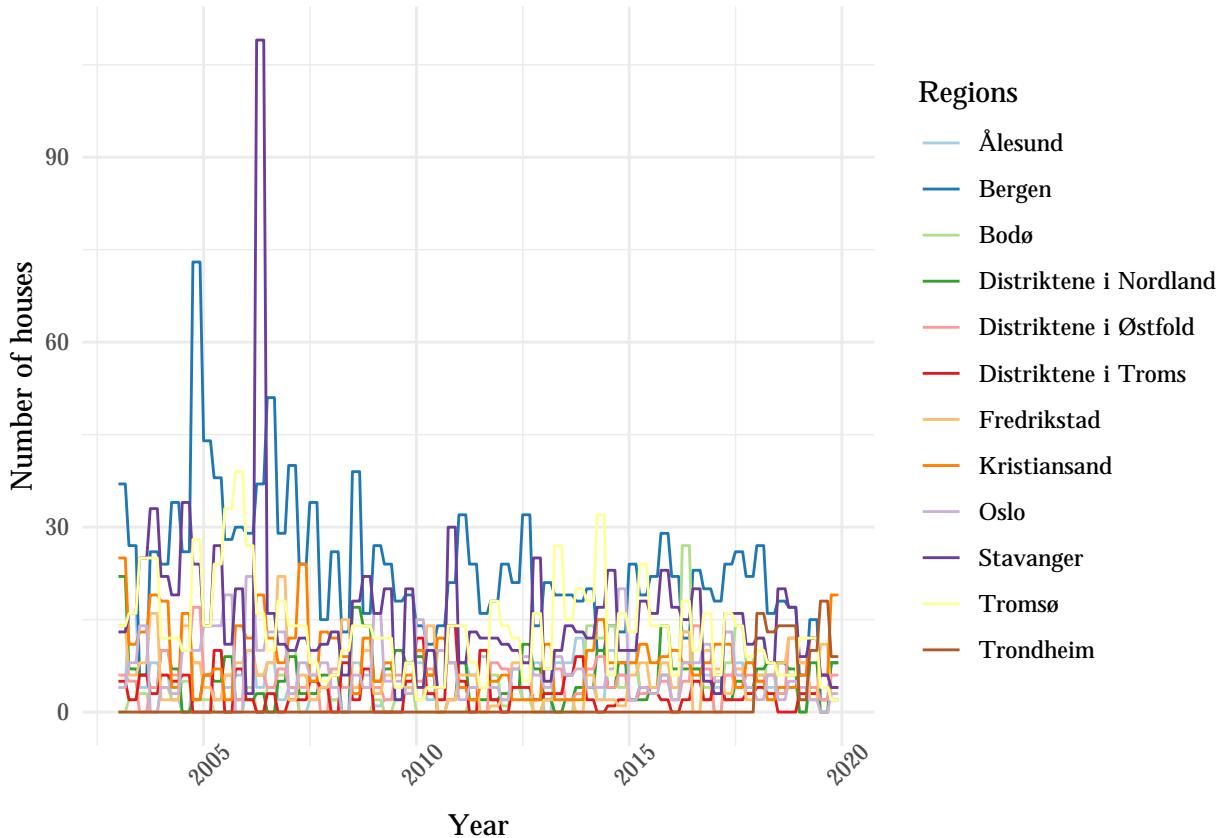
Figure 13: Completed constructed detached houses with rent possibility 2003-2019

Stavanger has more completed houses then initiated and Tromsø has fewer. This could indicate missing observations or developers failing to report the building start or completion of residences. Ignoring the possible faults of the data previous to 2015 it seems correctly correlated with initiated construction. The majority of the regions varies between 0-20 in the period used.

3.7.9 Average house lend rate

Average house lend rate was collected from SSB table 08175 (Statistisk sentralbyrå, 2020c). This is the yearly average lending rate on new and existing loans related to real estate. We collected the data from 2003–2019. The variable explanatory in all models and are expressed as percentages. The logarithmic transformations of the values are used. We utilize these values because they represent the most relevant rate for new and existing loans. Fixed rates agreements are uncommon in Norway, meaning most loan takers will except the rate to shift annually. There is no variation in house lend rate across regions. Below follows a figure presenting the house lend rate in Norway. We see little variation in the rate during the analysis time period. This could cause the model estimates to behave unexpected from previous research.
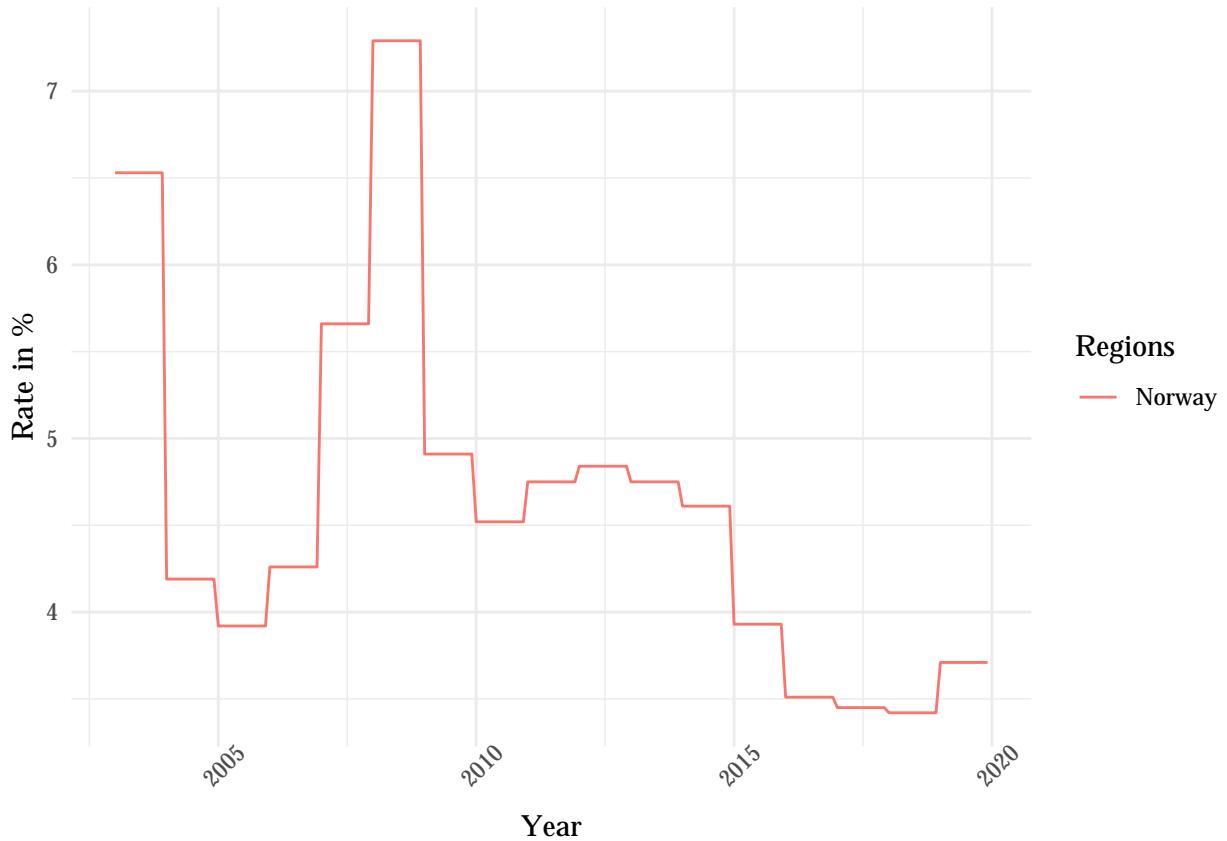
Figure 14: Average house lend rate 2003-2019

3.7.10   Gross domestic product (GDP)

Yearly data on GDP was collected from table 09842 through SSB (Statistisk sentralbyrå, 2020d). The data is not divided by regions and are an average count per inhabitant in Norway. This could affect the model estimates and result in unexpected behaviour. When looking closer at this figure and figure 9 for household income we see that they seem to move together. In addition, theory state that GDP is strongly correlated to house prices since it represents the wealth and purchasing power of the consumers. We therefore do a multicollinearity test for the variables we initially planned on using (appendix A2). The finding from this test shows that GDP and income are strongly correlated. We therefore decided to remove GDP from the models.
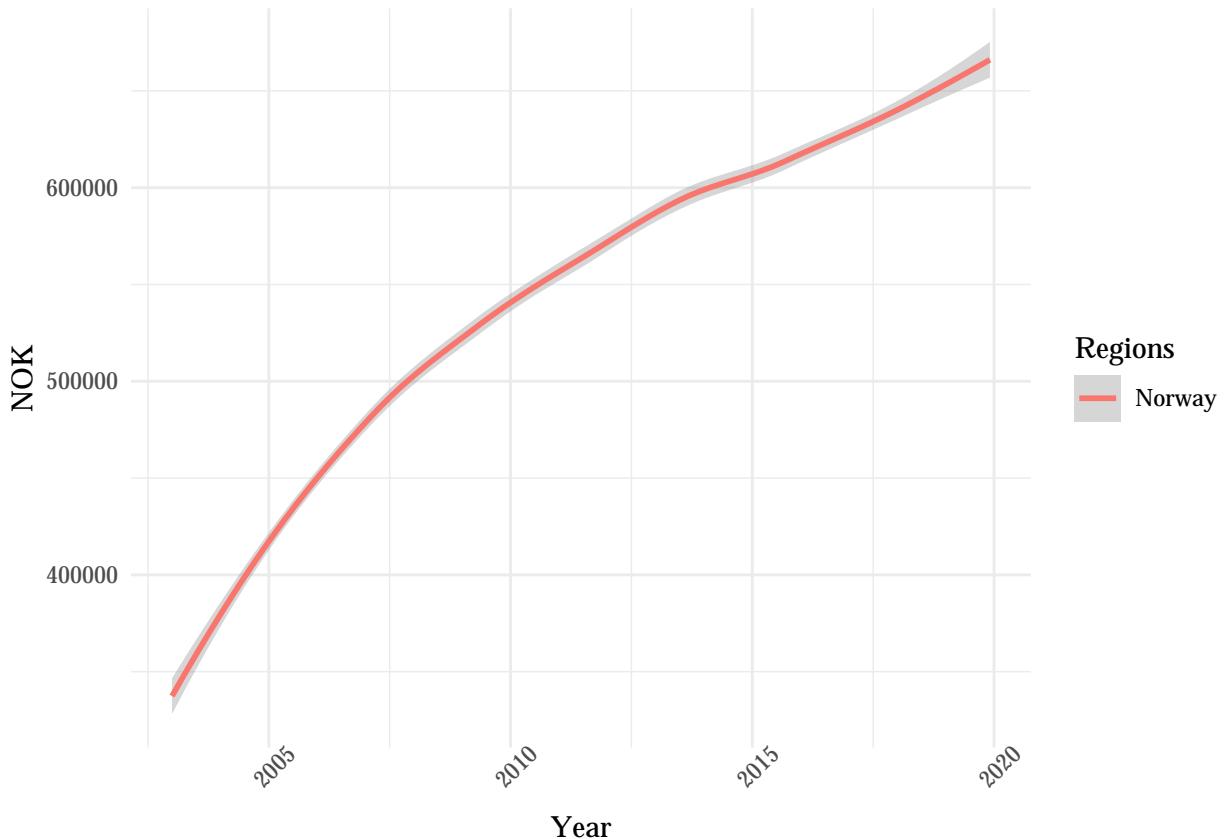
Figure 15: GDP per inhabitant 2003-2019

3.8 Variables not included in the models

Variables were excluded in order to not overfitting the models. Correlation between some variables were also an issue. The variables that according to theory was key factors were prioritised.

3.9 Adjusting for inflation?

The values are not adjusted for inflation. The indication for inflation in Norway is the consumer price index (KPI) produced by SSB. To make the values adjusted for inflation we would multiply it with 100 and divide it with the KPI value for each period. There are pros and cons for adjusting the numbers but being consistent is most important.

The main argument for transforming the data is adjusting to changes caused by inflation. This equals changes from X to Y period is *real* changes in value, and not a result of general inflation. An argument against is the *real* value of Y period do not compare as well with the market value for the same period when adjusted (Netland, 2016). Economic agents usually act on nominal prices, not real prices. As we are also analysing a short period of time, we decided not adjusting values for inflation.

3.10 Panel data set used in models

We ended up using a short and wide balanced panel data set. After focusing on quarterly time periods between 2016-2019 the data contains of 87 cross sectional units (regions) over 16 time periods equalling 1392 observations for 12 variables.

Chapter 4

4 Panel data regressions and procedure

This is a theory review of the estimators used in our thesis. We shortly mention estimators not included in the final analysis but tested and rejected preliminary. The model specification is also presented as well as statistical software used.

4.1 Panel data regression

Most of the theory has been obtained from the book *Principle of Econometrics* written by Hill et al. (2018, pp. 634-663). A panel data consists of cross-sectional units (i = 1,..,N individuals) observed over time (t=1, …,T). The dependent variable y_{it} will be dependent on both observed and unobserved omitted factors. The intercept variable $x_{1it} = 1$, observable variables (x_{Kit}) that varies across time and individuals. Time-invariant variables (w_{Mt}) where data on M factors do not change over time. Several types of unobserved effects can be identified:

- 1. unobserved and/or unmeasurable time-invariant variables (u_{Si}) where the combined effect represent unobserved heterogeneity.

- 2. Random errors (e_{it}) that varies across individual and time.

- 3. Unobserved time specific errors (m_t)

Presented below is an example of a simple panel data regression:

$$y_{it} = \beta_1 + \beta_2 x_{2it} + \alpha_1 w_{1i} + (u_i + e_{it}) \ (1)$$

The regression function then becomes:

$$E\left[y_{it} | x_{2i1}, x_{2i2}, x_{2it}, w_{li}, u_i\right] = \beta_1 + \beta_2 x_{2it} + a_1 w_{li} + u_i \ (2)$$

This function explains that when controlled for x_{2it} in all time periods and individual factors, the effect on the expected outcome comes from the current contemporaneous value of x_{2it}. The model conditions on the time-invariant error is u_i. The unobserved heterogeneity then gets taken into account in a new exogeneity assumption. As a result, the expected value of the idiosyncratic error is zero.

4.1.1 Pooled estimation with panel data

The simplest method to estimate a panel data set is to use an ordinary least square model (OLS). The data for individuals is pooled together and individual differences are not included. In OLS we assume homoskedasticity and no correlation. As a result, this was not a good fit for the main analysis. When estimating Airbnb district and region effects we used OLS models.

4.1.2 Within group estimator

The fixed effects within estimator model is used when assuming model parameters are fixed or non-random. Consider the simple regression model from equation (1).

Where:

$$E\left[x_{it}\alpha_i\right] \neq 0 \ (3)$$

$$E\left[x_{it}e_{it}\right] = 0 \ (4)$$

In term of deviations from group means we get the transformed regression:

$$y_{it} - \bar{y}_i = \beta_2(x_{2it} - \bar{x}_{2i}) + (e_{it} - \bar{e}_i) \ (5)$$

That leads to the within-transformed model:

$$\tilde{y}_{it} = \beta_2\tilde{x}_{2it} + \tilde{e}_{it} \ (6)$$

The OLS estimator of β_2 using (6) is called the within estimator. The estimator is consistent if $\tilde{e}_{it}$ has zero mean and is uncorrelated with $\tilde{x}_{2it}$ and $\tilde{x}_{2it}$ takes more than two values. The within group estimator is used in our models.

4.1.3 The first difference estimator

The first difference estimator is an alternative subtraction strategy. We subtract the previous observation to reveal changes in the data. This results in the transformed equation:

$$(y_{it} - y_{it-1}) = \beta_2(x_{2it} - x_{2it-1}) + (e_{it} - e_{it-1})\ (7)$$

Here the intercept, β_1, has been subtracted out as well as α_1, w_1 and u_i. For this reason, estimate α_1 cannot be estimated using this approach. The terms are subtracted out because they are time invariant. Further we get this equation:

$$\Delta y_i = \beta_2 \Delta x_{it} + \Delta e_i\ (8)$$

The OLS estimator β_2 in (8) is called the first-difference estimator. The estimator is consistent if Δe_i have zero mean and is uncorrelated with Δx_{it}, and Δx_{it} takes more than two values. The estimator is used to eliminate unobserved heterogeneity. We use this estimator in our models to compensate for correlation between quarters.

4.1.4 The between estimator

The between estimator takes the individual effects model averages out the time component using group means. The estimator uses the cross-sectional information and discards the time variation resulting in not fitting our data. The estimator is only consistent if α_i are random effects (StackExchange, s.a.). We tested and rejected the models.

4.1.5 The Random effects estimator

The random effects estimator is used when unobserved heterogeneity terms is not correlated with any of the explanatory variables. An essential part of this model is that time-invariant variables are not eliminated. When testing random effects models the results were similar to our fixed effects models. We decided excluding this model since we do not have time-invariant variables.

4.2   Model specifications

We estimated multiple models for the analysis. The within and first difference estimators are used as a consequence of not having time-invariant data. We also conducted a Hausman test supporting to reject the random effects model in favour of the within estimator. We then found first order autocorrelation in our data. Because the observations in our data for one period strongly indicates were the observations will be next period, we decided using a first difference estimator. This means we estimate changes in the data and not observations itself. When testing for multicollinearity we found high correlation between household income and GDP resulting in removing GDP from our models. Further we expect the within estimator to generalize better than the first difference estimator when T > 2. All models follow the same structure with dependent variables being the only difference. We tested lagging different variables preliminary with varying results. From the specifications presented below we differentiates the variable where regions are equal with $|$. The heterogeneity term u_i captures the unobservable personal preferences and e_{it} equals random error.

4.2.1   log(House price index) model 1:

$$ln(HousePriceIndex_{it}) = \beta_1 + \beta_2 ln(AirbnbRevenuePerUnit_{it}) +$$
$$\beta_3 ln(HouseholdIncome_{it}) + \beta_4 ln(UnemploymentInPercent_{it}) +$$
$$\beta_5 ln(HousesForSale_{it}) + \beta_6 InitiatedHousesWithRent_{it} +$$
$$\beta_7 CompletedHousesWithRent_{it} | \beta_8 ln(AverageHouseLendRate_{it}) + u_i + e_{it}$$

4.2.2   log(Square meter price detached houses) model 2:

$$ln(SquareMeterPriceHouses_{it}) = \beta_1 + \beta_2 ln(AirbnbRevenuePerUnit_{it}) +$$
$$\beta_3 ln(HouseholdIncome_{it}) + \beta_4 ln(UnemploymentInPercent_{it}) +$$
$$\beta_5 ln(HousesForSale_{it}) + \beta_6 InitiatedHousesWithRent_{it} +$$
$$\beta_7 CompletedHousesWithRent_{it} | \beta_8 ln(AverageHouseLendRate_{it}) + u_i + e_{it}$$

4.2.3   log(Square meter price apartments) model 3:

$ln(SquareMeterPriceApartments_{it}) = \beta_1 + \beta_2 ln(AirbnbRevenuePerUnit_{it}) +$
$\beta_3 ln(HouseholdIncome_{it}) + \beta_4 ln(UnemploymentInPercent_{it}) +$
$\beta_5 ln(HousesForSale_{it}) + \beta_6 InitiatedHousesWithRent_{it} +$
$\beta_7 CompletedHousesWithRent_{it}|\beta_8 ln(AverageHouseLendRate_{it}) + u_i + e_{it}$

4.2.4   log(Square meter price small houses) model 4:

$ln(SquareMeterPriceSmallHouses_{it}) = \beta_1 + \beta_2 ln(AirbnbRevenuePerUnit_{it}) +$
$\beta_3 ln(HouseholdIncome_{it}) + \beta_4 ln(UnemploymentInPercent_{it}) +$
$\beta_5 ln(HousesForSale_{it}) + \beta_6 InitiatedHousesWithRent_{it} +$
$\beta_7 CompletedHousesWithRent_{it}|\beta_8 ln(AverageHouseLendRate_{it}) + u_i + e_{it}$

The model specifications for Airbnb follows the same structure of explanatory variables. Both districts and region effects were conducted using the house price index as dependent variable. For overall district effects an additional dummy variable was created and included in the OLS model. The region effects were estimated using OLS models for each region alone.

4.3   Packages used for estimations

Figures were constructed using the *ggplot2* package in R (Wickham et al., 2020). All tables are illustrated with *knitr* and *stargazer* (Hlavac, 2018; Xie, 2018). Excel files was imported using the *readxl* package. *Tidyverse,stringr*, *dplyr* and *lubridate* were used for general R tasks (Spinu, Grolemund, & Wickham, 2018; Wickham, 2017, 2018; Wickham & Bryan, 2018; Wickham, François, Henry, & Müller, 2018). *Zoo* was used for data manipulation(Zeileis et al., 2018). *Data.table* and *xtable* were utilized for table tasks(Dahl, Scott, Roosen, Magnusson, & Swinton, 2018; Dowle & Srinivasan, 2018). *Panelr*, *lmtest* and *plm* are behind the estimations and *extrafont* gave figures correct font (Chang, 2014; Croissant et al., 2019; Hothorn, Zeileis, Farebrothe, & Cummins, 2018; Long, 2020). The Latex packages *setspace*, *dcolumn*, *graphic* and *tocbasic* ensured the correct visual guidelines for the final appearance (Carlisle, 2011, 2017, 2020; Kohm, 2020).

Chapter 5

5   Analysis

5.1   Autocorrelation

We conducted two tests for serial correlation testing AR(1) for the house price index model within estimator. This includes the Breusch - Godfrey / Wooldridge test and Bhargava / Franzini / Narendranathan Durbin-Watson test:

Table 3: Test for serial correlation in panel models

statistics	p-value	test	alternative
575	0.001	B-G/W	serial correlation in idiosyncratic errors
0.405	No p-values given	D-W	serial correlation in idiosyncratic error

The results show that the data is first order correlated. This means that data in quarter one is correlated with the data in quarter two, but not quarter three and onwards. We conclude going forward including the first difference estimator.

5.2 Summary statistics

Table 4: Summary statistics 2016-2019 (N = 87, T = 16)

Variable	Mean	Standard Deviation	Min	Max
House price index	245.57	24.88	184.60	326.00
Square meter price detached houses	16025.38	14581.45	0.00	62689.00
Square meter price apartments	21933.09	21075.97	0.00	80163.00
Square meter price small houses	13938.71	16047.26	0.00	64308.00
Airbnb revenue per availabe unit	17715.14	9939.75	0.00	61341.48
Median household income	530155.67	50842.41	440000.00	675475.00
Unemployment in percent	2.46	0.79	0.97	5.20
Residences for sale	279.37	596.72	23.00	6452.00
Initiated detached houses with rent	3.90	4.77	0.00	34.00
Completed detached houses with rent	4.17	4.69	0.00	27.00
Average house lend rate	3.53	0.12	3.42	3.71

- The house price index is measured as a numeric index.

- Unemployment and average house lend rate are measured in percent.

- Median household income, Airbnb revenue and square meter prices is measured in NOK.

- Residences for sale and completed / initiated constructed detached houses is measured in units.

5.3 What do we expect from the variables

From theory we expect a change in the independent variables to affect real estate price variables as follows:

When people rent out trough Airbnb their income increases. This should lead to increased house prices. If household income increase, real estate prices should increase. The prices should increase as a cause of people having more money to spend on property. If unemployment increases, prices should decrease because fewer people could afford residences.From demand and supply theory we would expect the prices to decrease if the number of residences for sale increased. We would expect the decrease in prices to be bigger short-term than long-term. However, as population grows, we will expect the prices to stay relatively constant. This is because deficits of real estate compared to population due to the time it takes constructing residences. If initiated/completed constructing detached houses with rent possibility increase, we would expect the house price to stay constant as a cause of long construction times giving other variables a chance to shift. However, the oldest houses and apartments might be more outdated during this time. This would set higher quality standards in general that may affect the price.If house lend rate increase it becomes more expensive to lend money to buy real estate. Therefore, the prices should decrease.

5.4 Regression results

We will now present the findings from the within and first difference estimators. Standard error is in parentheses.

5.4.1 House price index

Table 5: Regression results house price index

	Dependent variable:	
	log(House price index)	
	Within	First difference
	(1)	(2)
log(Airbnb revenue per unit)	0.004***	0.002***
	(0.001)	(0.0004)
log(Household income)	1.430***	0.736***
	(0.051)	(0.052)
log(Unemployment in percent)	0.057***	0.036***
	(0.008)	(0.008)
log(Residences for sale)	0.028***	0.028***
	(0.004)	(0.002)
Initiated houses with rent	0.001***	0.0001
	(0.0002)	(0.0001)
Completed houses with rent	0.001*	0.00002
	(0.0003)	(0.0001)
log(Average house lend rate)	−0.225***	−0.040*
	(0.032)	(0.024)
Constant		0.004***
		(0.001)
Observations	1,297	1,210
R^2	0.610	0.401
Adjusted R^2	0.579	0.398
F Statistic	268.000*** (df = 7; 1203)	115.000*** (df = 7; 1202)
Note:		*p<0.1; **p<0.05; ***p<0.01

From the table we see that the F-statistic are significant in both models. Therefore, we proceed to look at the variables. In the within model all variables are significant at 1% significance level except from initiated houses on a 10% level. The R-square value for this model are 0.61 and represents the proportion of the variance explained by the explanatory variables.

The first difference model has a R-square value of 0.401. There are four variables that are significant at a significance level of 1%. These are Airbnb, income, unemployment and residences for sale. Average house lend rate is significant on a 10% level.

Within estimator:

A 1% increase in Airbnb revenue per unit leads to an increase by 0.004% in house prices. Even if this number is small it is consistent with our expectations. The index price looks at all types of houses and Norway as a whole. Therefore, it could be expected that Airbnb would affect prices less than for residences suited for rental.

Furthermore a two tail t-test on the significance of this estimate yields a t-statistic of 5.992 and a p-value of 0. This means that the null hypothesis stating the coefficient of Airbnb equals zero is rejected.

From the table above we see household income having the greatest effect on house prices with a 1.43% increase. This result is as predicted as previous research states that income is the variable that affects house prices most.

When unemployment increases with 1% the price increase with 0.057%. This result is not as predicted from the theory presented. We would expect the opposite to happen. On the other hand, the value is relatively close to zero. If you are unemployed today this could possibly lead to a change in the future and not influence right away.

A 1% increase in residences for sale leads to an increase by 0.028% in house prices. As mentioned, we predicted that this factor would lead to a decrease in house prices especially on short-term. Further, we also predicted this factor to stay relatively constant with these model specifications.

A 1-unit increase in both initiated houses and completed houses leads to an increase by 0.001% in house prices. We would expect this value to be close to zero.

First difference estimator:

When Airbnb increases with 1% the price increases with 0.002%. A 1% increase in income leads to an increase by 0.736% in house prices. There is an increase in prices by 0.036% when unemployment goes up with 1% and 0.028% increase when residences for sale increases by 1%.

5.4.2 Square meter price detached houses

Table 6: Regression results square meter price detached houses

	Dependent variable:	
	log(Square meter price detached houses)	
	Within	First difference
	(1)	(2)
log(Airbnb revenue per unit)	0.005***	0.004**
	(0.001)	(0.002)
log(Household income)	1.300***	0.782***
	(0.103)	(0.255)
log(Unemployment in percent)	0.063***	0.017
	(0.016)	(0.033)
log(Residences for sale)	0.056***	0.060***
	(0.008)	(0.008)
Initiated houses with rent	0.001	0.0001
	(0.0005)	(0.0005)
Completed houses with rent	0.0003	0.00002
	(0.001)	(0.0005)
log(Average house lend rate)	−0.158**	0.051
	(0.066)	(0.112)
Constant		0.002
		(0.003)
Observations	791	736
R^2	0.390	0.136
Adjusted R^2	0.339	0.127
F Statistic	66.500*** (df = 7; 729)	16.300*** (df = 7; 728)

Note: *p<0.1; **p<0.05; ***p<0.01

The F-statistic are significant in both models. In the within model the significant variables are Airbnb, household income, unemployment, residences for sale and average house lend rate. All with a significance level of 0.01 with exception of house lend rate. For the first difference model Airbnb is significant with a p-value of 0.05. Household income and residences for sale are significant with a p-value of 0.01. The R squared is 0.39 for the within model and 0.136 for the first difference estimator.

Within estimator:

A 1% increase in Airbnb revenue leads to an increase by 0.005% in the square meter price for detached houses. As predicted a 1% increase in household income increase prices. The rise is in this instance 1.3%. There is an increase by 0.063% in the price when unemployment increases by 1%. This is not as predicted. However, the value is close to zero. A 1% increase in residences for sale leads to an increase by 0.056% in house prices. This is a relatively small change as predicted. Average house lend rate decrease price with 0.158% when increasing with 1%.

First difference estimator:

Airbnb increases prices with 0.004% when increasing with 1%. A 1% increase in household income leads to an increase by 0.782% in square meter prices which is as we predicted. When residences for sale increase with 1%, we would expect the value to be close to zero or negative. The change leads to an increase by 0.06%.

5.4.3 Square meter price apartments

Table 7: Regression results square meter price apartments

	Dependent variable:	
	log(Square meter price apartments)	
	Within	First difference
	(1)	(2)
log(Airbnb revenue per unit)	0.001	0.001
	(0.002)	(0.003)
log(Household income)	1.910***	1.050***
	(0.158)	(0.382)
log(Unemployment in percent)	0.082***	0.067
	(0.024)	(0.050)
log(Residences for sale)	0.023*	0.024**
	(0.012)	(0.011)
Initiated houses with rent	0.002***	0.002***
	(0.001)	(0.001)
Completed houses with rent	−0.0001	−0.00000
	(0.001)	(0.001)
log(Average house lend rate)	−0.274***	−0.227
	(0.102)	(0.169)
Constant		0.005
		(0.004)
Observations	731	676
R^2	0.286	0.039
Adjusted R^2	0.221	0.029
F Statistic	38.300*** (df = 7; 669)	3.870*** (df = 7; 668)

Note:	*p<0.1; **p<0.05; ***p<0.01

We procced to look at the variables in the model since the F-statistic are significant for both models. In the within model household income, unemployment, initiated houses and average house lend rate has a significance level of 1%. Residences for sale has a 10% level of significance. The first difference model has three variables that are significant. Household income and initiated houses have a significance level of 1%, while with a significant level of 5% we find residences for sale. The R-squared values in the within model is 0.286 and in the first difference model it yielded 0.039.

Within estimator:

The square meter price for apartments increase with 1.91% when household income increases by 1%. A 1% increase in unemployment leads to an increase of 0.082% in prices which is not as expected. An increase of 1% in residences for sale leads to an increase of 0.023% in square meter price. As with the index price model a 1-unit change in initiated houses leads to an increase in the price. Specifically, an increase by 0.002%. When average house lend rate increase with 1% the price decreases with 0.274%.

First difference estimator:

We get an increase by 1.05% in the prices when there is a 1% increase in household income. A 1% change in residences for sale leads to an increase by 0.024% in the prices. A 1-unit increase in initiated houses cause a rise of 0.002%.

5.4.4 Square meter price small houses

Table 8: Regression results square meter price small houses

	Dependent variable:	
	log(Square meter price small houses)	
	Within	First difference
	(1)	(2)
log(Airbnb revenue per unit)	0.003	0.002
	(0.004)	(0.006)
log(Household income)	1.840***	1.560**
	(0.240)	(0.621)
log(Unemployment in percent)	0.148***	0.091
	(0.036)	(0.082)
log(Residences for sale)	0.052***	0.050**
	(0.018)	(0.020)
Initiated houses with rent	0.0004	0.0001
	(0.001)	(0.001)
Completed houses with rent	0.001	0.0005
	(0.001)	(0.001)
log(Average house lend rate)	−0.234	−0.060
	(0.152)	(0.269)
Constant		−0.0005
		(0.007)
Observations	616	563
R^2	0.166	0.038
Adjusted R^2	0.078	0.026
F Statistic	15.900*** (df = 7; 556)	3.170*** (df = 7; 555)
Note:		*$p<0.1$; **$p<0.05$; ***$p<0.01$

Like in the other models the F-statistics is significant for both models. The within model have three variables all significant with a p-value < 0.01. These variables are household income, unemployment and residences for sale. In the first difference model only household income and residences for sale are significant. The significance level equals p-value < 0.05. The R-squared for the within model is 0.166 and 0.038 for the first difference estimator.

Within estimator:

A 1% increase in household income leads to an increase by 1.84% in the square meter prices for small houses. Likewise, a 1% increase in unemployment leads to an increase by 0.148% in the prices. This is not expected. When the number of residences for sale increase by 1% the price increases with 0.052%.

First difference estimator:

When household income increases with 1% the square meter price of small houses increases with 1.56%. Residences for sale shifts the price upwards with 0.05% when increased by 1%.

5.5 Airbnb

5.5.1 Test for equal region level effects

We suspect that the region level effects are not equal for the different regions. This means that income can have a different effect in Oslo than in Bergen.

To test $H_0 : \beta_{1,1} = \beta_{1,2} = ... = \beta_{1,9}$ against the alternative that not all of the intercepts are equal, we use the F-test for testing a set of linear restrictions. The calculated F-value = 117.529, and the 5% critical F-value is; F(0.95,86, 1203), F = 1.276. The associated p-value is 0. We therefor reject H_0 and conclude that the region level effects are not all zero. In conclusion; the null hypothesis that there are no individual differences among municipalities are rejected. We will now explore some of the different region effects regarding Airbnb.

5.5.2 District effects

After concluding that different regions have different levels of effects it is natural to take a closer look at the different Airbnb estimates. When starting the process of the thesis we had a hypothesis that the effect of Airbnb in the districts were greater than in the cities. To test this hypothesis, we created a dummy variable indicating district specific or not. Remember, district regions are merged data and not individual municipality data. After adding the dummy variable, we estimated the following model:

$$ln(HousePriceIndex_{it}) = \beta_1 + \beta_2 Districts_{it} + \beta_3 ln(AirbnbRevenuePerUnit_{it}) +$$
$$\beta_4 ln(Districts_{it} * AirbnbRevenuePerUnit_{it}) + \beta_5 ln(HouseholdIncome_{it}) +$$
$$\beta_6 UnemploymentInPercent_{it} + \beta_7 ln(HousesForSale_{it}) +$$
$$\beta_8 InitiatedHousesWithRent_{it} +$$
$$\beta_9 CompletedHousesWithRent_{it} | \beta_{10} ln(AverageHouseLendRate_{it}) + u_i + e_{it}$$

The results were as followed:

Table 9: District effects Airbnb

	Dependent variable:
	log(House price index)
Districts	−0.103**
	(0.045)
log(Airbnb revenue per unit)	0.005***
	(0.002)
log(Districts * Airbnb revenue per unit)	0.006
	(0.005)
log(Household income)	0.287***
	(0.028)
log(Unemployment in percent)	−0.096***
	(0.008)
log(Residences for sale)	0.030***
	(0.003)
Initiated houses with rent	0.00002
	(0.001)
Completed houses with rent	0.0004
	(0.001)
log(Average house lend rate)	0.131*
	(0.076)
Constant	1.450***
	(0.372)
Observations	1,297
R^2	0.293
Adjusted R^2	0.288
Residual Std. Error	0.086 (df = 1287)
F Statistic	59.300*** (df = 9; 1287)
Note:	*p<0.1; **p<0.05; ***p<0.01

Looking at the *Districts* variable we see that it gets a coefficient result of -0.103 with a standard deviation of 0.045. This value is significant on a 0.05 level of significance. The parameter indicates that effect of Airbnb is greater in the cities than in the districts. In this case the hypothesis was rejected.

5.5.3 Region effect density

We continue exploring the importance of Airbnb regarding the house price index in the respective regions. The figure displays a density graph visualizing the distribution of the estimates Airbnb has for the 87 regions analysed between 2016-2019. The graph shows where the estimates are concentrated, and the line is plotted using the Kernel smoother. The majority of the regions have coefficient results higher than zero. We see a short tail for negative estimates and a long tail for positive. This means that Airbnb revenue in most regions increases house prices in the respective regions.
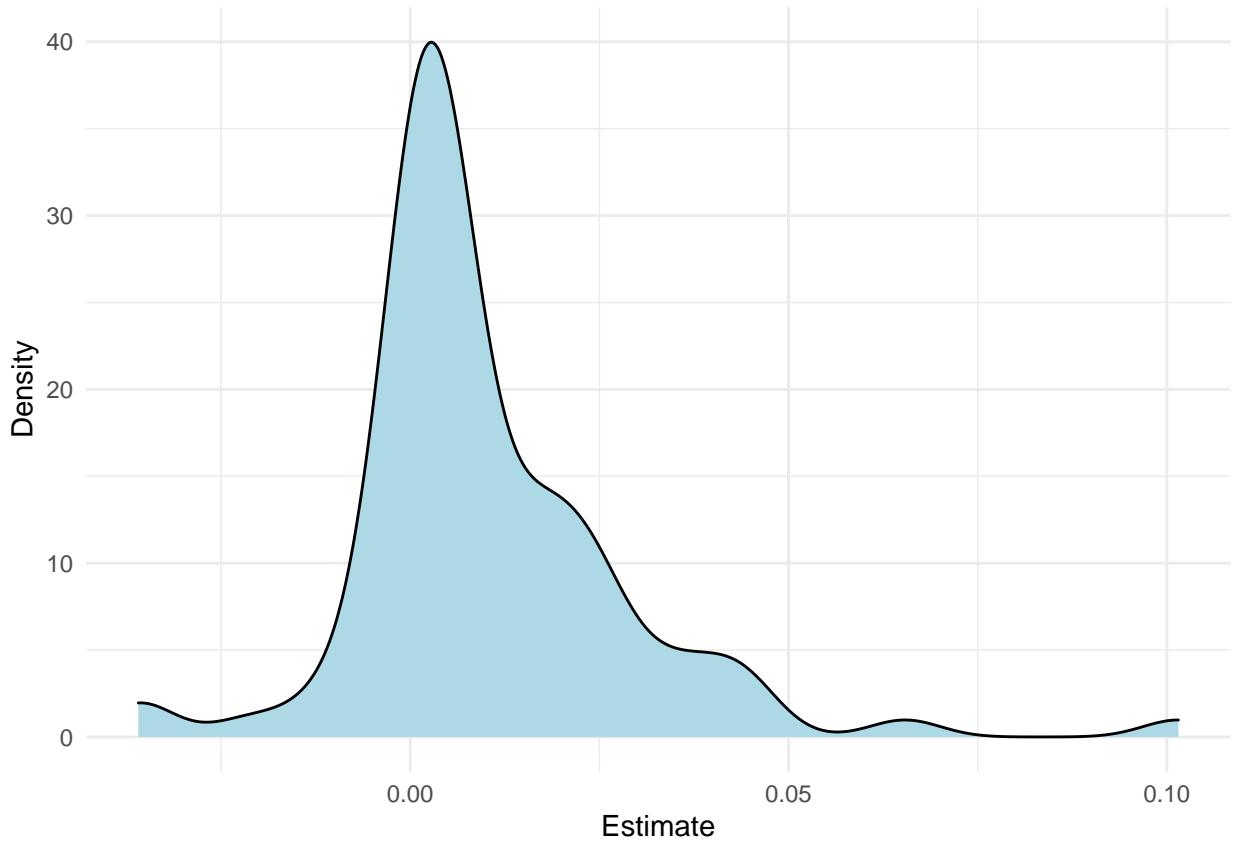
Figure 16: Log(Airbnb revenue pr unit) density all regions

5.5.4 Region effects estimates

We estimated 87 linear regression models (OLS) for each of the 87 regions in order to plot the graph above and do the calculations below. The regions are sorted from top to bottom showing where Airbnb is having the highest positive impact on real estate prices. The associated standard error, t-value and p-value are also displayed showing the significance of the estimates on different levels.

Table 10: Region effects Airbnb

Region	Variable	Estimate	Std.error	T.statistic	P.value
Drammen	log(AIRrevprUn)	0.102	0.031	3.327	0.010
Rælingen	log(AIRrevprUn)	0.065	0.013	5.123	0.001
Gjøvik	log(AIRrevprUn)	0.046	0.025	1.850	0.102
Frogn	log(AIRrevprUn)	0.044	0.021	2.091	0.070
Nittedal	log(AIRrevprUn)	0.042	0.039	1.090	0.307
Lillehammer	log(AIRrevprUn)	0.042	0.008	5.224	0.001
Hamar	log(AIRrevprUn)	0.036	0.019	1.859	0.100
Asker	log(AIRrevprUn)	0.035	0.027	1.305	0.228
Distriktene i Buskerud	log(AIRrevprUn)	0.035	0.025	1.401	0.199
Ringerike	log(AIRrevprUn)	0.029	0.016	1.779	0.113
Distriktene i Oppland	log(AIRrevprUn)	0.028	0.012	2.276	0.052
Bodø	log(AIRrevprUn)	0.026	0.007	3.948	0.004
Vestby	log(AIRrevprUn)	0.025	0.010	2.457	0.039
Distriktene i Sogn og Fjordane	log(AIRrevprUn)	0.025	0.011	2.286	0.052
Nesodden	log(AIRrevprUn)	0.023	0.021	1.114	0.298
Oslo	log(AIRrevprUn)	0.023	0.042	0.548	0.599
Eidsvoll	log(AIRrevprUn)	0.023	0.010	2.378	0.045
Distriktene i Hedmark	log(AIRrevprUn)	0.022	0.008	2.676	0.028
Sandefjord	log(AIRrevprUn)	0.020	0.004	5.247	0.001
Distriktene i Østfold	log(AIRrevprUn)	0.019	0.004	4.429	0.002
Bærum	log(AIRrevprUn)	0.018	0.039	0.473	0.649
Tønsberg	log(AIRrevprUn)	0.018	0.004	4.676	0.002

Region	Variable	Estimate	Std.error	T.statistic	P.value
Trondheim	log(AIRrevprUn)	0.018	0.010	1.853	0.101
Os og Fusa	log(AIRrevprUn)	0.017	0.007	2.453	0.040
Halden	log(AIRrevprUn)	0.016	0.004	4.105	0.003
Skien	log(AIRrevprUn)	0.015	0.003	5.790	0.000
Haugesund og Karmøy	log(AIRrevprUn)	0.015	0.007	2.292	0.051
Distriktene i Troms	log(AIRrevprUn)	0.014	0.013	1.100	0.303
Øygarden, Fjell og Sund	log(AIRrevprUn)	0.012	0.005	2.168	0.062
Bergen	log(AIRrevprUn)	0.011	0.011	1.045	0.327
Ski og Oppegård	log(AIRrevprUn)	0.010	0.028	0.352	0.734
Distriktene i Vestfold	log(AIRrevprUn)	0.010	0.020	0.497	0.633
Moss	log(AIRrevprUn)	0.008	0.003	2.550	0.034
Distriktene i Hordaland	log(AIRrevprUn)	0.008	0.005	1.513	0.169
Fredrikstad	log(AIRrevprUn)	0.008	0.002	3.720	0.006
Flora og Vågsøy	log(AIRrevprUn)	0.007	0.004	2.039	0.076
Kristiansand	log(AIRrevprUn)	0.007	0.003	2.339	0.048
Distriktene i Finnmark	log(AIRrevprUn)	0.007	0.011	0.609	0.560
Kongsvinger	log(AIRrevprUn)	0.007	0.002	2.826	0.022
Førde, Jølster, Gaular og Naustdal	log(AIRrevprUn)	0.006	0.003	2.077	0.071
Sarpsborg	log(AIRrevprUn)	0.006	0.002	3.845	0.005
Horten	log(AIRrevprUn)	0.006	0.001	4.260	0.003
Ringsaker	log(AIRrevprUn)	0.006	0.002	3.590	0.007
Færder	log(AIRrevprUn)	0.006	0.002	2.703	0.027
Alta	log(AIRrevprUn)	0.005	0.002	2.027	0.077
Arendal	log(AIRrevprUn)	0.005	0.003	1.518	0.167
Ålesund	log(AIRrevprUn)	0.005	0.005	0.940	0.375
Notodden	log(AIRrevprUn)	0.004	0.003	1.526	0.166
Porsgrunn	log(AIRrevprUn)	0.004	0.001	2.957	0.018
Distriktene i Nordland	log(AIRrevprUn)	0.003	0.011	0.296	0.775
Grimstad og Lillesand	log(AIRrevprUn)	0.003	0.002	2.010	0.079
Larvik	log(AIRrevprUn)	0.003	0.001	2.023	0.074

Region	Variable	Estimate	Std.error	T.statistic	P.value
Lier	log(AIRrevprUn)	0.003	0.003	0.966	0.362
Vefsn	log(AIRrevprUn)	0.003	0.007	0.368	0.722
Orkdal, Melhus og Malvik	log(AIRrevprUn)	0.002	0.002	1.158	0.280
Narvik	log(AIRrevprUn)	0.002	0.009	0.254	0.806
Stjørdal	log(AIRrevprUn)	0.002	0.002	1.322	0.223
Distriktene i Trøndelag	log(AIRrevprUn)	0.002	0.002	1.028	0.334
Harstad	log(AIRrevprUn)	0.002	0.001	1.517	0.168
Askøy	log(AIRrevprUn)	0.002	0.004	0.482	0.643
Distriktene i Telemark	log(AIRrevprUn)	0.002	0.013	0.133	0.898
Bamble	log(AIRrevprUn)	0.001	0.001	1.075	0.314
Hammerfest	log(AIRrevprUn)	0.001	0.026	0.056	0.956
Lindesnes, Mandal, Marnardal og Søgne	log(AIRrevprUn)	0.001	0.001	1.104	0.302
Stange	log(AIRrevprUn)	0.001	0.003	0.332	0.748
Steinkjer	log(AIRrevprUn)	0.001	0.001	0.633	0.544
Distriktene i Rogaland	log(AIRrevprUn)	0.001	0.001	0.564	0.589
Distriktene i Aust-Agder	log(AIRrevprUn)	0.000	0.003	0.138	0.893
Askim	log(AIRrevprUn)	0.000	0.003	0.124	0.904
Hå, Klepp og Time	log(AIRrevprUn)	0.000	0.001	0.134	0.897
Holmestrand	log(AIRrevprUn)	0.000	0.004	-0.050	0.961
Sandnes	log(AIRrevprUn)	-0.001	0.002	-0.387	0.709
Rana	log(AIRrevprUn)	-0.001	0.002	-0.300	0.772
Kristiansund	log(AIRrevprUn)	-0.001	0.001	-0.636	0.542
Distriktene i Vest-Agder	log(AIRrevprUn)	-0.001	0.002	-0.415	0.689
Molde	log(AIRrevprUn)	-0.002	0.004	-0.585	0.574
Stavanger	log(AIRrevprUn)	-0.002	0.004	-0.594	0.569
Distriktene i Møre og Romsdal	log(AIRrevprUn)	-0.003	0.003	-0.969	0.361
Elverum	log(AIRrevprUn)	-0.003	0.024	-0.119	0.908
Sola og Randaberg	log(AIRrevprUn)	-0.004	0.005	-0.763	0.467
Kongsberg	log(AIRrevprUn)	-0.004	0.004	-1.030	0.333
Ullensaker	log(AIRrevprUn)	-0.008	0.039	-0.212	0.838

Region	Variable	Estimate	Std.error	T.statistic	P.value
Kragerø	log(AIRrevprUn)	-0.009	0.012	-0.765	0.467
Tromsø	log(AIRrevprUn)	-0.014	0.022	-0.623	0.551
Ås	log(AIRrevprUn)	-0.021	0.042	-0.514	0.621
Lørenskog og Skedsmo	log(AIRrevprUn)	-0.036	0.048	-0.743	0.479
Distriktene i Akershus	log(AIRrevprUn)	-0.036	0.026	-1.399	0.199

According to the regressions 16 of the different regions have house prices that are negatively affected by Airbnb. None of these estimates are significant on any classic significance level. 32 regions were significant on $p < 0.1$ and had a positive impact. Drammen has the highest impact with a 0.102% increase in price when Airbnb revenue increases by 1%. The region had a total income of 25 000 NOK for every available unit in quarter four 2019. Rælingen and Gjøvik has the second and third highest impact. These values were also significant.

Chapter 6

6   Discussion and conclusion

Previous to discussing the variables effect on changes in prices related to real estate it is important to mention some of the drawbacks with estimating and trusting the models blindly. The most important factor we want to point out is human behaviour. Humans are not rational beings. We believe this is extremely important to consider when analysing the results of any models estimating effects on variables affected by possible irrational decisions. For the prices to be acknowledged, a purchase must be made. This means that people would have to make rational or irrational choices when purchasing the properties the analysis is based upon. When presented with the same real estate some people would like it and others would not. This all comes down to personal preferences which is not explained by the models. In the worst of times some people would still buy property even if it does not make sense for most. This can take away some of the effects we expect to see from the different variables which is important to consider.

It is also important to remember that models are only a tool to get *closer* to knowing the *true* relationship between variables. It is not a blueprint regarding how it actually is. When measuring relationships between variables affected by human behaviour, we cannot do more than trusting the model assumptions to be true and then discussing and reviewing the findings. It is also important to be aware that the size of the R-square values for the models is not directly equivalent with which model is the *better* one. When estimating data related to human behaviour like in this thesis, we cannot expect very high R-square values. This is because we experience a high amount of unexplained variability when trying to estimate models like this (Frost, s.a.). When constructing the models, it is always challenging deciding which variables to include or not. We could easily exclude many of the variables to manipulate Airbnb to have more effect than it ended up having. Likewise, we could remove unemployment from all models ending up with all variables *behaving as expected*. The problem with excluding the variable is simply that we could no longer discuss the variable or review its estimates. The beauty of econometrics modelling is being able to gain more knowledge. Specifically, regarding topics that in reality is impossible to measure exactly why everything happens in the way it does. We will now discuss the variables from our findings.

Our expectations to Airbnb was that it should have a positive effect regarding house prices. Due to the theory of income, these expectations retained when using Airbnb as an income variable. *Nordlandsforskning* did not find effect of Airbnb on neither house prices nor rent (Vinogradov & Strømmen-Bakhtiar, 2017). Horn and Merante (2017) found that an increase in Airbnb by one standard deviation lead to an increase in asking rent by 0.4%. If we combine this finding with the user-cost theory, we will further expect Airbnb to increase house prices. With the lack of research on the topic it is difficult to predict to which extent Airbnb would affect. From our analysis we see that Airbnb in fact have a significant impact even if it yields small estimates. Airbnb are significant in the within and first difference estimator for both *house price index model* and *square meter price detached houses model*. The estimate of 0.005 results in Airbnb explaining 25 000 NOK of a house worth five million. According to Capia, the total income from Airbnb rentals was 2.1 billion in 2018 and 2.7 billion for 2019. This equals an increase of 28%. The effect on square meter price for detached houses would then be 14% for our 0.005 estimate. With a square meter price of 40 000 NOK, this would equal an increase of 5600 NOK. Regardless of the size of the estimates, the *real* impact could be huge. Considering the size of the real estate market and the rapid growth of Airbnb, we consider these findings to be highly interesting.

For the square meter price regarding *small house* and *apartments*, Airbnb revenue were not significantly greater than zero. We would expect these types of residences not equivalently suited for rental to behave differently. However, it is possible to rent out rooms in small houses or apartments when living there as well. For most, this will not be the case. This could affect the models accordingly. If people renting out through Airbnb have registered their income, some of the income should then be found in the median household income variable. This correlation can also affect the models and make them behave unexpected.

For our district regions estimates there is only four significant affecters of price. One of these districts were Østfold were increased the price with 0.019%. Considerably higher than the average estimate. This was also the case for multiple non-district regions. Drammen with the highest impact of Airbnb regarding the index model had an average income of 25 000 NOK per unit in quarter four 2019. In other words, a noticeable extra income for the households. The districts of Nordland which includes Lofoten, had an average income of 54 000 NOK per unit in quarter three 2019. This is interesting considering the high index values the region has in figure 4. However,

the estimate was not significant when testing different region effect levels. With different data there could be other results for locations similar to Lofoten regarding tourism.

From theory the income variable is one of the fundamental factors that causes changes in house prices. This is consistent with our findings as we see that income are significant in all our models. The variable has also the highest effect in all models. From our results a 1% increase in income we see an increase in house prices between 0.736% and 1.91%. According to Sutton (2002) a 1% increase in income leads to a rise of 1- 4% after three years. This rise will according to Jacobsen and Naug (2004) be 0.5% the first year and 1.75% long-term. We see that our findings relative to changes fits well according to previous research. From figure 4 showing the house price index, and figure 9 showing household income we see that prices and income follows the same increasing trends. For example, when income decreased in Trondheim over the last years the increase in prices stopped accordingly. To conclude: Higher income equals higher purchasing power resulting in rising prices to *neutralise* the effect of people in general having more money to spend.

Unemployment are significant in all the within estimator models. In the first difference estimator it is only significant in the index model. All values are positive and relatively small, but we expected these estimates to be negative. According to theory an increase of unemployment with 1 percentage point will lead to a decrease in house prices with around 10% long-term (Andreassen, 2009; Jacobsen & Naug, 2004). The effect is slow, and the price change is only 7% after two years (Andreassen, 2009). The reason for this slow effect can be because it takes time before households perceives that unemployment has risen to a higher level (Jacobsen & Naug, 2004). Therefore, the lagged effect of unemployment could be a reason for why the estimates turned out the way they did. From figure 10 we can see that unemployment has been decreasing for most regions in the time period we are analysing. However, it has also been increasing in some regions. As the models are using the average effect of all regions, some regions can pull the estimates in the *wrong* directions. Resulting in unexpected estimates.

The findings for residences for sale are significant in all models. As we mentioned in the results, we expected this variable to be constant or negative. The values for the variable are relatively close to zero. From figure 11 we see a market repeating the same trend. Oslo has a considerably higher number of residences for sale compared to the rest. This affects the other regions drastically

when used in the same models. Like for unemployment, this could lead to unexpected results.

The variable initiated detached houses are significant in the within estimator for the house price index and square meter price apartment model. It is also significant in the first difference estimator for apartments. Since the significant values are relatively small, and that the variable is not significant in the rest of the models. We can speculate that it is consistent with our expectations. We expected it to be quite constant because of the time it takes to complete the residences. While in the meantime, other variables such as households can increase. Consequently, there would still be a building deficit in the market. Another factor could be that from figure 12 we see little variation in initiated houses in the time period analysed. Consequently, the housing market is not following population growth.

Completed detached houses are only significant in the within estimator for the house price index model. According to theory we would expect this variable to be relatively constant or negative. It was not significant in the rest of the models which tells us the estimates is zero and does not affect prices. Because of the small value in the significant model, we can speculate if this is caused by a more long-term effect. We suspected the unexpected estimates for residences for sale and initiated / completed houses to be a result of multicollinearity between them. However, when testing for correlation the results only yielded 0-0.13. The variables are however autocorrelated which can affect the estimates.

Average house lend rate is significant and negative in all within estimators with exception of square meter price small houses. The variable is also significant in the first difference estimator for the index model. According to theory we would expect the variable to be significant in all models and estimators. This is because it becomes more expensive to manage loans when the rate goes up. This should result in a high decrease in prices according to theory. A 1% decrease in the real short-term interest rate cause an increase in house prices over four quarters with 0.5-1.5 percentage points according to Sutton (2002). Jacobsen and Naug (2004) found that the change in rate lead to a decrease of 3.25% long-term and 2.25% short-term. In addition, Norges Bank found that a 1% decrease of the rate causes an 3% increase in house prices almost immediately (Andreassen, 2009). With numbers from the within estimator we find estimates between -0.158 and -0.274. These finding were not as high as anticipated. We can expect our models to have

shortcomings when estimating the results of average house lend rate. This is most likely caused by close to zero variation in the variables data during the period we are analysing. From the smallest to biggest value only 0.4 percent points is differentiating the values since this was annual data. This means that the variable only is estimated with four unique values throughout. This could be the reason the estimates are not significant in all models.

For further research it should be considered getting monthly real estate data for all municipalities in a country. In Norway it is uncommon to find data for district municipalities through open data sources but there are organizations sitting on this type of data that could be used for research purposes. If we had this type of data, it would be easier to modulate good models showing the different effects for different regions. We still believe it is important to know more about how short-term rentals are affecting the housing market in municipalities primarily known for tourism. When Airbnb now being forced publish their data it might create an opportunity to use the real data for further analysis, and not rely on secondary data. This analysis used the best data available at the time perspective of the thesis. One can discuss that some of the effects of the variables are better represented in the future than right away. Effect of unemployment is an example of such a variable. We have however tried to implement the lagged effect from different variables over different time periods in the preliminary stages of the analysis. Due to the relatively short time perspective of the models and variance across regions these types of dynamic models did not function well. The choice therefore fell on not lagging the effect of the different variables and estimating all variables effect in the same period. For further research, long-term effects should be implemented. Even if fixed effect estimators solve the endogeneity problem caused by the correlation between the explanatory variables and the unobservable individual characteristic it will not solve an endogeneity problem between explainable variables. We will possibly have an endogeneity problem in houses for sale, initiated houses and completed houses. A future hypothesis can be that Airbnb revenue is correlated with real estate prices. Generally, both real estate prices and Airbnb revenue are higher in populated areas. This indicates that variables indicating populated areas should be included in a model to isolate correlation. This was not particularly relevant in our case, because the district municipalities were added together. This resulted in high population being observed for regions originally consisting of few inhabitants. The dummy variable was therefore not sufficient.

6.1   Concluding words

In this thesis we have collected relevant data connected to Norwegian real estate prices and estimated different regression models trying to understand the dynamics. We utilize a balanced panel data set following 87 regions over 16 quarterly time periods between 2016-2019. We included seven explanatory variables when estimating the models. However, our prime focus has been modelling how Airbnb affects the real estate prices. This is something few have done previously for the Norwegian market. We used Airbnb as an income variable to emphasize the added income short-term rental provides for the households. The main hypothesis was that the real estate prices were significantly affected by Airbnb in Norway. Resulting in higher prices when income from Airbnb rises. An increase in Airbnb makes the real estate price rise according to both the within and first difference estimator for our fixed effects models. We expected to see estimates indicating rising prices for residences suited for rental. We found positive significant estimates for the *house price index* and *square meter price detached houses with rent possibility* models. These finding corresponded with our expectations. The sub hypothesis was that Airbnb are affecting significantly more for the districts than city municipalities. We assumed that high Airbnb activity is more important for real estate prices of small districts compared to cities. However, we were not able to statistically prove this were the case. The findings indicated Airbnb to be more important in city regions. The result was significant on a 5% significance level. However, we conclude that the data foundation for the districts were too weak. The thesis estimated the different region level effect statistically showing that the explanatory variables is affecting differently across regions. When estimating the different effects of Airbnb for the regions the estimates indicated that the real estate price in Drammen and Rælingen is hardest affected by Airbnb in Norway.

Household income has the highest effect on prices in all models. The second most important variable were house lend rate. The unexpected behaviour for some of the explanatory variables was most likely caused by the effects being long-term. The data has first order autocorrelation problems. No major multicollinearity issues were found after removing GDP from our models. For further research we would focus on collecting price data for district municipalities. We would also experiment with more complex models to the limit were not acquiring overfitting problems compromising the generalization of the models. It would also be interesting considering a *Bayesian* model approach to better modulate the difference in variance across regions. The thesis

concludes there is *statistical support* for the *idea* of Airbnb increasing real estate prices. This is exiting results as the Norwegian tourist market were *booming* before the ongoing Covid-19 situation, putting travellers all over the world to a stop.

List of references

Airbnb. (s.a.). About Us. Retrieved from https://news.airbnb.com/about-us/

Andreassen, H. M. (2009). Boligmarked og boligpriser. *Praktisk Økonomi & Finans, 25*(2), 3-11. Retrieved from https://www.idunn.no/pof/2009/02/art10

Baglo, C. (2018, March 10). Airbnb-utleiere kupper boligmarkedet. *Dagsavisen*. Retrieved from https://www.dagsavisen.no/reise

Carlisle, D. (2011). setspace - Set space between lines (Version 6.7a). Retrieved from https://ctan.org/tex-archive/macros/latex/contrib/setspace

Carlisle, D. (2017). graphicx - Enhanced support for graphics (Version 1.1a). Retrieved from https://ctan.org/tex-archive/macros/latex/required/graphics

Carlisle, D. (2020). dcolumn - Align on the decimal point of numbers in tabular columns (Version 1.06). Retrieved from https://www.ctan.org/tex-archive/macros/latex/required/tools

Chang, W. (2014). extrafont: Tools for using fonts (Version 0.17). Retrieved from https://github.com/wch/extrafont

Croissant, Y., Millo, G., & Tappe, K. (2019). Plm: Linear Models for Panel Data (Version 1.7-0). Retrieved from https://cran.r-project.org/package=plm

Dahl, D. B., Scott, D., Roosen, C., Magnusson, A., & Swinton, J. (2018). xtable: Export Tables to LaTeX or HTML (Version 1.8-3). Retrieved from http://xtable.r-forge.r-project.org/

Dette er Norge-redaksjonen. (2017, 2019, November 6). Hva er egentlig BNP. Retrieved from https://www.ssb.no/nasjonalregnskap-og-konjunkturer/artikler-og-publikasjoner/hva-er-egentlig-bnp

Dijk, B. v., Franses, P. H., Paap, R., & Dijk, D. v. (2009). Modelling regional house prices. *Applied Economics, 43*(17), 2097-2110. Retrieved from https://doi.org/10.1080/00036840903085089

Dowle, M., & Srinivasan, A. (2018). data.table: Extension of `data.frame` (Version 1.11.4). Retrieved from http://r-datatable.com

Dzamarija, M. T. (2017). Innvandrere og deres norskfødte barn -- gruppenes sammensetning. Retrieved from https://www.ssb.no/befolkning/artikler-og-publikasjoner/innvandrere-og-deres-norskfodte-barn-gruppenes-sammensetning

Eiendom Norge. (s.a.). Prisutvikling. Retrieved from https://eiendomnorge.no/boligprisstatistikk/statistikkbank/

EiendomsMegler1. (s.a.). Sunt boligmarked i nord. Retrieved from https://www.eiendomsmegler1.no/hjemtildeg/nord-norge/2018/februar/sunt-boligmarked-i-nord/

Frost, J. (s.a.). Five Reasons Why Your R-squared can be Too High. Retrieved from https://statisticsbyjim.com/regression/r-squared-too-high/

Grytten, O. (2009). Boligboble? *MAGMA,* (5). Retrieved from https://www.magma.no/boligboble

Guttentag, D. (2013). Airbnb: disruptive innovation and the rise of an informal tourism accommodation sector. *Current Issues in Tourismen, 18*(12), 1192-1217. doi:https://doi.org/10.1080/13683500.2013.827159

Hayes, A. (2019, June 25). Dutch Tulip Bulb Market Bubble Definition. Retrieved from https://www.investopedia.com/terms/d/dutch_tulip_bulb_market_bubble.asp

Hill, R. C., Griffiths, W. E., & Lim, G. C. (2018). *Principles of Econometrics* (5 ed.). United Kingdom: John Wiley & Sons.

Larsen, E. R., & Sommervoll, D. E. (2004). Hva bestemmer boligprisene?
    Samfunnsspeilet, 18(2), 10-17. Retrieved from
    https://www.ssb.no/a/samfunnsspeilet/utg/200402/ssp.pdf

Long, J. A. (2020). panelr: Regression Models and Utilities for Repeated
    Measures (Version 0.7.2). Retrieved from https://panelr.jacob-long.com

Muñoz, P., & Cohen, B. (2017). Mapping out the sharing economy: A
    configurational approach to sharing business modeling. *Technological
    Forecasting and Social Change, 125*, 21-37.
    doi:https://doi.org/10.1016/j.techfore.2017.03.035

Mæhlum, S., Pettersen, P. M., & Xu, H. (2018). *Boligbygging og
    husholdningsvekst* (12/2018). Retrieved from https://static.norges-
    bank.no/contentassets/81d086625b86453786dd5c5401b040df/staff_mem
    o_12_2018.pdf?v=01/22/2019123957&ft=.pdf

Mæland, M. (2019). *Boligpolitikk for alle*. Retrieved from
    https://www.regjeringen.no/no/aktuelt/boligpolitikk-for-alle/id2663311/

Nakajima, M. (2011). Understanding House-Price Dynamics. *Business Review
    (Federal Reserve Bank of Philadelphia), 2011*(Q2), 20-28. Retrieved from
    https://www.philadelphiafed.org/research-and-data/publications/business-
    review/2011

Netland, D. (2016). *Prisutvikling og regionale forskjeller i det norske
    boligmarkedet.* (Master thesis, University of Bergen). Retrieved from
    http://bora.uib.no/bitstream/handle/1956/12800/144763425.pdf?sequence
    =1&isAllowed=y

NOU 2002:2. (2002). *Boligmarkedene og
boligpolitikken*. Retrieved from
    https://www.regjeringen.no/no/dokumenter/nou-2002-2/id145338/

NOU 2011:15. (2011). *Rom for alle — En sosial boligpolitikk for framtiden*.
    Retrieved from https://www.regjeringen.no/no/dokumenter/nou-2011-
    15/id650426/

NOU 2017:4. (2017). *Delingsøkonomi - muligheter og utfordringer*. Retrieved
    from
    https://www.regjeringen.no/contentassets/1b21cafea73c4b45b63850bd83
    ba4fb4/no/pdfs/nou201720170004000dddpdfs.pdf

Quattrone, G., Proserpio, D., Quercia, D., Capra, L., & Musolesi, M. (2016).
    Who Benefits from the "Sharing" Economy of Airbnb? Paper presented at
    the WWW2016, Montréal, Canada.
    https://dl.acm.org/citation.cfm?id=2874815

Revold, K. M. (2019). Under halvparten av husholdninger med lav inntekt eier
    sin egen bolig. Retrieved from https://www.ssb.no/bygg-bolig-og-
    eiendom/artikler-og-publikasjoner/under-halvparten-av-husholdninger-
    med-lav-inntekt-eier-sin-egen-bolig

Røstadsand, J. I. (2020, April 30). Hvorfor har norske husholdninger lavest
    finansiell formue? Retrieved from https://www.ssb.no/nasjonalregnskap-

og-konjunkturer/artikler-og-publikasjoner/hvorfor-har-norske-husholdninger-lavest-finansiell-formue

Senneset, K., Andersen, K. A., & Lund, D. (2012). Boligmarked og boligpriser. *Samfunnsøkonomen, 26*(5), 24-28. Retrieved from https://www.samfunnsokonomene.no/magasin/samfunnsokonomen-nr-5-2012/

Skatteetaten. (s.a.-a). Skatteregler - utleie av del av egen bolig. Retrieved from https://www.skatteetaten.no/person/skatt/hjelp-til-riktig-skatt/bolig-og-eiendeler/bolig-eiendom-tomt/utleie/utleie-av-del-av-egen-bolig/skatteregler/

Skatteetaten. (s.a.-b). Skatteregler for korttidsutleie av bolig og fritidseiendom fra og med 2018. Retrieved from https://www.skatteetaten.no/person/skatt/hjelp-til-riktig-skatt/bolig-og-eiendeler/bolig-eiendom-tomt/utleie/korttidsutleie-av-bolig-og-fritidseiendom/skatteregler-2018/

Solheim, H. (2019). Er bolig dyrt eller billig? Retrieved from https://bankplassen.norges-bank.no/2019/08/13/er-bolig-dyrt-eller-billig/

Solset, J. R. (2019, July 29). Om gjesten raserer leiligheten din med vilje, gjelder ikke Airbnbs forsikring. Dette bør du vite før du bruker tjenesten. *Aftenposten*. Retrieved from https://www.aftenposten.no/

Spinu, V., Grolemund, G., & Wickham, H. (2018). lubridate: Make Dealing with Dates a Little Easier
 (Version 1.7.4). Retrieved from http://lubridate.tidyverse.org

StackExchange. (s.a.). The beween estimator in panel data. Retrieved from https://stats.stackexchange.com/questions/83462/the-between-estimator-in-panel-data

Statistisk sentralbyrå. (2019a, may 7, 2019). Boforhold, registerbasert. Retrieved from https://www.ssb.no/bygg-bolig-og-eiendom/statistikker/boforhold

Statistisk sentralbyrå. (2019b, June 25). Familier og husholdninger. Retrieved from https://www.ssb.no/familie

Statistisk sentralbyrå. (2020a). *05889: Byggeareal. Boliger og bruksareal til bolig, etter bygningstype (K) 2000K1 - 2020K1*. Retrieved from: https://www.ssb.no/statbank/table/05889

Statistisk sentralbyrå. (2020b). *05963: Selveierboliger. Gjennomsnittlig kvadratmeterpris og antall omsetninger (K) 2006K1 - 2020K1*. Retrieved from: https://www.ssb.no/statbank/table/05963

Statistisk sentralbyrå. (2020c). *08175: Bankenes utlåns- og innskuddsrenter. Totaltelling (prosent) 1980 - 2019*. Retrieved from: https://www.ssb.no/statbank/table/08175

Statistisk sentralbyrå. (2020d). *09842: BNP og andre hovedstørrelser (kr per innbygger) 1970 - 2019*. Retrieved from: https://www.ssb.no/statbank/table/09842

Statistisk sentralbyrå. (2020e). *10540: Registrerte arbeidsledige 15-74 år, etter alder (prosent) (K) 1999M01 - 2020M03*. Retrieved from: https://www.ssb.no/statbank/table/10540

Statistisk sentralbyrå. (2020f, April 23). Arbeidskraftundersøkinga, sesongjusterte tal. Retrieved from https://www.ssb.no/akumnd

Statistisk sentralbyrå. (2020g). *Inntekt etter skatt, etter husholdningstype. Antall husholdninger og median. Kommuner, 2005 - siste år*. Retrieved from: https://data.ssb.no/api/v0/dataset/49678/?lang=no&fbclid=IwAR3H4aZu WfVkbSe6qHlTTnWJx4qVPk9vDrWMEQp9c2sT6lAEdi537tRz3ms

Statistisk sentralbyrå. (s.a.-a). Befolkningens tilknytning til arbeidsmarkedet. 2019. Retrieved from https://www.ssb.no/arbeid-og-lonn/artikler-og-publikasjoner/_attachment/409255?_ts=16fcc3f5fd8

Statistisk sentralbyrå. (s.a.-b). Fakta om Befolkningen. Retrieved from https://www.ssb.no/befolkning/faktaside/befolkningen

Statistisk sentralbyrå. (s.a.-c). Fakta om Innvandring. Retrieved from https://www.ssb.no/innvandring-og-innvandrere/faktaside/innvandring

Statistisk sentralbyrå. (s.a.-d). Fakta om Norsk økonomi. Retrieved from https://www.ssb.no/nasjonalregnskap-og-konjunkturer/faktaside/norsk-okonomi

Statistisk sentralbyrå. (s.a.-e). Prisstigning for brukte boliger siste ti år. Retrieved from https://www.ssb.no/bygg-bolig-og-eiendom/faktaside/bolig#header

Sutton, G. D. (2002). Explaining vhanges in house prices. *BIS Quarterly Review,* (September), 46-55. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.370.5691&rep= rep1&type=pdf

Sørdal, K. (2010, March 30). Gjør det mest for gøy! *Dagbladet, Dinside*. Retrieved from https://www.dinside.no/r

Sørvoll, J. (2011). *Norsk boligpolitikk i forandring 1970–2010* (16/2011). Retrieved from http://biblioteket.husbanken.no/arkiv/dok/Komp/Norsk%20boligpolitikk %20i%20forandring.pdf

Takle, M. (2012). *Boligprisindeksen - Dokumentasjon av metode* (11). Retrieved from https://www.ssb.no/a/publikasjoner/pdf/notat_201210/notat_201210.pdf?f bclid=IwAR0vO0Mh_NMLimamaPvJPuyejJjpfaB4Op8fs8LObonGvaGq hadLMLxVcSg

Trygstad, A. N., & Juell, I. H. (2018, January 19). Elin hevder hun skvises ut av turister i Lofoten. *NRK, Nordland*. Retrieved from https://www.nrk.no/nordland/

Vale, P. H., Kutluay, M., & Yildiz, S. (2015). Er det boligboble i Norge? *MAGMA,* (3), 22-37.

Vinogradov, E., & Strømmen-Bakhtiar, A. (2017). *Effekt av Airbnb på det generelle utleiemarkedet og bomiljøet i Norge* (12/2017). Retrieved from http://www.nordlandsforskning.no/getfile.php/1320361-1512721073/Dokumenter/Rapporter/2017/NF-rapport%2012_2017.pdf

Wickham, H. (2017). tidyverse: Easily Install and Load the 'Tidyverse' (Version 1.2.1). Retrieved from http://tidyverse.tidyverse.org

Wickham, H. (2018). stringr: Simple, Consistent Wrappers for Common String Operations (Version 1.3.1). Retrieved from http://stringr.tidyverse.org

Wickham, H., & Bryan, J. (2018). readxl: Read Excel Files (Version 1.1.0). Retrieved from http://readxl.tidyverse.org,

Wickham, H., Chang, W., Henry, L., Pedersen, T. L., Takahashi, K., Wilke, C., . . . Dunnington, D. (2020). ggplot2: Create Elegant Data Visualisations Using the Grammar of Graphics. Retrieved from http://ggplot2.tidyverse.org

Wickham, H., François, R., Henry, L., & Müller, K. (2018). dplyr: A Grammar of Data Manipulation (Version 0.7.6). Retrieved from http://dplyr.tidyverse.org

Wig, K. (2019, November 25). Finanstilsynet: Boligkjøperes gjeld øker videre. *E24*. Retrieved from https://e24.no/

Xie, Y. (2018). knitr: A General-Purpose Package for Dynamic Report Generation in R (Version 1.20). Retrieved from https://yihui.name/knitr/

Ytreberg, R. (2019, July 17). Airbnb gir prisvekst og byggeboom. *Dagens Næringsliv, Eiendom*. Retrieved from https://www.dn.no/eiendom/

Zeileis, A., Grothendieck, G., & Ryan, J. A. (2018). zoo: S3 Infrastructure for Regular and Irregular Time Series (Z's (Version 1.8-4). Retrieved from http://zoo.R-Forge.R-project.org/

Øksnes, K. (2020). Nå må Airbnb og andre deleplattformer rapportere dine leieinntekter til Skatteetaten. Retrieved from https://www.pengenytt.no/na-ma-airbnb-og-andre-deleplattformer-rapportere-dine-leieinntekter-til-skatteetaten/

Appendix A

A Taxonomy and multicollinearity

A.1 Region Taxonomy

Region in thesis	Municipality
Arendal	ARENDAL
Grimstad og Lillesand	GRIMSTAD
Grimstad og Lillesand	LILLESAND
Haugesund og Karmøy	HAUGESUND
Haugesund og Karmøy	KARMØY
Hå, Klepp og Time	HÅ
Hå, Klepp og Time	KLEPP
Hå, Klepp og Time	TIME
Kristiansand	KRISTIANSAND
Lindesnes, Mandal, Marnardal og Søgne	LINDESNES
Lindesnes, Mandal, Marnardal og Søgne	MANDAL
Lindesnes, Mandal, Marnardal og Søgne	MARNARDAL
Lindesnes, Mandal, Marnardal og Søgne	SØGNE
Sandnes	SANDNES
Sola og Randaberg	SOLA
Sola og Randaberg	RANDABERG
Elverum	ELVERUM
Gjøvik	GJØVIK
Hamar	HAMAR
Kongsvinger	KONGSVINGER
Lillehammer	LILLEHAMMER
Ringsaker	RINGSAKER
Stange	STANGE
Kristiansund	KRISTIANSUND
Molde	MOLDE
Orkdal, Melhus og Malvik	ORKDAL
Orkdal, Melhus og Malvik	MELHUS
Orkdal, Melhus og Malvik	MALVIK
Steinkjer	STEINKJER
Stjørdal	STJØRDAL
Ålesund	ÅLESUND
Alta	ALTA
Bodø	BODØ
Hammerfest	HAMMERFEST
Harstad	HARSTAD
Narvik	NARVIK
Rana	RANA
Tromsø	TROMSØ
Vefsn	VEFSN
Bamble	BAMBLE
Færder	FÆRDER
Holmestrand	HOLMESTRAND
Horten	HORTEN
Kragerø	KRAGERØ
Larvik	LARVIK
Notodden	NOTODDEN
Porsgrunn	PORSGRUNN

Sandefjord	SANDEFJORD
Skien	SKIEN
Tønsberg	TØNSBERG
Askøy	ASKØY
Os og Fusa	OS (HORDALAND)
Os og Fusa	FUSA
Flora og Vågsøy	FLORA
Flora og Vågsøy	VÅGSØY
Førde, Jølster, Gaular og Naustdal	FØRDE
Førde, Jølster, Gaular og Naustdal	JØLSTER
Førde, Jølster, Gaular og Naustdal	GAULAR
Førde, Jølster, Gaular og Naustdal	NAUSTDAL
Øygarden, Fjell og Sund	ØYGARDEN
Øygarden, Fjell og Sund	FJELL
Øygarden, Fjell og Sund	SUND
Asker	ASKER
Askim	ASKIM
Bærum	BÆRUM
Drammen	DRAMMEN
Eidsvoll	EIDSVOLL
Fredrikstad	FREDRIKSTAD
Frogn	FROGN
Halden	HALDEN
Kongsberg	KONGSBERG
Lier	LIER
Lørenskog og Skedsmo	LØRENSKOG
Lørenskog og Skedsmo	SKEDSMO
Moss	MOSS
Nesodden	NESODDEN
Nittedal	NITTEDAL
Ski og Oppegård	SKI
Ski og Oppegård	OPPEGÅRD
Ringerike	RINGERIKE
Rælingen	RÆLINGEN
Sarpsborg	SARPSBORG
Ullensaker	ULLENSAKER
Vestby	VESTBY
Ås	ÅS
Oslo	OSLO
Trondheim	TRONDHEIM
Bergen	BERGEN
Stavanger	STAVANGER
Distriktene i Østfold	HVALER
Distriktene i Østfold	AREMARK
Distriktene i Østfold	MARKER
Distriktene i Østfold	RØMSKOG
Distriktene i Østfold	TRØGSTAD
Distriktene i Østfold	SPYDEBERG

Distriktene i Østfold	EIDSBERG
Distriktene i Østfold	SKIPTVET
Distriktene i Østfold	RAKKESTAD
Distriktene i Østfold	RÅDE
Distriktene i Østfold	RYGGE
Distriktene i Østfold	VÅLER (ØSTFOLD)
Distriktene i Østfold	HOBØL
Distriktene i Akershus	AURSKOG-HØLAND
Distriktene i Akershus	SØRUM
Distriktene i Akershus	FET
Distriktene i Akershus	ENEBAKK
Distriktene i Akershus	GJERDRUM
Distriktene i Akershus	NES (AKERSHUS)
Distriktene i Akershus	NANNESTAD
Distriktene i Akershus	HURDAL
Distriktene i Hedmark	LØTEN
Distriktene i Hedmark	NORD-ODAL
Distriktene i Hedmark	SØR-ODAL
Distriktene i Hedmark	EIDSKOG
Distriktene i Hedmark	GRUE
Distriktene i Hedmark	ÅSNES
Distriktene i Hedmark	VÅLER (HEDMARK)
Distriktene i Hedmark	TRYSIL
Distriktene i Hedmark	ÅMOT
Distriktene i Hedmark	STOR-ELVDAL
Distriktene i Hedmark	RENDALEN
Distriktene i Hedmark	ENGERDAL
Distriktene i Hedmark	TOLGA
Distriktene i Hedmark	TYNSET
Distriktene i Hedmark	ALVDAL
Distriktene i Hedmark	FOLLDAL
Distriktene i Hedmark	OS (HEDMARK)
Distriktene i Oppland	DOVRE
Distriktene i Oppland	LESJA
Distriktene i Oppland	SKJÅK
Distriktene i Oppland	LOM
Distriktene i Oppland	VÅGÅ
Distriktene i Oppland	NORD-FRON
Distriktene i Oppland	SEL
Distriktene i Oppland	SØR-FRON
Distriktene i Oppland	RINGEBU
Distriktene i Oppland	ØYER
Distriktene i Oppland	GAUSDAL
Distriktene i Oppland	ØSTRE TOTEN
Distriktene i Oppland	VESTRE TOTEN
Distriktene i Oppland	JEVNAKER
Distriktene i Oppland	LUNNER
Distriktene i Oppland	GRAN

Distriktene i Oppland	SØNDRE LAND
Distriktene i Oppland	NORDRE LAND
Distriktene i Oppland	SØR-AURDAL
Distriktene i Oppland	ETNEDAL
Distriktene i Oppland	NORD-AURDAL
Distriktene i Oppland	VESTRE SLIDRE
Distriktene i Oppland	ØYSTRE SLIDRE
Distriktene i Oppland	VANG
Distriktene i Buskerud	HOLE
Distriktene i Buskerud	FLÅ
Distriktene i Buskerud	NES (BUSKERUD)
Distriktene i Buskerud	GOL
Distriktene i Buskerud	HEMSEDAL
Distriktene i Buskerud	ÅL
Distriktene i Buskerud	HOL
Distriktene i Buskerud	SIGDAL
Distriktene i Buskerud	KRØDSHERAD
Distriktene i Buskerud	MODUM
Distriktene i Buskerud	ØVRE EIKER
Distriktene i Buskerud	NEDRE EIKER
Distriktene i Buskerud	RØYKEN
Distriktene i Buskerud	HURUM
Distriktene i Buskerud	FLESBERG
Distriktene i Buskerud	ROLLAG
Distriktene i Buskerud	NORE OG UVDAL
Distriktene i Vestfold	SVELVIK
Distriktene i Vestfold	SANDE (VESTFOLD)
Distriktene i Vestfold	RE
Distriktene i Telemark	SILJAN
Distriktene i Telemark	DRANGEDAL
Distriktene i Telemark	NOME
Distriktene i Telemark	BØ (TELEMARK)
Distriktene i Telemark	SAUHERAD
Distriktene i Telemark	TINN
Distriktene i Telemark	HJARTDAL
Distriktene i Telemark	SELJORD
Distriktene i Telemark	KVITESEID
Distriktene i Telemark	NISSEDAL
Distriktene i Telemark	FYRESDAL
Distriktene i Telemark	TOKKE
Distriktene i Telemark	VINJE
Distriktene i Aust-Agder	RISØR
Distriktene i Aust-Agder	GJERSTAD
Distriktene i Aust-Agder	VEGÅRSHEI
Distriktene i Aust-Agder	TVEDESTRAND
Distriktene i Aust-Agder	FROLAND
Distriktene i Aust-Agder	BIRKENES
Distriktene i Aust-Agder	ÅMLI

Distriktene i Aust-Agder	IVELAND
Distriktene i Aust-Agder	EVJE OG HORNNES
Distriktene i Aust-Agder	BYGLAND
Distriktene i Aust-Agder	VALLE
Distriktene i Aust-Agder	BYKLE
Distriktene i Vest-Agder	FARSUND
Distriktene i Vest-Agder	FLEKKEFJORD
Distriktene i Vest-Agder	VENNESLA
Distriktene i Vest-Agder	SONGDALEN
Distriktene i Vest-Agder	ÅSERAL
Distriktene i Vest-Agder	AUDNEDAL
Distriktene i Vest-Agder	LYNGDAL
Distriktene i Vest-Agder	HÆGEBOSTAD
Distriktene i Vest-Agder	KVINESDAL
Distriktene i Vest-Agder	SIRDAL
Distriktene i Rogaland	EIGERSUND
Distriktene i Rogaland	SOKNDAL
Distriktene i Rogaland	LUND
Distriktene i Rogaland	BJERKREIM
Distriktene i Rogaland	GJESDAL
Distriktene i Rogaland	FORSAND
Distriktene i Rogaland	STRAND
Distriktene i Rogaland	HJELMELAND
Distriktene i Rogaland	SULDAL
Distriktene i Rogaland	SAUDA
Distriktene i Rogaland	FINNØY
Distriktene i Rogaland	RENNESØY
Distriktene i Rogaland	KVITSØY
Distriktene i Rogaland	BOKN
Distriktene i Rogaland	TYSVÆR
Distriktene i Rogaland	UTSIRA
Distriktene i Rogaland	VINDAFJORD
Distriktene i Hordaland	ETNE
Distriktene i Hordaland	SVEIO
Distriktene i Hordaland	BØMLO
Distriktene i Hordaland	STORD
Distriktene i Hordaland	FITJAR
Distriktene i Hordaland	TYSNES
Distriktene i Hordaland	KVINNHERAD
Distriktene i Hordaland	JONDAL
Distriktene i Hordaland	ODDA
Distriktene i Hordaland	ULLENSVANG
Distriktene i Hordaland	EIDFJORD
Distriktene i Hordaland	ULVIK
Distriktene i Hordaland	GRANVIN
Distriktene i Hordaland	VOSS
Distriktene i Hordaland	KVAM
Distriktene i Hordaland	SAMNANGER

Distriktene i Hordaland	AUSTEVOLL
Distriktene i Hordaland	VAKSDAL
Distriktene i Hordaland	MODALEN
Distriktene i Hordaland	OSTERØY
Distriktene i Hordaland	MELAND
Distriktene i Hordaland	RADØY
Distriktene i Hordaland	LINDÅS
Distriktene i Hordaland	AUSTRHEIM
Distriktene i Hordaland	FEDJE
Distriktene i Hordaland	MASFJORDEN
Distriktene i Sogn og Fjordane	GULEN
Distriktene i Sogn og Fjordane	SOLUND
Distriktene i Sogn og Fjordane	HYLLESTAD
Distriktene i Sogn og Fjordane	HØYANGER
Distriktene i Sogn og Fjordane	VIK
Distriktene i Sogn og Fjordane	BALESTRAND
Distriktene i Sogn og Fjordane	LEIKANGER
Distriktene i Sogn og Fjordane	SOGNDAL
Distriktene i Sogn og Fjordane	AURLAND
Distriktene i Sogn og Fjordane	LÆRDAL
Distriktene i Sogn og Fjordane	ÅRDAL
Distriktene i Sogn og Fjordane	LUSTER
Distriktene i Sogn og Fjordane	ASKVOLL
Distriktene i Sogn og Fjordane	FJALER
Distriktene i Sogn og Fjordane	BREMANGER
Distriktene i Sogn og Fjordane	SELJE
Distriktene i Sogn og Fjordane	EID
Distriktene i Sogn og Fjordane	HORNINDAL
Distriktene i Sogn og Fjordane	GLOPPEN
Distriktene i Sogn og Fjordane	STRYN
Distriktene i Møre og Romsdal	VANYLVEN
Distriktene i Møre og Romsdal	SANDE (MØRE OG ROMSDAL)
Distriktene i Møre og Romsdal	HERØY (MØRE OG ROMSDAL)
Distriktene i Møre og Romsdal	ULSTEIN
Distriktene i Møre og Romsdal	HAREID
Distriktene i Møre og Romsdal	VOLDA
Distriktene i Møre og Romsdal	ØRSTA
Distriktene i Møre og Romsdal	ØRSKOG
Distriktene i Møre og Romsdal	NORDDAL
Distriktene i Møre og Romsdal	STRANDA
Distriktene i Møre og Romsdal	STORDAL
Distriktene i Møre og Romsdal	SYKKYLVEN
Distriktene i Møre og Romsdal	SKODJE
Distriktene i Møre og Romsdal	SULA
Distriktene i Møre og Romsdal	GISKE
Distriktene i Møre og Romsdal	HARAM
Distriktene i Møre og Romsdal	VESTNES
Distriktene i Møre og Romsdal	RAUMA

Distriktene i Møre og Romsdal	NESSET
Distriktene i Møre og Romsdal	MIDSUND
Distriktene i Møre og Romsdal	SANDØY
Distriktene i Møre og Romsdal	AUKRA
Distriktene i Møre og Romsdal	FRÆNA
Distriktene i Møre og Romsdal	EIDE
Distriktene i Møre og Romsdal	AVERØY
Distriktene i Møre og Romsdal	GJEMNES
Distriktene i Møre og Romsdal	TINGVOLL
Distriktene i Møre og Romsdal	SUNNDAL
Distriktene i Møre og Romsdal	SURNADAL
Distriktene i Møre og Romsdal	HALSA
Distriktene i Møre og Romsdal	SMØLA
Distriktene i Møre og Romsdal	AURE
Distriktene i Nordland	BINDAL
Distriktene i Nordland	SØMNA
Distriktene i Nordland	BRØNNØY
Distriktene i Nordland	VEGA
Distriktene i Nordland	VEVELSTAD
Distriktene i Nordland	HERØY (NORDLAND)
Distriktene i Nordland	ALSTAHAUG
Distriktene i Nordland	LEIRFJORD
Distriktene i Nordland	GRANE
Distriktene i Nordland	HATTFJELLDAL
Distriktene i Nordland	DØNNA
Distriktene i Nordland	NESNA
Distriktene i Nordland	HEMNES
Distriktene i Nordland	LURØY
Distriktene i Nordland	TRÆNA
Distriktene i Nordland	RØDØY
Distriktene i Nordland	MELØY
Distriktene i Nordland	GILDESKÅL
Distriktene i Nordland	BEIARN
Distriktene i Nordland	SALTDAL
Distriktene i Nordland	FAUSKE
Distriktene i Nordland	SØRFOLD
Distriktene i Nordland	STEIGEN
Distriktene i Nordland	HAMARØY
Distriktene i Nordland	TYSFJORD
Distriktene i Nordland	LØDINGEN
Distriktene i Nordland	TJELDSUND
Distriktene i Nordland	EVENES
Distriktene i Nordland	BALLANGEN
Distriktene i Nordland	RØST
Distriktene i Nordland	VÆRØY
Distriktene i Nordland	FLAKSTAD
Distriktene i Nordland	VESTVÅGØY
Distriktene i Nordland	VÅGAN

Distriktene i Nordland	HADSEL
Distriktene i Nordland	BØ (NORDLAND)
Distriktene i Nordland	ØKSNES
Distriktene i Nordland	SORTLAND
Distriktene i Nordland	ANDØY
Distriktene i Nordland	MOSKENES
Distriktene i Troms	KVÆFJORD
Distriktene i Troms	SKÅNLAND
Distriktene i Troms	IBESTAD
Distriktene i Troms	GRATANGEN
Distriktene i Troms	LAVANGEN
Distriktene i Troms	BARDU
Distriktene i Troms	SALANGEN
Distriktene i Troms	MÅLSELV
Distriktene i Troms	SØRREISA
Distriktene i Troms	DYRØY
Distriktene i Troms	TRANØY
Distriktene i Troms	TORSKEN
Distriktene i Troms	BERG
Distriktene i Troms	LENVIK
Distriktene i Troms	BALSFJORD
Distriktene i Troms	KARLSØY
Distriktene i Troms	LYNGEN
Distriktene i Troms	STORFJORD
Distriktene i Troms	GÁIVUOTNA KÅFJORD
Distriktene i Troms	SKJERVØY
Distriktene i Troms	NORDREISA
Distriktene i Troms	KVÆNANGEN
Distriktene i Finnmark	VARDØ
Distriktene i Finnmark	VADSØ
Distriktene i Finnmark	GUOVDAGEAIDNU KAUTOKEINO
Distriktene i Finnmark	LOPPA
Distriktene i Finnmark	HASVIK
Distriktene i Finnmark	KVALSUND
Distriktene i Finnmark	MÅSØY
Distriktene i Finnmark	NORDKAPP
Distriktene i Finnmark	PORSANGER PORSÁNGU PORSANKI
Distriktene i Finnmark	KARASJOHKA KARASJOK
Distriktene i Finnmark	LEBESBY
Distriktene i Finnmark	GAMVIK
Distriktene i Finnmark	BERLEVÅG
Distriktene i Finnmark	DEATNU TANA
Distriktene i Finnmark	UNJARGGA NESSEBY
Distriktene i Finnmark	BÅTSFJORD
Distriktene i Finnmark	SØR-VARANGER
Distriktene i Trøndelag	NAMSOS
Distriktene i Trøndelag	HEMNE
Distriktene i Trøndelag	SNILLFJORD

Distriktene i Trøndelag	HITRA
Distriktene i Trøndelag	FRØYA
Distriktene i Trøndelag	ØRLAND
Distriktene i Trøndelag	AGDENES
Distriktene i Trøndelag	BJUGN
Distriktene i Trøndelag	ÅFJORD
Distriktene i Trøndelag	ROAN
Distriktene i Trøndelag	OSEN
Distriktene i Trøndelag	OPPDAL
Distriktene i Trøndelag	RENNEBU
Distriktene i Trøndelag	MELDAL
Distriktene i Trøndelag	RØROS
Distriktene i Trøndelag	HOLTÅLEN
Distriktene i Trøndelag	MIDTRE GAULDAL
Distriktene i Trøndelag	SKAUN
Distriktene i Trøndelag	KLÆBU
Distriktene i Trøndelag	SELBU
Distriktene i Trøndelag	TYDAL
Distriktene i Trøndelag	MERÅKER
Distriktene i Trøndelag	FROSTA
Distriktene i Trøndelag	LEVANGER
Distriktene i Trøndelag	VERDAL
Distriktene i Trøndelag	VERRAN
Distriktene i Trøndelag	NAMDALSEID
Distriktene i Trøndelag	SNÅSA
Distriktene i Trøndelag	LIERNE
Distriktene i Trøndelag	RØYRVIK
Distriktene i Trøndelag	NAMSSKOGAN
Distriktene i Trøndelag	GRONG
Distriktene i Trøndelag	HØYLANDET
Distriktene i Trøndelag	OVERHALLA
Distriktene i Trøndelag	FOSNES
Distriktene i Trøndelag	FLATANGER
Distriktene i Trøndelag	VIKNA
Distriktene i Trøndelag	NÆRØY
Distriktene i Trøndelag	LEKA
Distriktene i Trøndelag	INDERØY
Distriktene i Trøndelag	INDRE FOSEN
Distriktene i Trøndelag	RINDAL

A.2 Multicollinearity with GDP
```
## The following auxiliary models are being estimated and returned in a list:
## `log(HouseHinc)` ~ `log(unemploymentPerc)` + `log(HousesForSale)` +
##     InitiatedProp2 + CompletedProp2 + `log(AveHouseLendRate)` +
##     `log(BNPinhabitant)`
## `log(unemploymentPerc)` ~ `log(HouseHinc)` + `log(HousesForSale)` +
##     InitiatedProp2 + CompletedProp2 + `log(AveHouseLendRate)` +
##     `log(BNPinhabitant)`
## `log(HousesForSale)` ~ `log(HouseHinc)` + `log(unemploymentPerc)` +
##     InitiatedProp2 + CompletedProp2 + `log(AveHouseLendRate)` +
##     `log(BNPinhabitant)`
## InitiatedProp2 ~ `log(HouseHinc)` + `log(unemploymentPerc)` +
##     `log(HousesForSale)` + CompletedProp2 + `log(AveHouseLendRate)` +
##     `log(BNPinhabitant)`
## CompletedProp2 ~ `log(HouseHinc)` + `log(unemploymentPerc)` +
##     `log(HousesForSale)` + InitiatedProp2 + `log(AveHouseLendRate)` +
##     `log(BNPinhabitant)`
## `log(AveHouseLendRate)` ~ `log(HouseHinc)` + `log(unemploymentPerc)` +
##     `log(HousesForSale)` + InitiatedProp2 + CompletedProp2 +
##     `log(BNPinhabitant)`
## `log(BNPinhabitant)` ~ `log(HouseHinc)` + `log(unemploymentPerc)` +
##     `log(HousesForSale)` + InitiatedProp2 + CompletedProp2 +
##     `log(AveHouseLendRate)`
##
## R_j Squares of auxiliary models
##       log(HouseHinc) log(unemploymentPerc)    log(HousesForSale)
##             0.9670                0.4988                0.0716
##       InitiatedProp2        CompletedProp2 log(AveHouseLendRate)
##             0.0636                0.0432                0.7922
##    log(BNPinhabitant)
##             0.9573
## The Corresponding VIF, 1/(1-R_j^2)
```

```
##      log(HouseHinc) log(unemploymentPerc)    log(HousesForSale)
##               30.35                  2.00                  1.08
##       InitiatedProp2       CompletedProp2 log(AveHouseLendRate)
##                1.07                  1.05                  4.81
##   log(BNPinhabitant)
##               23.40
## Bivariate Pearson Correlations for design matrix
##                       log(HouseHinc) log(unemploymentPerc)
## log(HouseHinc)                  1.00                 -0.67
## log(unemploymentPerc)          -0.67                  1.00
## log(HousesForSale)              0.20                 -0.07
## InitiatedProp2                 -0.20                  0.18
## CompletedProp2                 -0.14                  0.15
## log(AveHouseLendRate)           0.54                 -0.20
## log(BNPinhabitant)              0.92                 -0.69
##                       log(HousesForSale) InitiatedProp2 CompletedProp2
## log(HouseHinc)                      0.20          -0.20          -0.14
## log(unemploymentPerc)              -0.07           0.18           0.15
## log(HousesForSale)                  1.00           0.00           0.02
## InitiatedProp2                      0.00           1.00           0.13
## CompletedProp2                      0.02           0.13           1.00
## log(AveHouseLendRate)               0.07          -0.10          -0.11
## log(BNPinhabitant)                  0.22          -0.21          -0.13
##                       log(AveHouseLendRate) log(BNPinhabitant)
## log(HouseHinc)                         0.54               0.92
## log(unemploymentPerc)                 -0.20              -0.69
## log(HousesForSale)                     0.07               0.22
## InitiatedProp2                        -0.10              -0.21
## CompletedProp2                        -0.11              -0.13
## log(AveHouseLendRate)                  1.00               0.22
## log(BNPinhabitant)                     0.22               1.00
```

A.3 Multicollinearity without GDP

```
## The following auxiliary models are being estimated and returned in a list:
## `log(HouseHinc)` ~ `log(unemploymentPerc)` + `log(HousesForSale)` +
##     InitiatedProp2 + CompletedProp2 + `log(AveHouseLendRate)`
## `log(unemploymentPerc)` ~ `log(HouseHinc)` + `log(HousesForSale)` +
##     InitiatedProp2 + CompletedProp2 + `log(AveHouseLendRate)`
## `log(HousesForSale)` ~ `log(HouseHinc)` + `log(unemploymentPerc)` +
##     InitiatedProp2 + CompletedProp2 + `log(AveHouseLendRate)`
## InitiatedProp2 ~ `log(HouseHinc)` + `log(unemploymentPerc)` +
##     `log(HousesForSale)` + CompletedProp2 + `log(AveHouseLendRate)`
## CompletedProp2 ~ `log(HouseHinc)` + `log(unemploymentPerc)` +
##     `log(HousesForSale)` + InitiatedProp2 + `log(AveHouseLendRate)`
## `log(AveHouseLendRate)` ~ `log(HouseHinc)` + `log(unemploymentPerc)` +
##     `log(HousesForSale)` + InitiatedProp2 + CompletedProp2
##
## R_j Squares of auxiliary models
##        log(HouseHinc) log(unemploymentPerc)    log(HousesForSale)
##                0.6356                0.4892                0.0580
##        InitiatedProp2        CompletedProp2 log(AveHouseLendRate)
##                0.0541                0.0390                0.3393
## The Corresponding VIF, 1/(1-R_j^2)
##        log(HouseHinc) log(unemploymentPerc)    log(HousesForSale)
##                  2.74                  1.96                  1.06
##        InitiatedProp2        CompletedProp2 log(AveHouseLendRate)
##                  1.06                  1.04                  1.51
## Bivariate Pearson Correlations for design matrix
##                        log(HouseHinc) log(unemploymentPerc)
## log(HouseHinc)                   1.00                 -0.67
## log(unemploymentPerc)           -0.67                  1.00
## log(HousesForSale)               0.20                 -0.07
## InitiatedProp2                  -0.20                  0.18
## CompletedProp2                  -0.14                  0.15
```

```
## log(AveHouseLendRate)              0.54                -0.20
##                       log(HousesForSale) InitiatedProp2 CompletedProp2
## log(HouseHinc)                     0.20          -0.20          -0.14
## log(unemploymentPerc)            -0.07           0.18           0.15
## log(HousesForSale)                1.00           0.00           0.02
## InitiatedProp2                    0.00           1.00           0.13
## CompletedProp2                    0.02           0.13           1.00
## log(AveHouseLendRate)             0.07          -0.10          -0.11
##                       log(AveHouseLendRate)
## log(HouseHinc)                         0.54
## log(unemploymentPerc)                 -0.20
## log(HousesForSale)                     0.07
## InitiatedProp2                        -0.10
## CompletedProp2                        -0.11
## log(AveHouseLendRate)                  1.00
```

Appendix B

B R Code

B.1 Data collecting

```
# Data master
rm(list = ls())
library(readxl)
library(dplyr)
library(zoo)
library(knitr) # Markdown
library(tidyr)
library(scales)# Scaling
library(stringr)
library(rjstat)
library(data.table)
library(xtable)
library(gridExtra)

#####################################################################
################
#####################################################################
################
##################### Innhenting av data
############################
#####################################################################
################
#####################################################################
################

### Airbnb ###
con <- RMariaDB::dbConnect(RMariaDB::MariaDB(), groups = "███")

bing_tax <- read.csv("bing_tax_orjan.csv",
                    colClasses = "character", encoding = "UTF-8") %>%
  as_tibble() %>%
  #filter(nchar(Postnummer)>=4) %>%
  select(Postnummer, Kommunenummer, Kommunenavn) %>%
  mutate(Kommunenummer=ifelse(nchar(Kommunenummer) == 3, paste0(0, Kommunenummer), Kommunenummer))
%>%
  rename(postal_code = Postnummer,
         municipality_code = Kommunenummer,
         municipality = Kommunenavn)

# taxonomi kommuner før 2019
airbnb_taxonomy <- read_excel("kommuneinndeling_taxnomy.xlsx")

# henter data på rett kommuneinndeling
airbnb <- con %>% tbl(█████████████████████████) %>%
  filter(country=='Norge') %>%
  filter(airbnb_property_id!=-1) %>% # Added by Bjørn Ole as temp fix fot new homeaway data
  filter(active==1) %>%
  filter(keep_filter==1) %>%
  filter(date_start <= "2019-12-01") %>%
  select(date_start, postal_code,revenue_nok,reservation_rooms, available_rooms,reservation_days,
         available_days) %>%
  group_by(date_start) %>%
  #group_by(date_start, county) %>%
  #summarise(reservation_days = sum(reservation_days)) %>%
  collect() %>%
  #filter(county != 'Svalbard') %>%
  #rename("airbnb" = reservation_days) %>%
  #Fix postal_codes and make exception for Svalbard
  mutate(postal_code=ifelse(nchar(postal_code)==5, substr(postal_code, 2, 5), postal_code))%>%
  left_join(bing_tax) %>%
  filter(!is.na(municipality_code)) %>%
  group_by(date_start,municipality) %>%
  #summarise(revenue=sum(revenue_nok, na.rm = TRUE))%>%
  ungroup() %>%
  #arrange(date_start,municipality,revenue) %>%
  mutate(date_start = as.Date(date_start)) %>%
  left_join(airbnb_taxonomy)
#mutate(county_code = substr(municipality_code, 1,2)) %>%
#left_join(old_county_tax)
#airbnb[is.na(airbnb)] <- 0

#unique(AirData$municipality)


AirData <- airbnb %>%
  group_by(date_start,airbnbmun) %>%
  summarise(revenue=sum(revenue_nok, na.rm = TRUE),
            roomsBooked=sum(reservation_rooms, na.rm = TRUE),
            roomsAvailable=sum(available_rooms, na.rm = TRUE),
            RevenuePerUnit=mean(revenue_nok, na.rm = TRUE),
            ADR=sum(revenue_nok,na.rm = TRUE)/sum(reservation_days,na.rm = TRUE),
            RevPAU=sum(revenue_nok,na.rm = TRUE)/sum(available_days+reservation_days,na.rm = TRUE),
            availableUnits=n()) %>%
  mutate(availableUnits = as.numeric(availableUnits))

colnames(AirData) <- c("date_start","municipality","revenue","roomsBooked","roomsAvailable",
                       "RevenuePerUnit","ADR","RevPAU","availableUnits")


AirData <- AirData %>% filter(municipality != "Svalbard")
AirData[is.na(AirData)] <- 0

RMariaDB::dbDisconnect(con)


# Backup måte å gjøre det på
# This wont run without SQL key
# con <- RMariaDB::dbConnect(RMariaDB::MariaDB(), groups = "███")
# airbnb_mat <- tbl(con, "█████████████████████")
#
# land <- "Norge"
# region <- c("Tromsø")
#
# unitsData<-airbnb_mat %>%
#   filter(country==land)%>%
#   filter(municipality %in% region) %>% #admin_name1
#   filter(active==1)%>%
#   filter(keep_filter ==1) %>%
#   filter(date_start == "2019-12-01") %>%
#   filter(!is.na(listing_type) & !is.na(bedrooms)) %>%
#   filter(airbnb_property_id!=-1) %>% # homeaway filter
#   select(date_start, revenue_nok, reservation_rooms, available_rooms,reservation_days,
#          available_days, municipality) %>%
```

```
#   group_by(date_start) %>%
#   summarise(revenue=sum(revenue_nok, na.rm = TRUE),
#         roomsBooked=sum(reservation_rooms, na.rm = TRUE),
#         roomsAvailable=sum(available_rooms, na.rm = TRUE),
#         RevenuePerUnit=mean(revenue_nok, na.rm = TRUE),
#         ADR=sum(revenue_nok,na.rm = TRUE)/sum(reservation_days,na.rm = TRUE),
#         RevPAU=sum(revenue_nok,na.rm = TRUE)/sum(available_days+reservation_days,na.rm = TRUE),
#         availableUnits=n()))%>%
#   ungroup() %>%
#   mutate(municipality = "Grimstad og Lillesand") %>%
#   arrange(date_start,municipality,revenue,roomsBooked,roomsAvailable,
#         RevenuePerUnit,ADR,RevPAU,availableUnits) %>%
#   collect() %>%
#   mutate(date_start = as.Date(date_start)) %>%
#   mutate(availableUnits = as.numeric(availableUnits))
#
# unitsData
##### Denne funker faktisk ####


#####################################################################
################
######################### Price Index
#####################################
#####################################################################
################
Priceindex <- read_excel("Prisindeks_region_Q419.xlsx",
                         skip = 1)
Priceindex$`Quarter of Dato` <- gsub(" ", "", Priceindex$`Quarter of Dato`, fixed = TRUE)


#names(Priceindex[1]) <- paste('date_start')

# municipality names
PriceindexMun <- data.frame(t(Priceindex))
PriceindexMun <- setDT(PriceindexMun, keep.rownames = TRUE)[]
names(PriceindexMun)[1:1] <- paste("municipality")
PriceindexMun <- PriceindexMun[-1,]

# as transposed tibble
Priceindex <- as_tibble(t(Priceindex))
colnames(Priceindex) <- Priceindex[1,]
Priceindex <- Priceindex[-1,]
Priceindex <- Priceindex %>% mutate_if(is.character,as.numeric)

#cbind
Priceindex <- cbind(PriceindexMun$municipality,Priceindex)
names(Priceindex)[1:1] <- paste("municipality")

Priceindex <- Priceindex %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable


Priceindex <- Priceindex %>%
  mutate(municipality = case_when(municipality %in% c("Oslo: Alna","Oslo: Bjerke","Oslo: Frogner","Oslo: Gamle
Oslo",
                                  "Oslo: Grorud","Oslo: Grünerløkka","Oslo: Nordre Aker",
                                  "Oslo: Nordstrand","Oslo: Sagene","Oslo: St.Hanshaugen",
                                  "Oslo: Stovner","Oslo: Søndre Nordstrand","Oslo: Ullern",
                                  "Oslo: Vestre Aker","Oslo: Østensjø") ~ "Oslo",
                                  municipality %in% c("Trondheim: Sentrum","Trondheim: Sør",
                                  "Trondheim: Vest", "Trondheim: Øst") ~ "Trondheim",
                                  municipality %in% c("Bergen: Nord/Øst","Bergen: Sentrum",
                                  "Bergen: Sør","Bergen: Vest") ~ "Bergen",
                                  municipality %in% c("Stavanger: Nord","Stavanger: Sentrum",
                                  "Stavanger: Sør","Stavanger: Vest") ~ "Stavanger",
                                  municipality %in% c("Arendal") ~ "Arendal",
                                  municipality %in% c("Grimstad og Lillesand") ~ "Grimstad og Lillesand",
                                  municipality %in% c("Haugesund og Karmøy") ~ "Haugesund og Karmøy",
                                  municipality %in% c("Hå, Klepp og Time") ~ "Hå, Klepp og Time",
                                  municipality %in% c("Kristiansand") ~ "Kristiansand",
                                  municipality %in% c("Lindesnes, Mandal, Marnardal og Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
                                  municipality %in% c("Sandnes") ~ "Sandnes",
                                  municipality %in% c("Sola og Randaberg") ~ "Sola og Randaberg",
                                  municipality %in% c("Elverum") ~ "Elverum",
                                  municipality %in% c("Gjøvik") ~ "Gjøvik",
                                  municipality %in% c("Hamar") ~ "Hamar",
                                  municipality %in% c("Kongsvinger") ~ "Kongsvinger",
                                  municipality %in% c("Lillehammer") ~ "Lillehammer",
                                  municipality %in% c("Ringsaker") ~ "Ringsaker",
                                  municipality %in% c("Stange") ~ "Stange",
                                  municipality %in% c("Kristiansund") ~ "Kristiansund",
                                  municipality %in% c("Molde") ~ "Molde",
                                  municipality %in% c("Orkdal, Melhus og Malvik") ~ "Orkdal, Melhus og Malvik",
                                  municipality %in% c("Steinkjer") ~ "Steinkjer",
                                  municipality %in% c("Stjørdal") ~ "Stjørdal",
                                  municipality %in% c("Ålesund") ~ "Ålesund",
                                  municipality %in% c("Alta") ~ "Alta",
                                  municipality %in% c("Bodø") ~ "Bodø",
                                  municipality %in% c("Hammerfest") ~ "Hammerfest",
                                  municipality %in% c("Harstad") ~ "Harstad",
                                  municipality %in% c("Narvik") ~ "Narvik",
                                  municipality %in% c("Rana") ~ "Rana",
                                  municipality %in% c("Tromsø") ~ "Tromsø",
                                  municipality %in% c("Vefsn") ~ "Vefsn",
                                  municipality %in% c("Bamble") ~ "Bamble",
                                  municipality %in% c("Færder") ~ "Færder",
                                  municipality %in% c("Holmestrand") ~ "Holmestrand",
                                  municipality %in% c("Horten") ~ "Horten",
                                  municipality %in% c("Kragerø") ~ "Kragerø",
                                  municipality %in% c("Larvik") ~ "Larvik",
                                  municipality %in% c("Notodden") ~ "Notodden",
                                  municipality %in% c("Porsgrunn") ~ "Porsgrunn",
                                  municipality %in% c("Sandefjord") ~ "Sandefjord",
                                  municipality %in% c("Skien") ~ "Skien",
                                  municipality %in% c("Tønsberg") ~ "Tønsberg",
```

```r
                     municipality %in% c("Askøy") – "Askøy",
                     municipality %in% c("Bjørnafjorden") – "Os og Fusa",
                     municipality %in% c("Kinn") – "Flora og Vågsøy",
                     municipality %in% c("Sunnfjord") – "Førde, Jølster, Gaular og Naustdal",
                     municipality %in% c("Øygarden, Fjell og Sund") – "Øygarden, Fjell og Sund",
                     municipality %in% c("Asker") – "Asker",
                     municipality %in% c("Askim") – "Askim",
                     municipality %in% c("Bærum") – "Bærum",
                     municipality %in% c("Drammen") – "Drammen",
                     municipality %in% c("Eidsvoll") – "Eidsvoll",
                     municipality %in% c("Fredrikstad") – "Fredrikstad",
                     municipality %in% c("Frogn") – "Frogn",
                     municipality %in% c("Halden") – "Halden",
                     municipality %in% c("Kongsberg") – "Kongsberg",
                     municipality %in% c("Lier") – "Lier",
                     municipality %in% c("Lørenskog og Skedsmo") – "Lørenskog og Skedsmo",
                     municipality %in% c("Moss") – "Moss",
                     municipality %in% c("Nesodden") – "Nesodden",
                     municipality %in% c("Nittedal") – "Nittedal",
                     municipality %in% c("Nordre Follo") – "Ski og Oppegård",
                     municipality %in% c("Ringerike") – "Ringerike",
                     municipality %in% c("Rælingen") – "Rælingen",
                     municipality %in% c("Sarpsborg") – "Sarpsborg",
                     municipality %in% c("Ullensaker") – "Ullensaker",
                     municipality %in% c("Vestby") – "Vestby",
                     municipality %in% c("Ås") – "Ås",
                     municipality %in% c("Distriktene i Østfold") – "Distriktene i Østfold",
                     municipality %in% c("Distriktene i Akershus") – "Distriktene i Akershus",
                     municipality %in% c("Distriktene i Hedmark") – "Distriktene i Hedmark",
                     municipality %in% c("Distriktene i Oppland") – "Distriktene i Oppland",
                     municipality %in% c("Distriktene i Buskerud") – "Distriktene i Buskerud",
                     municipality %in% c("Distriktene i Vestfold") – "Distriktene i Vestfold",
                     municipality %in% c("Distriktene i Telemark") – "Distriktene i Telemark",
                     municipality %in% c("Distriktene i Aust-Agder") – "Distriktene i Aust-Agder",
                     municipality %in% c("Distriktene i Vest-Agder") – "Distriktene i Vest-Agder",
                     municipality %in% c("Distriktene i Rogaland") – "Distriktene i Rogaland",
                     municipality %in% c("Distriktene i Hordaland") – "Distriktene i Hordaland",
                     municipality %in% c("Distriktene i Sogn og Fjordane") – "Distriktene i Sogn og Fjordane",
                     municipality %in% c("Distriktene i Møre og Romsdal") – "Distriktene i Møre og Romsdal",
                     municipality %in% c("Distriktene i Nordland") – "Distriktene i Nordland",
                     municipality %in% c("Distriktene i Troms") – "Distriktene i Troms",
                     municipality %in% c("Distriktene i Finnmark") – "Distriktene i Finnmark",
                     municipality %in% c("Distriktene i Trøndelag") – "Distriktene i Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=mean(value))

colnames(Priceindex) <- c("variable","date_start","value")


###########################################################
################
######################### Sold region
####################################
###########################################################
################

Sold_region <- read_excel("Solgte_region_Q419.xlsx",
                          skip = 1)


Sold_region[is.na(Sold_region)] <- 0


Sold_region$`Quarter of Dato` <-  gsub(" ", "", Sold_region$`Quarter of Dato`, fixed = TRUE)

# municipality names
Sold_regionMun <- data.frame(t(Sold_region))
Sold_regionMun <- setDT(Sold_regionMun, keep.rownames = TRUE)[]
names(Sold_regionMun)[1:1] <- paste("municipality")
Sold_regionMun <- Sold_regionMun[-1,]

# as transposed tibble
Sold_region <- as_tibble(t(Sold_region))
colnames(Sold_region) <- Sold_region[1,]
Sold_region <- Sold_region[-1,]
Sold_region <- Sold_region %>% mutate_if(is.character,as.numeric)

#cbind
Sold_region <- cbind(Sold_regionMun$municipality,Sold_region)
names(Sold_region)[1:1] <- paste("municipality")

Sold_region <- Sold_region %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable

Sold_region <- Sold_region %>%
  mutate(municipality = case_when(municipality %in% c("Oslo: Alna","Oslo: Bjerke","Oslo: Frogner","Oslo: Gamle Oslo",
                               "Oslo: Grorud","Oslo: Grünerløkka","Oslo: Nordre Aker",
                               "Oslo: Nordstrand","Oslo: Sagene","Oslo: St.Hanshaugen",
                               "Oslo: Stovner","Oslo: Søndre Nordstrand","Oslo: Ullern",
                               "Oslo: Vestre Aker","Oslo: Østensjø") – "Oslo",
                     municipality %in% c("Trondheim: Sentrum","Trondheim: Sør",
                               "Trondheim: Vest", "Trondheim: Øst") – "Trondheim",
                     municipality %in% c("Bergen: Nord/Øst","Bergen: Sentrum",
                               "Bergen: Sør","Bergen: Vest") – "Bergen",
                     municipality %in% c("Stavanger: Nord","Stavanger: Sentrum",
                               "Stavanger: Sør","Stavanger: Vest") – "Stavanger",
                     municipality %in% c("Arendal") – "Arendal",
                     municipality %in% c("Grimstad og Lillesand") – "Grimstad og Lillesand",
                     municipality %in% c("Haugesund og Karmøy") – "Haugesund og Karmøy",
                     municipality %in% c("Hå, Klepp og Time") – "Hå, Klepp og Time",
                     municipality %in% c("Kristiansand") – "Kristiansand",
                     municipality %in% c("Lindesnes, Mandal, Marnardal og Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
                     municipality %in% c("Sandnes") – "Sandnes",
                     municipality %in% c("Sola og Randaberg") – "Sola og Randaberg",
                     municipality %in% c("Elverum") – "Elverum",
                     municipality %in% c("Gjøvik") – "Gjøvik",
                     municipality %in% c("Hamar") – "Hamar",
                     municipality %in% c("Kongsvinger") – "Kongsvinger",
                     municipality %in% c("Lillehammer") – "Lillehammer",
```

```r
                     municipality %in% c("Ringsaker") – "Ringsaker",
                     municipality %in% c("Stange") – "Stange",
                     municipality %in% c("Kristiansund") – "Kristiansund",
                     municipality %in% c("Molde") – "Molde",
                     municipality %in% c("Orkdal, Melhus og Malvik") – "Orkdal, Melhus og Malvik",
                     municipality %in% c("Steinkjer") – "Steinkjer",
                     municipality %in% c("Stjørdal") – "Stjørdal",
                     municipality %in% c("Ålesund") – "Ålesund",
                     municipality %in% c("Alta") – "Alta",
                     municipality %in% c("Bodø") – "Bodø",
                     municipality %in% c("Hammerfest") – "Hammerfest",
                     municipality %in% c("Harstad") – "Harstad",
                     municipality %in% c("Narvik") – "Narvik",
                     municipality %in% c("Rana") – "Rana",
                     municipality %in% c("Tromsø") – "Tromsø",
                     municipality %in% c("Vefsn") – "Vefsn",
                     municipality %in% c("Bamble") – "Bamble",
                     municipality %in% c("Færder") – "Færder",
                     municipality %in% c("Holmestrand") – "Holmestrand",
                     municipality %in% c("Horten") – "Horten",
                     municipality %in% c("Kragerø") – "Kragerø",
                     municipality %in% c("Larvik") – "Larvik",
                     municipality %in% c("Notodden") – "Notodden",
                     municipality %in% c("Porsgrunn") – "Porsgrunn",
                     municipality %in% c("Sandefjord") – "Sandefjord",
                     municipality %in% c("Skien") – "Skien",
                     municipality %in% c("Tønsberg") – "Tønsberg",
                     municipality %in% c("Askøy") – "Askøy",
                     municipality %in% c("Bjørnafjorden") – "Os og Fusa",
                     municipality %in% c("Kinn") – "Flora og Vågsøy",
                     municipality %in% c("Sunnfjord") – "Førde, Jølster, Gaular og Naustdal",
                     municipality %in% c("Øygarden, Fjell og Sund") – "Øygarden, Fjell og Sund",
                     municipality %in% c("Asker") – "Asker",
                     municipality %in% c("Askim") – "Askim",
                     municipality %in% c("Bærum") – "Bærum",
                     municipality %in% c("Drammen") – "Drammen",
                     municipality %in% c("Eidsvoll") – "Eidsvoll",
                     municipality %in% c("Fredrikstad") – "Fredrikstad",
                     municipality %in% c("Frogn") – "Frogn",
                     municipality %in% c("Halden") – "Halden",
                     municipality %in% c("Kongsberg") – "Kongsberg",
                     municipality %in% c("Lier") – "Lier",
                     municipality %in% c("Lørenskog og Skedsmo") – "Lørenskog og Skedsmo",
                     municipality %in% c("Moss") – "Moss",
                     municipality %in% c("Nesodden") – "Nesodden",
                     municipality %in% c("Nittedal") – "Nittedal",
                     municipality %in% c("Nordre Follo") – "Ski og Oppegård",
                     municipality %in% c("Ringerike") – "Ringerike",
                     municipality %in% c("Rælingen") – "Rælingen",
                     municipality %in% c("Sarpsborg") – "Sarpsborg",
                     municipality %in% c("Ullensaker") – "Ullensaker",
                     municipality %in% c("Vestby") – "Vestby",
                     municipality %in% c("Ås") – "Ås",
                     municipality %in% c("Distriktene i Østfold") – "Distriktene i Østfold",
                     municipality %in% c("Distriktene i Akershus") – "Distriktene i Akershus",
                     municipality %in% c("Distriktene i Hedmark") – "Distriktene i Hedmark",
                     municipality %in% c("Distriktene i Oppland") – "Distriktene i Oppland",
                     municipality %in% c("Distriktene i Buskerud") – "Distriktene i Buskerud",
                     municipality %in% c("Distriktene i Vestfold") – "Distriktene i Vestfold",
                     municipality %in% c("Distriktene i Telemark") – "Distriktene i Telemark",
                     municipality %in% c("Distriktene i Aust-Agder") – "Distriktene i Aust-Agder",
                     municipality %in% c("Distriktene i Vest-Agder") – "Distriktene i Vest-Agder",
                     municipality %in% c("Distriktene i Rogaland") – "Distriktene i Rogaland",
                     municipality %in% c("Distriktene i Hordaland") – "Distriktene i Hordaland",
                     municipality %in% c("Distriktene i Sogn og Fjordane") – "Distriktene i Sogn og Fjordane",
                     municipality %in% c("Distriktene i Møre og Romsdal") – "Distriktene i Møre og Romsdal",
                     municipality %in% c("Distriktene i Nordland") – "Distriktene i Nordland",
                     municipality %in% c("Distriktene i Troms") – "Distriktene i Troms",
                     municipality %in% c("Distriktene i Finnmark") – "Distriktene i Finnmark",
                     municipality %in% c("Distriktene i Trøndelag") – "Distriktene i Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

colnames(Sold_region) <- c("variable","date_start","value")


###########################################################
################
######################### Unsold region
####################################
###########################################################
################
UnSold_region <- read_excel("Usolgte_region_Q419.xlsx",
                            skip = 1)

UnSold_region[is.na(UnSold_region)] <- 0

UnSold_region$`Quarter of Dato` <-  gsub(" ", "", UnSold_region$`Quarter of Dato`, fixed = TRUE)

# municipality names
UnSold_regionMun <- data.frame(t(UnSold_region))
UnSold_regionMun <- setDT(UnSold_regionMun, keep.rownames = TRUE)[]
names(UnSold_regionMun)[1:1] <- paste("municipality")
UnSold_regionMun <- UnSold_regionMun[-1,]

# as transposed tibble
UnSold_region <- as_tibble(t(UnSold_region))
colnames(UnSold_region) <- UnSold_region[1,]
UnSold_region <- UnSold_region[-1,]

UnSold_region <- cbind(UnSold_regionMun$municipality,UnSold_region)
names(UnSold_region)[1:1] <- paste("municipality")

UnSold_region <- UnSold_region %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable


UnSold_region$value <- gsub("[[:space:]]", "", UnSold_region$value)
UnSold_region$value <- as.numeric(UnSold_region$value)


UnSold_region <- UnSold_region %>%
```

```r
  mutate(municipality = case_when(municipality %in% c("Oslo: Alna","Oslo: Bjerke","Oslo: Frogner","Oslo: Gamle
Oslo",
                                  "Oslo: Grorud","Oslo: Grünerløkka","Oslo: Nordre Aker",
                                  "Oslo: Nordstrand","Oslo: Sagene","Oslo: St.Hanshaugen",
                                  "Oslo: Stovner","Oslo: Søndre Nordstrand","Oslo: Ullern",
                                  "Oslo: Vestre Aker","Oslo: Østensjø") ~ "Oslo",
             municipality %in% c("Trondheim: Sentrum","Trondheim: Sør",
                                  "Trondheim: Vest", "Trondheim: Øst") ~ "Trondheim",
             municipality %in% c("Bergen: Nord/Øst","Bergen: Sentrum",
                                  "Bergen: Sør","Bergen: Vest") ~ "Bergen",
             municipality %in% c("Stavanger: Nord","Stavanger: Sentrum",
                                  "Stavanger: Sør","Stavanger: Vest") ~ "Stavanger",
             municipality %in% c("Arendal") ~ "Arendal",
             municipality %in% c("Grimstad og Lillesand") ~ "Grimstad og Lillesand",
             municipality %in% c("Haugesund og Karmøy") ~ "Haugesund og Karmøy",
             municipality %in% c("Hå, Klepp og Time") ~ "Hå, Klepp og Time",
             municipality %in% c("Kristiansand") ~ "Kristiansand",
             municipality %in% c("Lindesnes, Mandal, Marnardal og Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
             municipality %in% c("Sandnes") ~ "Sandnes",
             municipality %in% c("Sola og Randaberg") ~ "Sola og Randaberg",
             municipality %in% c("Elverum") ~ "Elverum",
             municipality %in% c("Gjøvik") ~ "Gjøvik",
             municipality %in% c("Hamar") ~ "Hamar",
             municipality %in% c("Kongsvinger") ~ "Kongsvinger",
             municipality %in% c("Lillehammer") ~ "Lillehammer",
             municipality %in% c("Ringsaker") ~ "Ringsaker",
             municipality %in% c("Stange") ~ "Stange",
             municipality %in% c("Kristiansund") ~ "Kristiansund",
             municipality %in% c("Molde") ~ "Molde",
             municipality %in% c("Orkdal, Melhus og Malvik") ~ "Orkdal, Melhus og Malvik",
             municipality %in% c("Steinkjer") ~ "Steinkjer",
             municipality %in% c("Stjørdal") ~ "Stjørdal",
             municipality %in% c("Ålesund") ~ "Ålesund",
             municipality %in% c("Alta") ~ "Alta",
             municipality %in% c("Bodø") ~ "Bodø",
             municipality %in% c("Hammerfest") ~ "Hammerfest",
             municipality %in% c("Harstad") ~ "Harstad",
             municipality %in% c("Narvik") ~ "Narvik",
             municipality %in% c("Rana") ~ "Rana",
             municipality %in% c("Tromsø") ~ "Tromsø",
             municipality %in% c("Vefsn") ~ "Vefsn",
             municipality %in% c("Bamble") ~ "Bamble",
             municipality %in% c("Færder") ~ "Færder",
             municipality %in% c("Holmestrand") ~ "Holmestrand",
             municipality %in% c("Horten") ~ "Horten",
             municipality %in% c("Kragerø") ~ "Kragerø",
             municipality %in% c("Larvik") ~ "Larvik",
             municipality %in% c("Notodden") ~ "Notodden",
             municipality %in% c("Porsgrunn") ~ "Porsgrunn",
             municipality %in% c("Sandefjord") ~ "Sandefjord",
             municipality %in% c("Skien") ~ "Skien",
             municipality %in% c("Tønsberg") ~ "Tønsberg",
             municipality %in% c("Askøy") ~ "Askøy",
             municipality %in% c("Bjørnafjorden") ~ "Os og Fusa",
             municipality %in% c("Kinn") ~ "Flora og Vågsøy",
             municipality %in% c("Sunnfjord") ~ "Førde, Jølster, Gaular og Naustdal",
             municipality %in% c("Øygarden, Fjell og Sund") ~ "Øygarden, Fjell og Sund",
             municipality %in% c("Asker") ~ "Asker",
             municipality %in% c("Askim") ~ "Askim",
             municipality %in% c("Bærum") ~ "Bærum",
             municipality %in% c("Drammen") ~ "Drammen",
             municipality %in% c("Eidsvoll") ~ "Eidsvoll",
             municipality %in% c("Fredrikstad") ~ "Fredrikstad",
             municipality %in% c("Frogn") ~ "Frogn",
             municipality %in% c("Halden") ~ "Halden",
             municipality %in% c("Kongsberg") ~ "Kongsberg",
             municipality %in% c("Lier") ~ "Lier",
             municipality %in% c("Lørenskog og Skedsmo") ~ "Lørenskog og Skedsmo",
             municipality %in% c("Moss") ~ "Moss",
             municipality %in% c("Nesodden") ~ "Nesodden",
             municipality %in% c("Nittedal") ~ "Nittedal",
             municipality %in% c("Nordre Follo") ~ "Ski og Oppegård",
             municipality %in% c("Ringerike") ~ "Ringerike",
             municipality %in% c("Rælingen") ~ "Rælingen",
             municipality %in% c("Sarpsborg") ~ "Sarpsborg",
             municipality %in% c("Ullensaker") ~ "Ullensaker",
             municipality %in% c("Vestby") ~ "Vestby",
             municipality %in% c("Ås") ~ "Ås",
             municipality %in% c("Distriktene i Østfold") ~ "Distriktene i Østfold",
             municipality %in% c("Distriktene i Akershus") ~ "Distriktene i Akershus",
             municipality %in% c("Distriktene i Hedmark") ~ "Distriktene i Hedmark",
             municipality %in% c("Distriktene i Oppland") ~ "Distriktene i Oppland",
             municipality %in% c("Distriktene i Buskerud") ~ "Distriktene i Buskerud",
             municipality %in% c("Distriktene i Vestfold") ~ "Distriktene i Vestfold",
             municipality %in% c("Distriktene i Telemark") ~ "Distriktene i Telemark",
             municipality %in% c("Distriktene i Aust-Agder") ~ "Distriktene i Aust-Agder",
             municipality %in% c("Distriktene i Vest-Agder") ~ "Distriktene i Vest-Agder",
             municipality %in% c("Distriktene i Rogaland") ~ "Distriktene i Rogaland",
             municipality %in% c("Distriktene i Hordaland") ~ "Distriktene i Hordaland",
             municipality %in% c("Distriktene i Sogn og Fjordane") ~ "Distriktene i Sogn og Fjordane",
             municipality %in% c("Distriktene i Møre og Romsdal") ~ "Distriktene i Møre og Romsdal",
             municipality %in% c("Distriktene i Nordland") ~ "Distriktene i Nordland",
             municipality %in% c("Distriktene i Troms") ~ "Distriktene i Troms",
             municipality %in% c("Distriktene i Finnmark") ~ "Distriktene i Finnmark",
             municipality %in% c("Distriktene i Trøndelag") ~ "Distriktene i Trøndelag") %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

colnames(UnSold_region) <- c("variable","date_start","value")


##############################################################
#################
######################### Advertised houses region
#########################
##############################################################
#################

# Advertised houses region
advertised_houses_region <- read_excel("Lagtutforsalg_region_Q419.xlsx",
                  skip = 1)

advertised_houses_region[is.na(advertised_houses_region)] <- 0
```

```r
advertised_houses_region$`Quarter of Dato` <- gsub(" ", "", advertised_houses_region$`Quarter of Dato`, fixed =
TRUE)

# municipality names
advertised_houses_regionMun <- data.frame(t(advertised_houses_region))
advertised_houses_regionMun <- setDT(advertised_houses_regionMun, keep.rownames = TRUE)[]
names(advertised_houses_regionMun)[1:1] <- paste("municipality")
advertised_houses_regionMun <- advertised_houses_regionMun[-1,]

# as transposed tibble
advertised_houses_region <- as_tibble(t(advertised_houses_region))
colnames(advertised_houses_region) <- advertised_houses_region[1,]
advertised_houses_region <- advertised_houses_region[-1,]

advertised_houses_region <- cbind(advertised_houses_regionMun$municipality,advertised_houses_region)
names(advertised_houses_region)[1:1] <- paste("municipality")

advertised_houses_region <- advertised_houses_region %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable


advertised_houses_region$value <- gsub("[[:space:]]", "", advertised_houses_region$value)
advertised_houses_region$value <- as.numeric(advertised_houses_region$value)

advertised_houses_region <- advertised_houses_region %>%
  mutate(municipality = case_when(municipality %in% c("Oslo: Alna","Oslo: Bjerke","Oslo: Frogner","Oslo: Gamle
Oslo",
                                  "Oslo: Grorud","Oslo: Grünerløkka","Oslo: Nordre Aker",
                                  "Oslo: Nordstrand","Oslo: Sagene","Oslo: St.Hanshaugen",
                                  "Oslo: Stovner","Oslo: Søndre Nordstrand","Oslo: Ullern",
                                  "Oslo: Vestre Aker","Oslo: Østensjø") ~ "Oslo",
             municipality %in% c("Trondheim: Sentrum","Trondheim: Sør",
                                  "Trondheim: Vest", "Trondheim: Øst") ~ "Trondheim",
             municipality %in% c("Bergen: Nord/Øst","Bergen: Sentrum",
                                  "Bergen: Sør","Bergen: Vest") ~ "Bergen",
             municipality %in% c("Stavanger: Nord","Stavanger: Sentrum",
                                  "Stavanger: Sør","Stavanger: Vest") ~ "Stavanger",
             municipality %in% c("Arendal") ~ "Arendal",
             municipality %in% c("Grimstad og Lillesand") ~ "Grimstad og Lillesand",
             municipality %in% c("Haugesund og Karmøy") ~ "Haugesund og Karmøy",
             municipality %in% c("Hå, Klepp og Time") ~ "Hå, Klepp og Time",
             municipality %in% c("Kristiansand") ~ "Kristiansand",
             municipality %in% c("Lindesnes, Mandal, Marnardal og Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
             municipality %in% c("Sandnes") ~ "Sandnes",
             municipality %in% c("Sola og Randaberg") ~ "Sola og Randaberg",
             municipality %in% c("Elverum") ~ "Elverum",
             municipality %in% c("Gjøvik") ~ "Gjøvik",
             municipality %in% c("Hamar") ~ "Hamar",
             municipality %in% c("Kongsvinger") ~ "Kongsvinger",
             municipality %in% c("Lillehammer") ~ "Lillehammer",
             municipality %in% c("Ringsaker") ~ "Ringsaker",
             municipality %in% c("Stange") ~ "Stange",
             municipality %in% c("Kristiansund") ~ "Kristiansund",
             municipality %in% c("Molde") ~ "Molde",
             municipality %in% c("Orkdal, Melhus og Malvik") ~ "Orkdal, Melhus og Malvik",
             municipality %in% c("Steinkjer") ~ "Steinkjer",
             municipality %in% c("Stjørdal") ~ "Stjørdal",
             municipality %in% c("Ålesund") ~ "Ålesund",
             municipality %in% c("Alta") ~ "Alta",
             municipality %in% c("Bodø") ~ "Bodø",
             municipality %in% c("Hammerfest") ~ "Hammerfest",
             municipality %in% c("Harstad") ~ "Harstad",
             municipality %in% c("Narvik") ~ "Narvik",
             municipality %in% c("Rana") ~ "Rana",
             municipality %in% c("Tromsø") ~ "Tromsø",
             municipality %in% c("Vefsn") ~ "Vefsn",
             municipality %in% c("Bamble") ~ "Bamble",
             municipality %in% c("Færder") ~ "Færder",
             municipality %in% c("Holmestrand") ~ "Holmestrand",
             municipality %in% c("Horten") ~ "Horten",
             municipality %in% c("Kragerø") ~ "Kragerø",
             municipality %in% c("Larvik") ~ "Larvik",
             municipality %in% c("Notodden") ~ "Notodden",
             municipality %in% c("Porsgrunn") ~ "Porsgrunn",
             municipality %in% c("Sandefjord") ~ "Sandefjord",
             municipality %in% c("Skien") ~ "Skien",
             municipality %in% c("Tønsberg") ~ "Tønsberg",
             municipality %in% c("Askøy") ~ "Askøy",
             municipality %in% c("Bjørnafjorden") ~ "Os og Fusa",
             municipality %in% c("Kinn") ~ "Flora og Vågsøy",
             municipality %in% c("Sunnfjord") ~ "Førde, Jølster, Gaular og Naustdal",
             municipality %in% c("Øygarden, Fjell og Sund") ~ "Øygarden, Fjell og Sund",
             municipality %in% c("Asker") ~ "Asker",
             municipality %in% c("Askim") ~ "Askim",
             municipality %in% c("Bærum") ~ "Bærum",
             municipality %in% c("Drammen") ~ "Drammen",
             municipality %in% c("Eidsvoll") ~ "Eidsvoll",
             municipality %in% c("Fredrikstad") ~ "Fredrikstad",
             municipality %in% c("Frogn") ~ "Frogn",
             municipality %in% c("Halden") ~ "Halden",
             municipality %in% c("Kongsberg") ~ "Kongsberg",
             municipality %in% c("Lier") ~ "Lier",
             municipality %in% c("Lørenskog og Skedsmo") ~ "Lørenskog og Skedsmo",
             municipality %in% c("Moss") ~ "Moss",
             municipality %in% c("Nesodden") ~ "Nesodden",
             municipality %in% c("Nittedal") ~ "Nittedal",
             municipality %in% c("Nordre Follo") ~ "Ski og Oppegård",
             municipality %in% c("Ringerike") ~ "Ringerike",
             municipality %in% c("Rælingen") ~ "Rælingen",
             municipality %in% c("Sarpsborg") ~ "Sarpsborg",
             municipality %in% c("Ullensaker") ~ "Ullensaker",
             municipality %in% c("Vestby") ~ "Vestby",
             municipality %in% c("Ås") ~ "Ås",
             municipality %in% c("Distriktene i Østfold") ~ "Distriktene i Østfold",
             municipality %in% c("Distriktene i Akershus") ~ "Distriktene i Akershus",
             municipality %in% c("Distriktene i Hedmark") ~ "Distriktene i Hedmark",
             municipality %in% c("Distriktene i Oppland") ~ "Distriktene i Oppland",
             municipality %in% c("Distriktene i Buskerud") ~ "Distriktene i Buskerud",
             municipality %in% c("Distriktene i Vestfold") ~ "Distriktene i Vestfold",
             municipality %in% c("Distriktene i Telemark") ~ "Distriktene i Telemark",
```

```
      municipality %in% c("Distriktene i Aust-Agder") – "Distriktene i Aust-Agder",
      municipality %in% c("Distriktene i Vest-Agder") – "Distriktene i Vest-Agder",
      municipality %in% c("Distriktene i Rogaland") – "Distriktene i Rogaland",
      municipality %in% c("Distriktene i Hordaland") – "Distriktene i Hordaland",
      municipality %in% c("Distriktene i Sogn og Fjordane") – "Distriktene i Sogn og Fjordane",
      municipality %in% c("Distriktene i Møre og Romsdal") – "Distriktene i Møre og Romsdal",
      municipality %in% c("Distriktene i Nordland") – "Distriktene i Nordland",
      municipality %in% c("Distriktene i Troms") – "Distriktene i Troms",
      municipality %in% c("Distriktene i Finnmark") – "Distriktene i Finnmark",
      municipality %in% c("Distriktene i Trøndelag")) – "Distriktene i Trøndelag")) %>%
   group_by(municipality, variable) %>% summarise(value=sum(value))

colnames(advertised_houses_region) <- c("variable","date_start","value")


#############################################################
#################
######################### Time before sold houses
##########################
#############################################################
#################


# Time before sold houses
salestime_houses_region <- read_excel("Liggetid_region_Q419.xlsx",
                                skip = 1)

salestime_houses_region[is.na(salestime_houses_region)] <- 0
salestime_houses_region$`Quarter of Dato` <- gsub(" ", "", salestime_houses_region$`Quarter of Dato`, fixed =
TRUE)

# municipality names
salestime_houses_regionMun <- data.frame(t(salestime_houses_region))
salestime_houses_regionMun <- setDT(salestime_houses_regionMun, keep.rownames = TRUE)[]
names(salestime_houses_regionMun)[1:1] <- paste("municipality")
salestime_houses_regionMun <- salestime_houses_regionMun[-1,]


# as transposed tibble
salestime_houses_region <- as_tibble(t(salestime_houses_region))
colnames(salestime_houses_region) <- salestime_houses_region[1,]
salestime_houses_region <- salestime_houses_region[-1,]

#cbind
salestime_houses_region <- cbind(salestime_houses_regionMun$municipality,salestime_houses_region)
names(salestime_houses_region)[1:1] <- paste("municipality")


salestime_houses_region <- salestime_houses_region %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable

salestime_houses_region$value <- gsub("[[:space:]]", "", salestime_houses_region$value)
salestime_houses_region$value <- as.numeric(salestime_houses_region$value)


salestime_houses_region <- salestime_houses_region %>%
  mutate(municipality = case_when(municipality %in% c("Oslo: Alna","Oslo: Bjerke","Oslo: Frogner","Oslo: Gamle
Oslo",
                             "Oslo: Grorud","Oslo: Grünerløkka","Oslo: Nordre Aker",
                             "Oslo: Nordstrand","Oslo: Sagene","Oslo: St.Hanshaugen",
                             "Oslo: Stovner","Oslo: Søndre Nordstrand","Oslo: Ullern",
                             "Oslo: Vestre Aker","Oslo: Østensjø") – "Oslo",
                  municipality %in% c("Trondheim: Sentrum","Trondheim: Sør",
                             "Trondheim: Vest", "Trondheim: Øst") – "Trondheim",
                  municipality %in% c("Bergen: Nord/Øst","Bergen: Sentrum",
                             "Bergen: Sør","Bergen: Vest") – "Bergen",
                  municipality %in% c("Stavanger: Nord","Stavanger: Sentrum",
                             "Stavanger: Sør","Stavanger: Vest") – "Stavanger",
                  municipality %in% c("Arendal") – "Arendal",
                  municipality %in% c("Grimstad og Lillesand") – "Grimstad og Lillesand",
                  municipality %in% c("Haugesund og Karmøy") – "Haugesund og Karmøy",
                  municipality %in% c("Hå, Klepp og Time") – "Hå, Klepp og Time",
                  municipality %in% c("Kristiansand") – "Kristiansand",
                  municipality %in% c("Lindesnes, Mandal, Marnardal og Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
                  municipality %in% c("Sandnes") – "Sandnes",
                  municipality %in% c("Sola og Randaberg") – "Sola og Randaberg",
                  municipality %in% c("Elverum") – "Elverum",
                  municipality %in% c("Gjøvik") – "Gjøvik",
                  municipality %in% c("Hamar") – "Hamar",
                  municipality %in% c("Kongsvinger") – "Kongsvinger",
                  municipality %in% c("Lillehammer") – "Lillehammer",
                  municipality %in% c("Ringsaker") – "Ringsaker",
                  municipality %in% c("Stange") – "Stange",
                  municipality %in% c("Kristiansund") – "Kristiansund",
                  municipality %in% c("Molde") – "Molde",
                  municipality %in% c("Orkdal, Melhus og Malvik") – "Orkdal, Melhus og Malvik",
                  municipality %in% c("Steinkjer") – "Steinkjer",
                  municipality %in% c("Stjørdal") – "Stjørdal",
                  municipality %in% c("Ålesund") – "Ålesund",
                  municipality %in% c("Alta") – "Alta",
                  municipality %in% c("Bodø") – "Bodø",
                  municipality %in% c("Hammerfest") – "Hammerfest",
                  municipality %in% c("Harstad") – "Harstad",
                  municipality %in% c("Narvik") – "Narvik",
                  municipality %in% c("Rana") – "Rana",
                  municipality %in% c("Tromsø") – "Tromsø",
                  municipality %in% c("Vefsn") – "Vefsn",
                  municipality %in% c("Bamble") – "Bamble",
                  municipality %in% c("Færder") – "Færder",
                  municipality %in% c("Holmestrand") – "Holmestrand",
                  municipality %in% c("Horten") – "Horten",
                  municipality %in% c("Kragerø") – "Kragerø",
                  municipality %in% c("Larvik") – "Larvik",
                  municipality %in% c("Notodden") – "Notodden",
                  municipality %in% c("Porsgrunn") – "Porsgrunn",
                  municipality %in% c("Sandefjord") – "Sandefjord",
                  municipality %in% c("Skien") – "Skien",
                  municipality %in% c("Tønsberg") – "Tønsberg",
                  municipality %in% c("Askøy") – "Askøy",
                  municipality %in% c("Bjørnafjorden") – "Os og Fusa",
```

```
                  municipality %in% c("Kinn") – "Flora og Vågsøy",
                  municipality %in% c("Sunnfjord") – "Førde, Jølster, Gaular og Naustdal",
                  municipality %in% c("Øygarden, Fjell og Sund") – "Øygarden, Fjell og Sund",
                  municipality %in% c("Asker") – "Asker",
                  municipality %in% c("Askim") – "Askim",
                  municipality %in% c("Bærum") – "Bærum",
                  municipality %in% c("Drammen") – "Drammen",
                  municipality %in% c("Eidsvoll") – "Eidsvoll",
                  municipality %in% c("Fredrikstad") – "Fredrikstad",
                  municipality %in% c("Frogn") – "Frogn",
                  municipality %in% c("Halden") – "Halden",
                  municipality %in% c("Kongsberg") – "Kongsberg",
                  municipality %in% c("Lier") – "Lier",
                  municipality %in% c("Lørenskog og Skedsmo") – "Lørenskog og Skedsmo",
                  municipality %in% c("Moss") – "Moss",
                  municipality %in% c("Nesodden") – "Nesodden",
                  municipality %in% c("Nittedal") – "Nittedal",
                  municipality %in% c("Nordre Follo") – "Ski og Oppegård",
                  municipality %in% c("Ringerike") – "Ringerike",
                  municipality %in% c("Rælingen") – "Rælingen",
                  municipality %in% c("Sarpsborg") – "Sarpsborg",
                  municipality %in% c("Ullensaker") – "Ullensaker",
                  municipality %in% c("Vestby") – "Vestby",
                  municipality %in% c("Ås") – "Ås",
                  municipality %in% c("Distriktene i Østfold") – "Distriktene i Østfold",
                  municipality %in% c("Distriktene i Akershus") – "Distriktene i Akershus",
                  municipality %in% c("Distriktene i Hedmark") – "Distriktene i Hedmark",
                  municipality %in% c("Distriktene i Oppland") – "Distriktene i Oppland",
                  municipality %in% c("Distriktene i Buskerud") – "Distriktene i Buskerud",
                  municipality %in% c("Distriktene i Vestfold") – "Distriktene i Vestfold",
                  municipality %in% c("Distriktene i Telemark") – "Distriktene i Telemark",
                  municipality %in% c("Distriktene i Aust-Agder") – "Distriktene i Aust-Agder",
                  municipality %in% c("Distriktene i Vest-Agder") – "Distriktene i Vest-Agder",
                  municipality %in% c("Distriktene i Rogaland") – "Distriktene i Rogaland",
                  municipality %in% c("Distriktene i Hordaland") – "Distriktene i Hordaland",
                  municipality %in% c("Distriktene i Sogn og Fjordane") – "Distriktene i Sogn og Fjordane",
                  municipality %in% c("Distriktene i Møre og Romsdal") – "Distriktene i Møre og Romsdal",
                  municipality %in% c("Distriktene i Nordland") – "Distriktene i Nordland",
                  municipality %in% c("Distriktene i Troms") – "Distriktene i Troms",
                  municipality %in% c("Distriktene i Finnmark") – "Distriktene i Finnmark",
                  municipality %in% c("Distriktene i Trøndelag") – "Distriktene i Trøndelag")) %>%
   group_by(municipality, variable) %>% summarise(value=mean(value))

colnames(salestime_houses_region) <- c("variable","date_start","value")

#############################################################
#################
##################### Kvmpris boliger store kommuner
##########################
#############################################################
#################

KvPris <- read_excel("KvPris.xlsx")
KvPris <- KvPris[-c(1:2,202:260),]
colnames(KvPris) <- KvPris[1,]
KvPris <- KvPris[-1,]
names(KvPris)[1:2] <- paste(c("municipality","type"))
KvPris[c(193:195),c(3:30)] <- KvPris[c(187:189),c(3:30)]
KvPris <- KvPris[-c(187:189),] # Removing harstad pre 2013
KvPris$municipality <- gsub("[^\\p{L}']+", "", KvPris$municipality, perl = TRUE)
#KvPris[190,1] <- "Harstad"
KvPris$municipality <- na.locf(KvPris$municipality, na.rm = F)
KvPris <- replace(KvPris, KvPris == ".", 0)
KvPris <- replace(KvPris, KvPris == "..", 0)

# Enebolig
KvPrisEnebolig <- KvPris[seq(1, nrow(KvPris), 3), ]
KvPrisEnebolig <- KvPrisEnebolig[,-2]
KvPrisEnebolig[, c(2:57)] <- sapply(KvPrisEnebolig[, c(2:57)], as.numeric)
KvPrisEnebolig <- KvPrisEnebolig %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
KvPrisEnebolig <- KvPrisEnebolig[order(KvPrisEnebolig$municipality),]


KvPrisEnebolig <- KvPrisEnebolig %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
                  municipality %in% c("Trondheim") – "Trondheim",
                  municipality %in% c("Bergen") – "Bergen",
                  municipality %in% c("Stavanger") – "Stavanger",
                  municipality %in% c("Arendal") – "Arendal",
                  municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
                  municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
                  municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
                  municipality %in% c("Kristiansand") – "Kristiansand",
                  municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
                  municipality %in% c("Sandnes") – "Sandnes",
                  municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
                  municipality %in% c("Elverum") – "Elverum",
                  municipality %in% c("Gjøvik") – "Gjøvik",
                  municipality %in% c("Hamar") – "Hamar",
                  municipality %in% c("Kongsvinger") – "Kongsvinger",
                  municipality %in% c("Lillehammer") – "Lillehammer",
                  municipality %in% c("Ringsaker") – "Ringsaker",
                  municipality %in% c("Stange") – "Stange",
                  municipality %in% c("Kristiansund") – "Kristiansund",
                  municipality %in% c("Molde") – "Molde",
                  municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
                  municipality %in% c("Steinkjer") – "Steinkjer",
                  municipality %in% c("Stjørdal") – "Stjørdal",
                  municipality %in% c("Ålesund") – "Ålesund",
                  municipality %in% c("Alta") – "Alta",
                  municipality %in% c("Bodø") – "Bodø",
                  municipality %in% c("Hammerfest") – "Hammerfest",
                  municipality %in% c("HarstadHårsttåk") – "Harstad",
                  municipality %in% c("Narvik") – "Narvik",
                  municipality %in% c("Rana") – "Rana",
                  municipality %in% c("Tromsø") – "Tromsø",
                  municipality %in% c("Vefsn") – "Vefsn",
                  municipality %in% c("Bamble") – "Bamble",
                  municipality %in% c("Tjøme","Nøtterøy","Færder") – "Færder",
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                                    municipality %in% c("Holmestrand") – "Holmestrand",
                                    municipality %in% c("Horten") – "Horten",
                                    municipality %in% c("Kragerø") – "Kragerø",
                                    municipality %in% c("Larvik") – "Larvik",
                                    municipality %in% c("Notodden") – "Notodden",
                                    municipality %in% c("Porsgrunn") – "Porsgrunn",
                                    municipality %in% c("Sandefjord") – "Sandefjord",
                                    municipality %in% c("Skien") – "Skien",
                                    municipality %in% c("Tønsberg") – "Tønsberg",
                                    municipality %in% c("Askøy") – "Askøy",
                                    municipality %in% c("OsHordaland","Fusa") – "Os og Fusa,
                                    municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
                                    municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
                                    municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
                                    municipality %in% c("Asker") – "Asker",
                                    municipality %in% c("Askim") – "Askim",
                                    municipality %in% c("Bærum") – "Bærum",
                                    municipality %in% c("Drammen") – "Drammen",
                                    municipality %in% c("Eidsvoll") – "Eidsvoll",
                                    municipality %in% c("Fredrikstad") – "Fredrikstad",
                                    municipality %in% c("Frogn") – "Frogn",
                                    municipality %in% c("Halden") – "Halden",
                                    municipality %in% c("Kongsberg") – "Kongsberg",
                                    municipality %in% c("Lier") – "Lier",
                                    municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
                                    municipality %in% c("Moss") – "Moss",
                                    municipality %in% c("Nesodden") – "Nesodden",
                                    municipality %in% c("Nittedal") – "Nittedal",
                                    municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
                                    municipality %in% c("Ringerike") – "Ringerike",
                                    municipality %in% c("Rælingen") – "Rælingen",
                                    municipality %in% c("Sarpsborg") – "Sarpsborg",
                                    municipality %in% c("Ullensaker") – "Ullensaker",
                                    municipality %in% c("Vestby") – "Vestby",
                                    municipality %in% c("Ås") – "Ås",
                                    municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                                            "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                                            "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

                                    municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                                            "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

                                    municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                                            "Grue", "Åsnes", "VålerHedmark", "Trysil",
                                            "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                                            "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",

                                    municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                                            "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                                            "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                                            "NordreLand","SørAurdal","Etnedal","NordAurdal",
                                            "VestreSlidre","ØystreSlidre","Vang") – "Distriktene i Oppland",

                                    municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                                            "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                                            "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – "Distriktene i
Buskerud",

                                    municipality %in% c("Svelvik","SandeVestfold","Re") – "Distriktene i Vestfold",

                                    municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                                            "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – "Distriktene i
Telemark",

                                    municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                                            "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                                            "Valle","Bykle") – "Distriktene i Aust-Agder",

                                    municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                                            "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – "Distriktene i Vest-
Agder",

                                    municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                                            "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                                            "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – "Distriktene i Rogaland",

                                    municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                                            "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                                            "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                                            "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland",

                                    municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                                            "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                                            "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") –
"Distriktene i Sogn og Fjordane",

                                    municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                                            "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                                            "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                                            "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                                            "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – "Distriktene i Møre
og Romsdal",

                                    municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                                            "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                                            "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                                            "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – "Distriktene i Nordland",

                                    municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                                            "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                                            "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – "Distriktene i Troms",
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                                    municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                                            "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

                                    municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                                            "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                                            "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                                            "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                                            "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=mean(value))


# Småhus
KvPrisSmaahus <- KvPris[seq(2, nrow(KvPris), 3), ]
KvPrisSmaahus <- KvPrisSmaahus[,-2]
KvPrisSmaahus[, c(2:57)] <- sapply(KvPrisSmaahus[, c(2:57)], as.numeric)
KvPrisSmaahus <- KvPrisSmaahus %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
KvPrisSmaahus <- KvPrisSmaahus[order(KvPrisSmaahus$municipality),]

KvPrisSmaahus <- KvPrisSmaahus %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
                                    municipality %in% c("Trondheim") – "Trondheim",
                                    municipality %in% c("Bergen") – "Bergen",
                                    municipality %in% c("Stavanger") – "Stavanger",
                                    municipality %in% c("Arendal") – "Arendal",
                                    municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
                                    municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
                                    municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
                                    municipality %in% c("Kristiansand") – "Kristiansand",
                                    municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
                                    municipality %in% c("Sandnes") – "Sandnes",
                                    municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
                                    municipality %in% c("Elverum") – "Elverum",
                                    municipality %in% c("Gjøvik") – "Gjøvik",
                                    municipality %in% c("Hamar") – "Hamar",
                                    municipality %in% c("Kongsvinger") – "Kongsvinger",
                                    municipality %in% c("Lillehammer") – "Lillehammer",
                                    municipality %in% c("Ringsaker") – "Ringsaker",
                                    municipality %in% c("Stange") – "Stange",
                                    municipality %in% c("Kristiansund") – "Kristiansund",
                                    municipality %in% c("Molde") – "Molde",
                                    municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
                                    municipality %in% c("Steinkjer") – "Steinkjer",
                                    municipality %in% c("Stjørdal") – "Stjørdal",
                                    municipality %in% c("Ålesund") – "Ålesund",
                                    municipality %in% c("Alta") – "Alta",
                                    municipality %in% c("Bodø") – "Bodø",
                                    municipality %in% c("Hammerfest") – "Hammerfest",
                                    municipality %in% c("HarstadHárstták") – "Harstad",
                                    municipality %in% c("Narvik") – "Narvik",
                                    municipality %in% c("Rana") – "Rana",
                                    municipality %in% c("Tromsø") – "Tromsø",
                                    municipality %in% c("Vefsn") – "Vefsn",
                                    municipality %in% c("Bamble") – "Bamble",
                                    municipality %in% c("Tjøme","Nøtterøy","Færder") – "Færder",
                                    municipality %in% c("Holmestrand") – "Holmestrand",
                                    municipality %in% c("Horten") – "Horten",
                                    municipality %in% c("Kragerø") – "Kragerø",
                                    municipality %in% c("Larvik") – "Larvik",
                                    municipality %in% c("Notodden") – "Notodden",
                                    municipality %in% c("Porsgrunn") – "Porsgrunn",
                                    municipality %in% c("Sandefjord") – "Sandefjord",
                                    municipality %in% c("Skien") – "Skien",
                                    municipality %in% c("Tønsberg") – "Tønsberg",
                                    municipality %in% c("Askøy") – "Askøy",
                                    municipality %in% c("OsHordaland","Fusa") – "Os og Fusa,
                                    municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
                                    municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
                                    municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
                                    municipality %in% c("Asker") – "Asker",
                                    municipality %in% c("Askim") – "Askim",
                                    municipality %in% c("Bærum") – "Bærum",
                                    municipality %in% c("Drammen") – "Drammen",
                                    municipality %in% c("Eidsvoll") – "Eidsvoll",
                                    municipality %in% c("Fredrikstad") – "Fredrikstad",
                                    municipality %in% c("Frogn") – "Frogn",
                                    municipality %in% c("Halden") – "Halden",
                                    municipality %in% c("Kongsberg") – "Kongsberg",
                                    municipality %in% c("Lier") – "Lier",
                                    municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
                                    municipality %in% c("Moss") – "Moss",
                                    municipality %in% c("Nesodden") – "Nesodden",
                                    municipality %in% c("Nittedal") – "Nittedal",
                                    municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
                                    municipality %in% c("Ringerike") – "Ringerike",
                                    municipality %in% c("Rælingen") – "Rælingen",
                                    municipality %in% c("Sarpsborg") – "Sarpsborg",
                                    municipality %in% c("Ullensaker") – "Ullensaker",
                                    municipality %in% c("Vestby") – "Vestby",
                                    municipality %in% c("Ås") – "Ås",
                                    municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                                            "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                                            "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

                                    municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                                            "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

                                    municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                                            "Grue", "Åsnes", "VålerHedmark", "Trysil",
                                            "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                                            "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",
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                          municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                               "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                               "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                               "NordreLand","SørAurdal","Etnedal","NordAurdal",
                               "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

                          municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                               "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                               "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",

                          municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

                          municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                               "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

                          municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                               "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                               "Valle","Bykle") ~ "Distriktene i Aust-Agder",

                          municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                               "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

                          municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                               "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                               "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

                          municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                               "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                               "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                               "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

                          municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                               "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                               "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

                          municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda,
                               "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                               "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                               "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                               "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

                          municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                               "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                               "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                               "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

                          municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                               "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuonó",
                               "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",

                          municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                               "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
"Distriktene i Finnmark",

                          municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                               "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                               "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                               "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                               "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ "Distriktene i
Trøndelag")) %>%
    group_by(municipality, variable) %>% summarise(value=mean(value))


# Blokk
KvPrisBlokk <- KvPris[seq(3, nrow(KvPris), 3), ]
KvPrisBlokk <- KvPrisBlokk[,-2]
KvPrisBlokk[, c(2:57)] <- sapply(KvPrisBlokk[, c(2:57)], as.numeric)
KvPrisBlokk <- KvPrisBlokk %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
KvPrisBlokk <- KvPrisBlokk[order(KvPrisBlokk$municipality),]

KvPrisBlokk <- KvPrisBlokk %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") ~ "Oslo",
          municipality %in% c("Trondheim") ~ "Trondheim",
          municipality %in% c("Bergen") ~ "Bergen",
          municipality %in% c("Stavanger") ~ "Stavanger",
          municipality %in% c("Arendal") ~ "Arendal",
          municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
          municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
          municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
          municipality %in% c("Kristiansand") ~ "Kristiansand",
          municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
          municipality %in% c("Sandnes") ~ "Sandnes",
          municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
          municipality %in% c("Elverum") ~ "Elverum",
          municipality %in% c("Gjøvik") ~ "Gjøvik",
          municipality %in% c("Hamar") ~ "Hamar",
          municipality %in% c("Kongsvinger") ~ "Kongsvinger",
          municipality %in% c("Lillehammer") ~ "Lillehammer",
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          municipality %in% c("Ringsaker") ~ "Ringsaker",
          municipality %in% c("Stange") ~ "Stange",
          municipality %in% c("Kristiansund") ~ "Kristiansund",
          municipality %in% c("Molde") ~ "Molde",
          municipality %in% c("Orkdal", "Melhus", "Malvik") ~ "Orkdal, Melhus og Malvik",
          municipality %in% c("Steinkjer") ~ "Steinkjer",
          municipality %in% c("Stjørdal") ~ "Stjørdal",
          municipality %in% c("Ålesund") ~ "Ålesund",
          municipality %in% c("Alta") ~ "Alta",
          municipality %in% c("Bodø") ~ "Bodø",
          municipality %in% c("Hammerfest") ~ "Hammerfest",
          municipality %in% c("HarstadHárstták") ~ "Harstad",
          municipality %in% c("Narvik") ~ "Narvik",
          municipality %in% c("Rana") ~ "Rana",
          municipality %in% c("Tromsø") ~ "Tromsø",
          municipality %in% c("Vefsn") ~ "Vefsn",
          municipality %in% c("Bamble") ~ "Bamble",
          municipality %in% c("Tjøme","Nøtterøy","Færder") ~ "Færder",
          municipality %in% c("Holmestrand") ~ "Holmestrand",
          municipality %in% c("Horten") ~ "Horten",
          municipality %in% c("Kragerø") ~ "Kragerø",
          municipality %in% c("Larvik") ~ "Larvik",
          municipality %in% c("Notodden") ~ "Notodden",
          municipality %in% c("Porsgrunn") ~ "Porsgrunn",
          municipality %in% c("Sandefjord") ~ "Sandefjord",
          municipality %in% c("Skien") ~ "Skien",
          municipality %in% c("Tønsberg") ~ "Tønsberg",
          municipality %in% c("Askøy") ~ "Askøy",
          municipality %in% c("OsHordaland","Fusa") ~ "Os og Fusa",
          municipality %in% c("Flora","Vågsøy") ~ "Flora og Vågsøy",
          municipality %in% c("Førde","Jølster","Gaular","Naustdal") ~ "Førde, Jølster, Gaular og
Naustdal",

          municipality %in% c("Øygarden", "Fjell", "Sund") ~ "Øygarden, Fjell og Sund",
          municipality %in% c("Asker") ~ "Asker",
          municipality %in% c("Askim") ~ "Askim",
          municipality %in% c("Bærum") ~ "Bærum",
          municipality %in% c("Drammen") ~ "Drammen",
          municipality %in% c("Eidsvoll") ~ "Eidsvoll",
          municipality %in% c("Fredrikstad") ~ "Fredrikstad",
          municipality %in% c("Frogn") ~ "Frogn",
          municipality %in% c("Halden") ~ "Halden",
          municipality %in% c("Kongsberg") ~ "Kongsberg",
          municipality %in% c("Lier") ~ "Lier",
          municipality %in% c("Lørenskog", "Skedsmo") ~ "Lørenskog og Skedsmo",
          municipality %in% c("Moss") ~ "Moss",
          municipality %in% c("Nesodden") ~ "Nesodden",
          municipality %in% c("Nittedal") ~ "Nittedal",
          municipality %in% c("Ski","Oppegård") ~ "Ski og Oppegård",
          municipality %in% c("Ringerike") ~ "Ringerike",
          municipality %in% c("Rælingen") ~ "Rælingen",
          municipality %in% c("Sarpsborg") ~ "Sarpsborg",
          municipality %in% c("Ullensaker") ~ "Ullensaker",
          municipality %in% c("Vestby") ~ "Vestby",
          municipality %in% c("Ås") ~ "Ås",
          municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
               "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
               "Rakkestad","Råde","Rygge","VålerØstfold") ~ "Distriktene i Østfold",

          municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
               "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ "Distriktene i Akershus",

          municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
               "Grue", "Åsnes", "VålerHedmark", "Trysil",
               "Åmot", "StorElvdal", "Rendalen", "Engerdal",
               "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ "Distriktene i Hedmark",

          municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
               "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
               "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
               "NordreLand","SørAurdal","Etnedal","NordAurdal",
               "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

          municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
               "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
               "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",

          municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

          municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
               "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

          municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
               "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
               "Valle","Bykle") ~ "Distriktene i Aust-Agder",

          municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
               "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

          municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
               "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
               "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

          municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
               "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
               "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
               "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

          municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
               "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
               "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

          municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda,
               "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
               "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
               "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
               "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",
```

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                    municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                    "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                    "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                    "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – "Distriktene i Nordland",

                    municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                    "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                    "Skjervøy","NordreisaRáisaRaisí","Kvænangen") – "Distriktene i Troms",

                    municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                    "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

                    municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                    "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                    "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                    "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                    "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=mean(value))


### Household Income after tax and number of houses ###
# SSB scrape
url <- "http://data.ssb.no/api/v0/dataset/49678.json?lang=no"
results <- fromJSONstat(url)
SSBtable49678 <- results[[1]]

# Systemating the data
SSBtable49678$region <- gsub("[^\\p{L}]+", "", SSBtable49678$region, perl = TRUE)

# Household Income after tax
Hinc <- SSBtable49678 %>%
  filter(husholdningstype %in% c("Alle husholdninger")) %>%
  filter(statistikkvariabel %in% c("Inntekt etter skatt, median (kr)"))
Hinc <- Hinc[,-c(2,4)]
colnames(Hinc) <- c("municipality","year","house_inc_a_tax")
Hinc <- spread(Hinc, year, house_inc_a_tax)
okningHinc <- 1.050

#Hinc[is.na(Hinc)] <- 0

Hinc[133,2] <- 320000 #harstad år 1
Hinc[133,3] <- Hinc[133,2]*okningHinc
Hinc[133,4] <- Hinc[133,3]*okningHinc
Hinc[133,5] <- Hinc[133,4]*okningHinc
Hinc[133,6] <- Hinc[133,5]*okningHinc
Hinc[133,7] <- Hinc[133,6]*okningHinc
Hinc[133,8] <- Hinc[133,7]*okningHinc


Hinc[160,2] <- 355000 #inderøy år 1
Hinc[160,3] <- Hinc[160,2]*okningHinc
Hinc[160,4] <- Hinc[160,3]*okningHinc
Hinc[160,5] <- Hinc[160,4]*okningHinc
Hinc[160,6] <- Hinc[160,5]*okningHinc
Hinc[160,7] <- Hinc[160,6]*okningHinc

Hinc[174,2] <- 330000 #Kristiansund år 1
Hinc[174,3] <- Hinc[174,2]*okningHinc

okningHinc <- 1.025

#Hinc$`2018` <- Hinc$`2017`*okningHinc
Hinc$`2019` <- Hinc$`2018`*okningHinc
Hinc <- Hinc %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
Hinc <- Hinc[order(Hinc$municipality),]


Hinc$value <- na.locf(Hinc$value, na.rm = F)

#h <- as.data.frame(unique(Hinc$municipality))
#h2 <- as.data.frame(unique(salestime_houses_region$municipality))


Hinc <- Hinc %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
                    municipality %in% c("Trondheim") – "Trondheim",
                    municipality %in% c("Bergen") – "Bergen",
                    municipality %in% c("Stavanger") – "Stavanger",
                    municipality %in% c("Arendal") – "Arendal",
                    municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
                    municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
                    municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
                    municipality %in% c("Kristiansand") – "Kristiansand",
                    municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
                    municipality %in% c("Sandnes") – "Sandnes",
                    municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
                    municipality %in% c("Elverum") – "Elverum",
                    municipality %in% c("Gjøvik") – "Gjøvik",
                    municipality %in% c("Hamar") – "Hamar",
                    municipality %in% c("Kongsvinger") – "Kongsvinger",
                    municipality %in% c("Lillehammer") – "Lillehammer",

                    municipality %in% c("Ringsaker") – "Ringsaker",
                    municipality %in% c("Stange") – "Stange",
                    municipality %in% c("Kristiansund") – "Kristiansund",
                    municipality %in% c("Molde") – "Molde",
                    municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
                    municipality %in% c("Steinkjer") – "Steinkjer",
                    municipality %in% c("Stjørdal") – "Stjørdal",
                    municipality %in% c("Ålesund") – "Ålesund",
                    municipality %in% c("Alta") – "Alta",
                    municipality %in% c("Bodø") – "Bodø",
                    municipality %in% c("Hammerfest") – "Hammerfest",
                    municipality %in% c("HarstadHárstták") – "Harstad",
                    municipality %in% c("Narvik") – "Narvik",
                    municipality %in% c("Rana") – "Rana",
                    municipality %in% c("Tromsø") – "Tromsø",
                    municipality %in% c("Vefsn") – "Vefsn",
                    municipality %in% c("Bamble") – "Bamble",
                    municipality %in% c("Tjøme","Nøtterøy","Færder") – "Færder",
                    municipality %in% c("Holmestrand") – "Holmestrand",
                    municipality %in% c("Horten") – "Horten",
                    municipality %in% c("Kragerø") – "Kragerø",
                    municipality %in% c("Larvik") – "Larvik",
                    municipality %in% c("Notodden") – "Notodden",
                    municipality %in% c("Porsgrunn") – "Porsgrunn",
                    municipality %in% c("Sandefjord") – "Sandefjord",
                    municipality %in% c("Skien") – "Skien",
                    municipality %in% c("Tønsberg") – "Tønsberg",
                    municipality %in% c("Askøy") – "Askøy",
                    municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
                    municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
                    municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
                    municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
                    municipality %in% c("Asker") – "Asker",
                    municipality %in% c("Askim") – "Askim",
                    municipality %in% c("Bærum") – "Bærum",
                    municipality %in% c("Drammen") – "Drammen",
                    municipality %in% c("Eidsvoll") – "Eidsvoll",
                    municipality %in% c("Fredrikstad") – "Fredrikstad",
                    municipality %in% c("Frogn") – "Frogn",
                    municipality %in% c("Halden") – "Halden",
                    municipality %in% c("Kongsberg") – "Kongsberg",
                    municipality %in% c("Lier") – "Lier",
                    municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
                    municipality %in% c("Moss") – "Moss",
                    municipality %in% c("Nesodden") – "Nesodden",
                    municipality %in% c("Nittedal") – "Nittedal",
                    municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
                    municipality %in% c("Ringerike") – "Ringerike",
                    municipality %in% c("Rælingen") – "Rælingen",
                    municipality %in% c("Sarpsborg") – "Sarpsborg",
                    municipality %in% c("Ullensaker") – "Ullensaker",
                    municipality %in% c("Vestby") – "Vestby",
                    municipality %in% c("Ås") – "Ås",
                    municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                    "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                    "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

                    municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                    "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

                    municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                    "Grue", "Åsnes", "VålerHedmark", "Trysil",
                    "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                    "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",

                    municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                    "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                    "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                    "NordreLand","SørAurdal","Etnedal","NordAurdal",
                    "VestreSlidre","ØystreSlidre","Vang") – "Distriktene i Oppland",

                    municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                    "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                    "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – "Distriktene i
Buskerud",

                    municipality %in% c("Svelvik","SandeVestfold","Re") – "Distriktene i Vestfold",

                    municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                    "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – "Distriktene i
Telemark",

                    municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                    "Birkenes","Åmli","Iveland","EvjegHornnes","Bygland",
                    "Valle","Bykle") – "Distriktene i Aust-Agder",

                    municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                    "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – "Distriktene i Vest-
Agder",

                    municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                    "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                    "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – "Distriktene i Rogaland",

                    municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                    "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                    "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                    "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland",

                    municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                    "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                    "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") –
"Distriktene i Sogn og Fjordane",

                    municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                    "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                    "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                    "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                    "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – "Distriktene i Møre
og Romsdal",
```

```
                          municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                    "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                    "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                    "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") − "Distriktene i Nordland",

                          municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                    "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                    "Skjervøy","NordreisaRáisaRaisi","Kvænangen") − "Distriktene i Troms",

                          municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                    "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") −
"Distriktene i Finnmark",

                          municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                    "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                    "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                    "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                    "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") − "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=mean(value))

Hinc <- na.omit(Hinc) # kommunene som ble overfladisk

### Numbers of households pr Municipality ###
NumHousehold <- SSBtable49678 %>%
  filter(husholdningstype %in% c("Alle husholdninger")) %>%
  filter(statistikkvariabel %in% c("Antall husholdninger"))
NumHousehold <- NumHousehold[,-c(2,4)]
colnames(NumHousehold) <- c("municipality","year","houses_per_munic")
NumHousehold <- spread(NumHousehold, year, houses_per_munic)

okningHinc <- 1.025

#Hinc[is.na(Hinc)] <- 0
#10071*0.9

NumHousehold[133,2] <- 9060 #harstad år 1
NumHousehold[133,3] <- NumHousehold[133,2]*okningHinc
NumHousehold[133,4] <- NumHousehold[133,3]*okningHinc
NumHousehold[133,5] <- NumHousehold[133,4]*okningHinc
NumHousehold[133,6] <- NumHousehold[133,5]*okningHinc
NumHousehold[133,7] <- NumHousehold[133,6]*okningHinc
NumHousehold[133,8] <- NumHousehold[133,7]*okningHinc


NumHousehold[160,2] <- 2500  #inderøy år 1
NumHousehold[160,3] <- NumHousehold[160,2]*okningHinc
NumHousehold[160,4] <- NumHousehold[160,3]*okningHinc
NumHousehold[160,5] <- NumHousehold[160,4]*okningHinc
NumHousehold[160,6] <- NumHousehold[160,5]*okningHinc
NumHousehold[160,7] <- NumHousehold[160,6]*okningHinc

NumHousehold[174,2] <- 9900 #Kristiansund år 1
NumHousehold[174,3] <- NumHousehold[174,2]*okningHinc


okningNumHousehold <- 1.011
NumHousehold$`2019` <- NumHousehold$`2018`*okningNumHousehold
NumHousehold <- NumHousehold %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
NumHousehold <- NumHousehold[order(NumHousehold$municipality),]

NumHousehold$value <- na.locf(NumHousehold$value, na.rm = F)


NumHousehold <- NumHousehold %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") − "Oslo",
                          municipality %in% c("Trondheim") − "Trondheim",
                          municipality %in% c("Bergen") − "Bergen",
                          municipality %in% c("Stavanger") − "Stavanger",
                          municipality %in% c("Arendal") − "Arendal",
                          municipality %in% c("Grimstad", "Lillesand") − "Grimstad og Lillesand",
                          municipality %in% c("Haugesund","Karmøy") − "Haugesund og Karmøy",
                          municipality %in% c("Hå", "Klepp", "Time") − "Hå, Klepp og Time",
                          municipality %in% c("Kristiansand") − "Kristiansand",
                          municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") − "Lindesnes, Mandal,
Marnardal og Søgne",
                          municipality %in% c("Sandnes") − "Sandnes",
                          municipality %in% c("Sola", "Randaberg") − "Sola og Randaberg",
                          municipality %in% c("Elverum") − "Elverum",
                          municipality %in% c("Gjøvik") − "Gjøvik",
                          municipality %in% c("Hamar") − "Hamar",
                          municipality %in% c("Kongsvinger") − "Kongsvinger",
                          municipality %in% c("Lillehammer") − "Lillehammer",
                          municipality %in% c("Ringsaker") − "Ringsaker",
                          municipality %in% c("Stange") − "Stange",
                          municipality %in% c("Kristiansund") − "Kristiansund",
                          municipality %in% c("Molde") − "Molde",
                          municipality %in% c("Orkdal", "Melhus", "Malvik") − "Orkdal, Melhus og Malvik",
                          municipality %in% c("Steinkjer") − "Steinkjer",
                          municipality %in% c("Stjørdal") − "Stjørdal",
                          municipality %in% c("Ålesund") − "Ålesund",
                          municipality %in% c("Alta") − "Alta",
                          municipality %in% c("Bodø") − "Bodø",
                          municipality %in% c("Hammerfest") − "Hammerfest",
                          municipality %in% c("HarstadHárstták") − "Harstad",
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                          municipality %in% c("Narvik") − "Narvik",
                          municipality %in% c("Rana") − "Rana",
                          municipality %in% c("Tromsø") − "Tromsø",
                          municipality %in% c("Vefsn") − "Vefsn",
                          municipality %in% c("Bamble") − "Bamble",
                          municipality %in% c("Tjøme","Nøtterøy","Færder") − "Færder",
                          municipality %in% c("Holmestrand") − "Holmestrand",
                          municipality %in% c("Horten") − "Horten",
                          municipality %in% c("Kragerø") − "Kragerø",
                          municipality %in% c("Larvik") − "Larvik",
                          municipality %in% c("Notodden") − "Notodden",
                          municipality %in% c("Porsgrunn") − "Porsgrunn",
                          municipality %in% c("Sandefjord") − "Sandefjord",
                          municipality %in% c("Skien") − "Skien",
                          municipality %in% c("Tønsberg") − "Tønsberg",
                          municipality %in% c("Askøy") − "Askøy",
                          municipality %in% c("OsHordaland","Fusa") − "Os og Fusa",
                          municipality %in% c("Flora","Vågsøy") − "Flora og Vågsøy",
                          municipality %in% c("Førde","Jølster","Gaular","Naustdal") − "Førde, Jølster, Gaular og
Naustdal",

                          municipality %in% c("Øygarden", "Fjell", "Sund") − "Øygarden, Fjell og Sund",
                          municipality %in% c("Asker") − "Asker",
                          municipality %in% c("Askim") − "Askim",
                          municipality %in% c("Bærum") − "Bærum",
                          municipality %in% c("Drammen") − "Drammen",
                          municipality %in% c("Eidsvoll") − "Eidsvoll",
                          municipality %in% c("Fredrikstad") − "Fredrikstad",
                          municipality %in% c("Frogn") − "Frogn",
                          municipality %in% c("Halden") − "Halden",
                          municipality %in% c("Kongsberg") − "Kongsberg",
                          municipality %in% c("Lier") − "Lier",
                          municipality %in% c("Lørenskog", "Skedsmo") − "Lørenskog og Skedsmo",
                          municipality %in% c("Moss") − "Moss",
                          municipality %in% c("Nesodden") − "Nesodden",
                          municipality %in% c("Nittedal") − "Nittedal",
                          municipality %in% c("Ski","Oppegård") − "Ski og Oppegård",
                          municipality %in% c("Ringerike") − "Ringerike",
                          municipality %in% c("Rælingen") − "Rælingen",
                          municipality %in% c("Sarpsborg") − "Sarpsborg",
                          municipality %in% c("Ullensaker") − "Ullensaker",
                          municipality %in% c("Vestby") − "Vestby",
                          municipality %in% c("Ås") − "Ås",
                          municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                          "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                          "Rakkestad","Råde","Rygge","VålerØstfold") − "Distriktene i Østfold",

                          municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                          "Gjerdrum","NesAkershus","Nannestad","Hurdal") − "Distriktene i Akershus",

                          municipality %in% c("Løten", "NordOdal", "SørOdal","Eidskog",
                          "Grue", "Åsnes","VålerHedmark", "Trysil",
                          "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                          "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") − "Distriktene i Hedmark",

                          municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                          "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                          "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                          "NordreLand","SørAurdal","Etnedal","NordAurdal",
                          "VestreSlidre","ØystreSlidre","Vang") − "Distriktene i Oppland",

                          municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                          "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                          "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") − "Distriktene i
Buskerud",

                          municipality %in% c("Svelvik","SandeVestfold","Re") − "Distriktene i Vestfold",

                          municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                          "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") − "Distriktene i
Telemark",

                          municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                          "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                          "Valle","Bykle") − "Distriktene i Aust-Agder",

                          municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                          "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") − "Distriktene i Vest-
Agder",

                          municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                          "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                          "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") − "Distriktene i Rogaland",

                          municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                          "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                          "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                          "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") −
"Distriktene i Hordaland",

                          municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                          "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                          "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") −
"Distriktene i Sogn og Fjordane",

                          municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                          "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                          "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                          "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                          "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") − "Distriktene i Møre
og Romsdal",

                          municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                          "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                          "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                          "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") − "Distriktene i Nordland",

                          municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
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                              "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                              "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – "Distriktene i Troms",

                              municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                              "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

                              municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                              "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                              "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                              "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                              "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

NumHousehold <- na.omit(NumHousehold)


# Arbeidsledighet
unemploy <- read_excel("arbeidsledige.xlsx",
               skip = 3)
names(unemploy)[1:2] <- paste(c("municipality","gender"))
unemploy <- unemploy[,-2]
unemploy <- unemploy[1:423,]
unemploy$municipality <- gsub("[^\\p{L}']+", "", unemploy$municipality, perl = TRUE)
#unemploy$municipality <- substring(unemploy$municipality, 6)
unemploy[, c(2:150)] <- sapply(unemploy[, c(2:150)], as.numeric)
unemploy[is.na(unemploy)] <- 0


unemploy <- unemploy %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
unemploy <- unemploy[order(unemploy$municipality),]


unemploy <- unemploy %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
                              municipality %in% c("Trondheim") – "Trondheim",
                              municipality %in% c("Bergen") – "Bergen",
                              municipality %in% c("Stavanger") – "Stavanger",
                              municipality %in% c("Arendal") – "Arendal",
                              municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
                              municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
                              municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
                              municipality %in% c("Kristiansand") – "Kristiansand",
                              municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
                              municipality %in% c("Sandnes") – "Sandnes",
                              municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
                              municipality %in% c("Elverum") – "Elverum",
                              municipality %in% c("Gjøvik") – "Gjøvik",
                              municipality %in% c("Hamar") – "Hamar",
                              municipality %in% c("Kongsvinger") – "Kongsvinger",
                              municipality %in% c("Lillehammer") – "Lillehammer",
                              municipality %in% c("Ringsaker") – "Ringsaker",
                              municipality %in% c("Stange") – "Stange",
                              municipality %in% c("Kristiansund") – "Kristiansund",
                              municipality %in% c("Molde") – "Molde",
                              municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
                              municipality %in% c("Steinkjer") – "Steinkjer",
                              municipality %in% c("Stjørdal") – "Stjørdal",
                              municipality %in% c("Ålesund") – "Ålesund",
                              municipality %in% c("Alta") – "Alta",
                              municipality %in% c("Bodø") – "Bodø",
                              municipality %in% c("Hammerfest") – "Hammerfest",
                              municipality %in% c("HarstadHárstták") – "Harstad",
                              municipality %in% c("Narvik") – "Narvik",
                              municipality %in% c("Rana") – "Rana",
                              municipality %in% c("Tromsø") – "Tromsø",
                              municipality %in% c("Vefsn") – "Vefsn",
                              municipality %in% c("Bamble") – "Bamble",
                              municipality %in% c("Færder") – "Færder",
                              municipality %in% c("Holmestrand") – "Holmestrand",
                              municipality %in% c("Horten") – "Horten",
                              municipality %in% c("Kragerø") – "Kragerø",
                              municipality %in% c("Larvik") – "Larvik",
                              municipality %in% c("Notodden") – "Notodden",
                              municipality %in% c("Porsgrunn") – "Porsgrunn",
                              municipality %in% c("Sandefjord") – "Sandefjord",
                              municipality %in% c("Skien") – "Skien",
                              municipality %in% c("Tønsberg") – "Tønsberg",
                              municipality %in% c("Askøy") – "Askøy",
                              municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
                              municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
                              municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
                              municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
                              municipality %in% c("Asker") – "Asker",
                              municipality %in% c("Askim") – "Askim",
                              municipality %in% c("Bærum") – "Bærum",
                              municipality %in% c("Drammen") – "Drammen",
                              municipality %in% c("Eidsvoll") – "Eidsvoll",
                              municipality %in% c("Fredrikstad") – "Fredrikstad",
                              municipality %in% c("Frogn") – "Frogn",
                              municipality %in% c("Halden") – "Halden",
                              municipality %in% c("Kongsberg") – "Kongsberg",
                              municipality %in% c("Lier") – "Lier",
                              municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
                              municipality %in% c("Moss") – "Moss",
                              municipality %in% c("Nesodden") – "Nesodden",
                              municipality %in% c("Nittedal") – "Nittedal",
                              municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
                              municipality %in% c("Ringerike") – "Ringerike",

                              municipality %in% c("Rælingen") – "Rælingen",
                              municipality %in% c("Sarpsborg") – "Sarpsborg",
                              municipality %in% c("Ullensaker") – "Ullensaker",
                              municipality %in% c("Vestby") – "Vestby",
                              municipality %in% c("Ås") – "Ås",
                              municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                                  "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                                  "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

                              municipality %in% c("AurskogHoland","Sørum","Fet","Enebakk",
                                  "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

                              municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                                  "Grue", "Åsnes", "VålerHedmark", "Trysil",
                                  "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                                  "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",

                              municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                                  "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                                  "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                                  "NordreLand","SørAurdal","Etnedal","NordAurdal",
                                  "VestreSlidre","ØystreSlidre","Vang") – "Distriktene i Oppland",

                              municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                                  "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                                  "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – "Distriktene i
Buskerud",

                              municipality %in% c("Svelvik","SandeVestfold","Re") – "Distriktene i Vestfold",

                              municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                                  "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – "Distriktene i
Telemark",

                              municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                                  "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                                  "Valle","Bykle") – "Distriktene i Aust-Agder",

                              municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                                  "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – "Distriktene i Vest-
Agder",

                              municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                                  "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                                  "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – "Distriktene i Rogaland",

                              municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                                  "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                                  "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                                  "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland",

                              municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                                  "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                                  "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") –
"Distriktene i Sogn og Fjordane",

                              municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                                  "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                                  "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                                  "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                                  "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – "Distriktene i Møre
og Romsdal",

                              municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                                  "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                                  "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuosko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                                  "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – "Distriktene i Nordland",

                              municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                                  "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKáfjordKaivuono",
                                  "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – "Distriktene i Troms",

                              municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                                  "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

                              municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                                  "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                                  "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                                  "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                                  "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

unemploy <- na.omit(unemploy)

#test <- as.data.frame(is.na(unemploy))

# Arbeidsledighet i prosent
unemployprob <- read_excel("RegHeltLedige.xlsx")
colnames(unemployprob) <- unemployprob[3,]
unemployprob <- unemployprob[-c(1:3),]
names(unemployprob)[1:2] <- paste(c("municipality","age"))
unemployprob <- unemployprob[1:423,]
unemployprob$municipality <- gsub("[^\\p{L}']+", "", unemployprob$municipality, perl = TRUE)
unemployprob[, c(2:150)] <- sapply(unemployprob[, c(2:150)], as.numeric)
unemployprob <- unemployprob[,-2]
unemployprob[is.na(unemployprob)] <- 0
```

```r
unemployprob <- unemployprob %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
unemployprob <- unemployprob[order(unemployprob$municipality),]
unemployprob$value <- as.numeric(unemployprob$value)
unemployprob[is.na(unemployprob)] <- 0


unemployprob <- unemployprob %>%
  mutate(municipality = case_when(municipality %in% c('Oslokommune') ~ 'Oslo',
                                  municipality %in% c("Trondheim") ~ "Trondheim",
                                  municipality %in% c("Bergen") ~ "Bergen",
                                  municipality %in% c("Stavanger") ~ "Stavanger",
                                  municipality %in% c("Arendal") ~ "Arendal",
                                  municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
                                  municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
                                  municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
                                  municipality %in% c("Kristiansand") ~ "Kristiansand",
                                  municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
                                  municipality %in% c("Sandnes") ~ "Sandnes",
                                  municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
                                  municipality %in% c("Elverum") ~ "Elverum",
                                  municipality %in% c("Gjøvik") ~ "Gjøvik",
                                  municipality %in% c("Hamar") ~ "Hamar",
                                  municipality %in% c("Kongsvinger") ~ "Kongsvinger",
                                  municipality %in% c("Lillehammer") ~ "Lillehammer",
                                  municipality %in% c("Ringsaker") ~ "Ringsaker",
                                  municipality %in% c("Stange") ~ "Stange",
                                  municipality %in% c("Kristiansund") ~ "Kristiansund",
                                  municipality %in% c("Molde") ~ "Molde",
                                  municipality %in% c("Orkdal", "Melhus", "Malvik") ~ "Orkdal, Melhus og Malvik",
                                  municipality %in% c("Steinkjer") ~ "Steinkjer",
                                  municipality %in% c("Stjørdal") ~ "Stjørdal",
                                  municipality %in% c("Ålesund") ~ "Ålesund",
                                  municipality %in% c("Alta") ~ "Alta",
                                  municipality %in% c("Bodø") ~ "Bodø",
                                  municipality %in% c("Hammerfest") ~ "Hammerfest",
                                  municipality %in% c("HarstadHárstták") ~ "Harstad",
                                  municipality %in% c("Narvik") ~ "Narvik",
                                  municipality %in% c("Rana") ~ "Rana",
                                  municipality %in% c("Tromsø") ~ "Tromsø",
                                  municipality %in% c("Vefsn") ~ "Vefsn",
                                  municipality %in% c("Bamble") ~ "Bamble",
                                  municipality %in% c("Færder","Tjøme","Nøtterøy") ~ "Færder",
                                  municipality %in% c("Holmestrand") ~ "Holmestrand",
                                  municipality %in% c("Horten") ~ "Horten",
                                  municipality %in% c("Kragerø") ~ "Kragerø",
                                  municipality %in% c("Larvik") ~ "Larvik",
                                  municipality %in% c("Notodden") ~ "Notodden",
                                  municipality %in% c("Porsgrunn") ~ "Porsgrunn",
                                  municipality %in% c("Sandefjord") ~ "Sandefjord",
                                  municipality %in% c("Skien") ~ "Skien",
                                  municipality %in% c("Tønsberg") ~ "Tønsberg",
                                  municipality %in% c("Askøy") ~ "Askøy",
                                  municipality %in% c("OsHordaland","Fusa") ~ "Os og Fusa",
                                  municipality %in% c("Flora","Vågsøy") ~ "Flora og Vågsøy",
                                  municipality %in% c("Førde","Jølster","Gaular","Naustdal") ~ "Førde, Jølster, Gaular og
Naustdal",
                                  municipality %in% c("Øygarden", "Fjell", "Sund") ~ "Øygarden, Fjell og Sund",
                                  municipality %in% c("Asker") ~ "Asker",
                                  municipality %in% c("Askim") ~ "Askim",
                                  municipality %in% c("Bærum") ~ "Bærum",
                                  municipality %in% c("Drammen") ~ "Drammen",
                                  municipality %in% c("Eidsvoll") ~ "Eidsvoll",
                                  municipality %in% c("Fredrikstad") ~ "Fredrikstad",
                                  municipality %in% c("Frogn") ~ "Frogn",
                                  municipality %in% c("Halden") ~ "Halden",
                                  municipality %in% c("Kongsberg") ~ "Kongsberg",
                                  municipality %in% c("Lier") ~ "Lier",
                                  municipality %in% c("Lørenskog", "Skedsmo") ~ "Lørenskog og Skedsmo",
                                  municipality %in% c("Moss") ~ "Moss",
                                  municipality %in% c("Nesodden") ~ "Nesodden",
                                  municipality %in% c("Nittedal") ~ "Nittedal",
                                  municipality %in% c("Ski","Oppegård") ~ "Ski og Oppegård",
                                  municipality %in% c("Ringerike") ~ "Ringerike",
                                  municipality %in% c("Rælingen") ~ "Rælingen",
                                  municipality %in% c("Sarpsborg") ~ "Sarpsborg",
                                  municipality %in% c("Ullensaker") ~ "Ullensaker",
                                  municipality %in% c("Vestby") ~ "Vestby",
                                  municipality %in% c("Ås") ~ "Ås",
                                  municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                                                      "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                                                      "Rakkestad","Råde","Rygge","VålerØstfold") ~ "Distriktene i Østfold",

                                  municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                                                      "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ "Distriktene i Akershus",

                                  municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                                                      "Grue", "Åsnes", "VålerHedmark", "Trysil",
                                                      "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                                                      "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ "Distriktene i Hedmark",

                                  municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                                                      "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                                                      "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                                                      "NordreLand","SørAurdal","Etnedal","NordAurdal",
                                                      "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

                                  municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                                                      "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                                                      "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",

                                  municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

                                  municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                                                      "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",
```

```r
                                  municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                                                      "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                                                      "Valle","Bykle") ~ "Distriktene i Aust-Agder",

                                  municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                                                      "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

                                  municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                                                      "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                                                      "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

                                  municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                                                      "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                                                      "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                                                      "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

                                  municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                                                      "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                                                      "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

                                  municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                                                      "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                                                      "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                                                      "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                                                      "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

                                  municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                                                      "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                                                      "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",
"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                                                      "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",
"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

                                  municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                                                      "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",
"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                                                      "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",

                                  municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",
"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                                                      "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
"Distriktene i Finnmark",

                                  municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                                                      "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                                                      "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",
"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                                                      "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                                                      "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=mean(value))

unemployprob <- na.omit(unemployprob)
#sum(is.na(unemployprob))


# rente
rente <- read_excel("Utlaan (2).xlsx")
rente <- rente[c(3,19),-c(1:26)]
colnames(rente) <- rente[1,]
rente <- rente[-1,]
rente$municipality <- "hele landet"

rente <- rente %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
rente$value <- as.numeric(rente$value)


# rente årlig gjennomsnitt
aarrente <- read_excel("Bankutlansrente.xlsx")
aarrente <- aarrente[3:5,-c(1:23)]
colnames(aarrente) <- aarrente[1,]
aarrente <- aarrente[-c(1,3),]
aarrente$municipality <- "Hele landet"

aarrente <- aarrente %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
aarrente$value <- as.numeric(aarrente$value)

# Renter nye boliger månedlig
mndrente <- read_excel("RenterNyeBolig (1).xlsx")
mndrente <- mndrente[c(3,4),-c(1:3)]
colnames(mndrente) <- mndrente[1,]
mndrente <- mndrente[-1,]
mndrente$municipality <- "hele landet"

mndrente <- mndrente %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
mndrente$value <- as.numeric(mndrente$value)

# Folkemengde pr kommune
Folkemengde <- read_excel("Folkemengde.xlsx")
Folkemengde$kommune <- substring(Folkemengde$kommune, 6)
names(Folkemengde)[1:1] <- paste("municipality")
```

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```r
#test <- as.data.frame(Folkemengde$municipality)

Folkemengde <- Folkemengde %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
Folkemengde <- Folkemengde[order(Folkemengde$municipality),]

# denne har annerledes
#unique(Folkemengde$municipality)


Folkemengde <- Folkemengde %>%
  mutate(municipality = case_when(municipality %in% c("Oslo kommune") ~ "Oslo",
                municipality %in% c("Trondheim") ~ "Trondheim",
                municipality %in% c("Bergen") ~ "Bergen",
                municipality %in% c("Stavanger") ~ "Stavanger",
                municipality %in% c("Arendal") ~ "Arendal",
                municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
                municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
                municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
                municipality %in% c("Kristiansand") ~ "Kristiansand",
                municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
                municipality %in% c("Sandnes") ~ "Sandnes",
                municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
                municipality %in% c("Elverum") ~ "Elverum",
                municipality %in% c("Gjøvik") ~ "Gjøvik",
                municipality %in% c("Hamar") ~ "Hamar",
                municipality %in% c("Kongsvinger") ~ "Kongsvinger",
                municipality %in% c("Lillehammer") ~ "Lillehammer",
                municipality %in% c("Ringsaker") ~ "Ringsaker",
                municipality %in% c("Stange") ~ "Stange",
                municipality %in% c("Kristiansund") ~ "Kristiansund",
                municipality %in% c("Molde") ~ "Molde",
                municipality %in% c("Orkdal", "Melhus", "Malvik") ~ "Orkdal, Melhus og Malvik",
                municipality %in% c("Steinkjer") ~ "Steinkjer",
                municipality %in% c("Stjørdal") ~ "Stjørdal",
                municipality %in% c("Ålesund") ~ "Ålesund",
                municipality %in% c("Alta") ~ "Alta",
                municipality %in% c("Bodø") ~ "Bodø",
                municipality %in% c("Hammerfest") ~ "Hammerfest",
                municipality %in% c("Harstad - Hárstták") ~ "Harstad",
                municipality %in% c("Narvik") ~ "Narvik",
                municipality %in% c("Rana") ~ "Rana",
                municipality %in% c("Tromsø") ~ "Tromsø",
                municipality %in% c("Vefsn") ~ "Vefsn",
                municipality %in% c("Bamble") ~ "Bamble",
                municipality %in% c("Færder","Tjøme","Nøtterøy") ~ "Færder",
                municipality %in% c("Holmestrand") ~ "Holmestrand",
                municipality %in% c("Horten") ~ "Horten",
                municipality %in% c("Kragerø") ~ "Kragerø",
                municipality %in% c("Larvik") ~ "Larvik",
                municipality %in% c("Notodden") ~ "Notodden",
                municipality %in% c("Porsgrunn") ~ "Porsgrunn",
                municipality %in% c("Sandefjord") ~ "Sandefjord",
                municipality %in% c("Skien") ~ "Skien",
                municipality %in% c("Tønsberg") ~ "Tønsberg",
                municipality %in% c("Askøy") ~ "Askøy",
                municipality %in% c("Os (Hordaland)","Fusa") ~ "Os og Fusa",
                municipality %in% c("Flora","Vågsøy") ~ "Flora og Vågsøy",
                municipality %in% c("Førde","Jølster","Gaular","Naustdal") ~ "Førde, Jølster, Gaular og
Naustdal",
                municipality %in% c("Øygarden", "Fjell", "Sund") ~ "Øygarden, Fjell og Sund",
                municipality %in% c("Asker") ~ "Asker",
                municipality %in% c("Askim") ~ "Askim",
                municipality %in% c("Bærum") ~ "Bærum",
                municipality %in% c("Drammen") ~ "Drammen",
                municipality %in% c("Eidsvoll") ~ "Eidsvoll",
                municipality %in% c("Fredrikstad") ~ "Fredrikstad",
                municipality %in% c("Frogn") ~ "Frogn",
                municipality %in% c("Halden") ~ "Halden",
                municipality %in% c("Kongsberg") ~ "Kongsberg",
                municipality %in% c("Lier") ~ "Lier",
                municipality %in% c("Lørenskog", "Skedsmo") ~ "Lørenskog og Skedsmo",
                municipality %in% c("Moss") ~ "Moss",
                municipality %in% c("Nesodden") ~ "Nesodden",
                municipality %in% c("Nittedal") ~ "Nittedal",
                municipality %in% c("Ski","Oppegård") ~ "Ski og Oppegård",
                municipality %in% c("Ringerike") ~ "Ringerike",
                municipality %in% c("Rælingen") ~ "Rælingen",
                municipality %in% c("Sarpsborg") ~ "Sarpsborg",
                municipality %in% c("Ullensaker") ~ "Ullensaker",
                municipality %in% c("Vestby") ~ "Vestby",
                municipality %in% c("Ås") ~ "Ås",
                municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                   "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                   "Rakkestad","Råde","Rygge","Våler (Østfold)") ~ "Distriktene i Østfold",

                municipality %in% c("Aurskog-Høland","Sørum","Fet","Enebakk",
                   "Gjerdrum","Nes (Akershus)","Nannestad","Hurdal") ~ "Distriktene i Akershus",

                municipality %in% c("Løten", "Nord-Odal", "Sør-Odal", "Eidskog",
                   "Grue", "Åsnes", "Våler (Hedmark)", "Trysil",
                   "Åmot", "Stor-Elvdal", "Rendalen", "Engerdal",
                   "Tolga","Tynset","Alvdal","Folldal", "Os (Hedmark)") ~ "Distriktene i
Hedmark",

                municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","Nord-Fron","Sel",
                   "Sør-Fron","Ringebu","Øyer","Gausdal","Østre Toten",
                   "Vestre Toten","Jevnaker","Lunner","Gran","Søndre Land",
                   "Nordre Land","Sør-Aurdal","Etnedal","Nord-Aurdal",
                   "Vestre Slidre","Øystre Slidre","Vang") ~ "Distriktene i Oppland",

                municipality %in% c("Hole","Flå","Nes (Buskerud)","Gol","Hemsedal","Ål","Hol",
                   "Sigdal","Krødsherad","Modum","Øvre Eiker","Nedre Eiker",
                   "Røyken","Hurum","Flesberg","Rollag","Nore og Uvdal") ~ "Distriktene i
Buskerud",

                municipality %in% c("Svelvik","Sande (Vestfold)","Re") ~ "Distriktene i Vestfold",
```

```r
                municipality %in% c("Siljan","Drangedal","Nome","Bø
(Telemark)","Sauherad","Tinn","Hjartdal",
                   "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

                municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                   "Birkenes","Åmli","Iveland","Evje og Hornnes","Bygland",
                   "Valle","Bykle") ~ "Distriktene i Aust-Agder",

                municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                   "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

                municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                   "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                   "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

                municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                   "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                   "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                   "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

                municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                   "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                   "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen","Stryn") ~
"Distriktene i Sogn og Fjordane",

                municipality %in% c("Vanylven","Sande (Møre og Romsdal)","Herøy (Møre og
Romsdal)","Ulstein","Hareid","Volda",
                   "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                   "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                   "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                   "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

                municipality %in% c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","Herøy
(Nordland)","Alstahaug",
                   "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                   "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",
                   "Fauske - Fuosko","Sørfold","Steigen","Hamarøy - Hábmer","Divtasvuodna -
Tysfjord","Lødingen",
                   "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",
                   "Vestvågøy","Vågan","Hadsel","Bø (Nordland)","Øksnes","Sortland -
Suortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

                municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","Loabák -
Lavangen","Bardu",
                   "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",
                   "Lenvik","Balsfjord","Karlsøy","Lyngen","Storfjord - Omasvuotna -
Omasvuono","Gáivuotna - Kåfjord - Kaivuono",
                   "Skjervøy","Nordreisa - Ráisa - Raisi","Kvænangen") ~ "Distriktene i Troms",

                municipality %in% c("Vardø","Vadsø","Guovdageaidnu -
Kautokeino","Loppa","Hasvik","Kvalsund","Måsøy",
                   "Nordkapp","Porsanger - Porsángu - Porsanki","Kárásjohka -
Karasjok","Lebesby","Gamvik",
                   "Berlevåg","Deatnu - Tana","Unjárga - Nesseby","Båtsfjord","Sør-Varanger") ~
"Distriktene i Finnmark",

                municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                   "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                   "Midtre Gauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",
                   "Levanger","Verdal","Verran","Namdalseid","Snåase -
Snåsa","Lierne","Raarvihke - Røyrvik",
                   "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                   "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal","Rindal (-2018)") ~
"Distriktene i Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

# Folkemengde <- na.omit(Folkemengde)


# fullførte og igangsatte boliger
# må deles inn i to pga store datasett
bolig1 <- read_excel("normaleboligbygget.xlsx")
colnames(bolig1) <- bolig1[3,]
names(bolig1)[1:2] <- paste(c("municipality","type"))
bolig1 <- bolig1[-c(1:3),]
bolig1$municipality <- na.locf(bolig1$municipality, na.rm = F)
bolig1$municipality <- gsub("[^\\p{L}]+", "", bolig1$municipality, perl = TRUE)
bolig1[is.na(bolig1)] <- 0


bolig2 <- read_excel("storeboligbygget.xlsx")
colnames(bolig2) <- bolig2[3,]
names(bolig2)[1:2] <- paste(c("municipality","type"))
bolig2 <- bolig2[-c(1:3),]
bolig2$municipality <- na.locf(bolig2$municipality, na.rm = F)
bolig2$municipality <- gsub("[^\\p{L}]+", "", bolig2$municipality, perl = TRUE)
bolig2[is.na(bolig2)] <- 0


igangsatt1 <- bolig1[,c(1:70)]
fullforte1 <- bolig1[,c(1,2,71:138)]
igangsatt2 <- bolig2[,c(1:70)]
fullforte2 <- bolig2[,c(1,2,71:138)]

igangsatteneboig <- igangsatt1 %>% filter(type == "111 Enebolig")
igangsatteneboligmutleie <- igangsatt1 %>% filter(type == "112 Enebolig med hybelleilighet, sokkelleilighet o.l.")
igangsattverttomansbolig <- igangsatt1 %>% filter(type == "121 Del av tomannsbolig, vertikaldelt")
igangsattrekkehus <- igangsatt1 %>% filter(type == "131 Rekkehus")
igangsattandresmaahus <- igangsatt1 %>% filter(type == "136 Andre småhus med 3 boliger eller flere")
igangsattfriboligbygg2et <- igangsatt2 %>% filter(type == "141 Store frittliggende boligbygg på 2 etasjer")
igangsattfriboligbygg34et <- igangsatt2 %>% filter(type == "142 Store frittliggende boligbygg på 3 og 4 etasjer")
igangsattfriboligbygg5et <- igangsatt2 %>% filter(type == "143 Store frittliggende boligbygg på 5 etasjer eller over")
igangsattsamboligbygg5et <- igangsatt2 %>% filter(type == "146 Stort sammenbygd boligbygg på 5 etasjer eller over")

fullforteeneboig <- fullforte1 %>% filter(type == "111 Enebolig")
fullforteeneboligmutleie <- fullforte1 %>% filter(type == "112 Enebolig med hybelleilighet, sokkelleilighet o.l.")
fullforteverttomansbolig <- fullforte1 %>% filter(type == "121 Del av tomannsbolig, vertikaldelt")
```

```r
fullforterekkehus <- fullforte1 %>% filter(type == "131 Rekkehus")
fullforteandresmaahus <- fullforte1 %>% filter(type == "136 Andre småhus med 3 boliger eller flere")
fullfortefriboligbygg2et <- fullforte2 %>% filter(type == "141 Store frittliggende boligbygg på 2 etasjer")
fullfortefriboligbygg34et <- fullforte2 %>% filter(type == "142 Store frittliggende boligbygg på 3 og 4 etasjer")
fullfortefriboligbygg5et <- fullforte2 %>% filter(type == "143 Store frittliggende boligbygg på 5 etasjer eller over")
fullfortesamboligbygg5et <- fullforte2 %>% filter(type == "146 Stort sammenbygd boligbygg på 5 etasjer eller over")


# følg denne framgangsmåten for resten
igangsattenebolig <- igangsattenebolig[,-2]
igangsattenebolig[, c(2:69)] <- sapply(igangsattenebolig[, c(2:69)], as.numeric)
igangsattenebolig <- igangsattenebolig %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
igangsattenebolig <- igangsattenebolig[order(igangsattenebolig$municipality),]


igangsatteneboligmutleie <- igangsatteneboligmutleie[,-2]
igangsatteneboligmutleie[, c(2:69)] <- sapply(igangsatteneboligmutleie[, c(2:69)], as.numeric)
igangsatteneboligmutleie <- igangsatteneboligmutleie %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
igangsatteneboligmutleie <- igangsatteneboligmutleie[order(igangsatteneboligmutleie$municipality),]


igangsattverttomansbolig <- igangsattverttomansbolig[,-2]
igangsattverttomansbolig[, c(2:69)] <- sapply(igangsattverttomansbolig[, c(2:69)], as.numeric)
igangsattverttomansbolig <- igangsattverttomansbolig %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
igangsattverttomansbolig <- igangsattverttomansbolig[order(igangsattverttomansbolig$municipality),]


igangsattrekkehus <- igangsattrekkehus[,-2]
igangsattrekkehus[, c(2:69)] <- sapply(igangsattrekkehus[, c(2:69)], as.numeric)
igangsattrekkehus <- igangsattrekkehus %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
igangsattrekkehus <- igangsattrekkehus[order(igangsattrekkehus$municipality),]


igangsattandresmaahus <- igangsattandresmaahus[,-2]
igangsattandresmaahus[, c(2:69)] <- sapply(igangsattandresmaahus[, c(2:69)], as.numeric)
igangsattandresmaahus <- igangsattandresmaahus %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
igangsattandresmaahus <- igangsattandresmaahus[order(igangsattandresmaahus$municipality),]


igangsattfriboligbygg2et <- igangsattfriboligbygg2et[,-2]
igangsattfriboligbygg2et[, c(2:69)] <- sapply(igangsattfriboligbygg2et[, c(2:69)], as.numeric)
igangsattfriboligbygg2et <- igangsattfriboligbygg2et %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
igangsattfriboligbygg2et <- igangsattfriboligbygg2et[order(igangsattfriboligbygg2et$municipality),]


igangsattfriboligbygg34et <- igangsattfriboligbygg34et[,-2]
igangsattfriboligbygg34et[, c(2:69)] <- sapply(igangsattfriboligbygg34et[, c(2:69)], as.numeric)
igangsattfriboligbygg34et <- igangsattfriboligbygg34et %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
igangsattfriboligbygg34et <- igangsattfriboligbygg34et[order(igangsattfriboligbygg34et$municipality),]


igangsattfriboligbygg5et <- igangsattfriboligbygg5et[,-2]
igangsattfriboligbygg5et[, c(2:69)] <- sapply(igangsattfriboligbygg5et[, c(2:69)], as.numeric)
igangsattfriboligbygg5et <- igangsattfriboligbygg5et %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
igangsattfriboligbygg5et <- igangsattfriboligbygg5et[order(igangsattfriboligbygg5et$municipality),]


igangsattsamboligbygg5et <- igangsattsamboligbygg5et[,-2]
igangsattsamboligbygg5et[, c(2:69)] <- sapply(igangsattsamboligbygg5et[, c(2:69)], as.numeric)
igangsattsamboligbygg5et <- igangsattsamboligbygg5et %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
igangsattsamboligbygg5et <- igangsattsamboligbygg5et[order(igangsattsamboligbygg5et$municipality),]


fullforteenebolig <- fullforteenebolig[,-2]
fullforteenebolig[, c(2:69)] <- sapply(fullforteenebolig[, c(2:69)], as.numeric)
fullforteenebolig <- fullforteenebolig %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
fullforteenebolig <- fullforteenebolig[order(fullforteenebolig$municipality),]


fullforteeneboligmutleie <- fullforteeneboligmutleie[,-2]
fullforteeneboligmutleie[, c(2:69)] <- sapply(fullforteeneboligmutleie[, c(2:69)], as.numeric)
fullforteeneboligmutleie <- fullforteeneboligmutleie %>%
  gather(variable, value, -`municipality`) %>%
```

```r
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
fullforteeneboligmutleie <- fullforteeneboligmutleie[order(fullforteeneboligmutleie$municipality),]


fullforteverttomansbolig <- fullforteverttomansbolig[,-2]
fullforteverttomansbolig[, c(2:69)] <- sapply(fullforteverttomansbolig[, c(2:69)], as.numeric)
fullforteverttomansbolig <- fullforteverttomansbolig %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
fullforteverttomansbolig <- fullforteverttomansbolig[order(fullforteverttomansbolig$municipality),]


fullforterekkehus <- fullforterekkehus[,-2]
fullforterekkehus[, c(2:69)] <- sapply(fullforterekkehus[, c(2:69)], as.numeric)
fullforterekkehus <- fullforterekkehus %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
fullforterekkehus <- fullforterekkehus[order(fullforterekkehus$municipality),]


fullforteandresmaahus <- fullforteandresmaahus[,-2]
fullforteandresmaahus[, c(2:69)] <- sapply(fullforteandresmaahus[, c(2:69)], as.numeric)
fullforteandresmaahus <- fullforteandresmaahus %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
fullforteandresmaahus <- fullforteandresmaahus[order(fullforteandresmaahus$municipality),]


fullfortefriboligbygg2et <- fullfortefriboligbygg2et[,-2]
fullfortefriboligbygg2et[, c(2:69)] <- sapply(fullfortefriboligbygg2et[, c(2:69)], as.numeric)
fullfortefriboligbygg2et <- fullfortefriboligbygg2et %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
fullfortefriboligbygg2et <- fullfortefriboligbygg2et[order(fullfortefriboligbygg2et$municipality),]


fullfortefriboligbygg34et <- fullfortefriboligbygg34et[,-2]
fullfortefriboligbygg34et[, c(2:69)] <- sapply(fullfortefriboligbygg34et[, c(2:69)], as.numeric)
fullfortefriboligbygg34et <- fullfortefriboligbygg34et %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
fullfortefriboligbygg34et <- fullfortefriboligbygg34et[order(fullfortefriboligbygg34et$municipality),]


fullfortefriboligbygg5et <- fullfortefriboligbygg5et [,-2]
fullfortefriboligbygg5et[, c(2:69)] <- sapply(fullfortefriboligbygg5et[, c(2:69)], as.numeric)
fullfortefriboligbygg5et <- fullfortefriboligbygg5et %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
fullfortefriboligbygg5et <- fullfortefriboligbygg5et[order(fullfortefriboligbygg5et$municipality),]


fullfortesamboligbygg5et <- fullfortesamboligbygg5et [,-2]
fullfortesamboligbygg5et[, c(2:69)] <- sapply(fullfortesamboligbygg5et[, c(2:69)], as.numeric)
fullfortesamboligbygg5et <- fullfortesamboligbygg5et %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
fullfortesamboligbygg5et <- fullfortesamboligbygg5et[order(fullfortesamboligbygg5et$municipality),]

# alle på samme kommunenivå

igangsattenebolig <- igangsattenebolig %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") ~ "Oslo",
                                  municipality %in% c("Trondheim") ~ "Trondheim",
                                  municipality %in% c("Bergen") ~ "Bergen",
                                  municipality %in% c("Stavanger") ~ "Stavanger",
                                  municipality %in% c("Arendal") ~ "Arendal",
                                  municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
                                  municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
                                  municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
                                  municipality %in% c("Kristiansand") ~ "Kristiansand",
                                  municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
                                  municipality %in% c("Sandnes") ~ "Sandnes",
                                  municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
                                  municipality %in% c("Elverum") ~ "Elverum",
                                  municipality %in% c("Gjøvik") ~ "Gjøvik",
                                  municipality %in% c("Hamar") ~ "Hamar",
                                  municipality %in% c("Kongsvinger") ~ "Kongsvinger",
                                  municipality %in% c("Lillehammer") ~ "Lillehammer",
                                  municipality %in% c("Ringsaker") ~ "Ringsaker",
                                  municipality %in% c("Stange") ~ "Stange",
                                  municipality %in% c("Kristiansund") ~ "Kristiansund",
                                  municipality %in% c("Molde") ~ "Molde",
                                  municipality %in% c("Orkdal", "Melhus", "Malvik") ~ "Orkdal, Melhus og Malvik",
                                  municipality %in% c("Steinkjer") ~ "Steinkjer",
                                  municipality %in% c("Stjørdal") ~ "Stjørdal",
                                  municipality %in% c("Ålesund") ~ "Ålesund",
                                  municipality %in% c("Alta") ~ "Alta",
                                  municipality %in% c("Bodø") ~ "Bodø",
                                  municipality %in% c("Hammerfest") ~ "Hammerfest",
                                  municipality %in% c("HarstadHárstták") ~ "Harstad",
                                  municipality %in% c("Narvik") ~ "Narvik",
                                  municipality %in% c("Rana") ~ "Rana",
                                  municipality %in% c("Tromsø") ~ "Tromsø",
                                  municipality %in% c("Vefsn") ~ "Vefsn",
                                  municipality %in% c("Bamble") ~ "Bamble",
                                  municipality %in% c("Færder") ~ "Færder",
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                municipality %in% c("Holmestrand") ~ "Holmestrand",
                municipality %in% c("Horten") ~ "Horten",
                municipality %in% c("Kragerø") ~ "Kragerø",
                municipality %in% c("Larvik") ~ "Larvik",
                municipality %in% c("Notodden") ~ "Notodden",
                municipality %in% c("Porsgrunn") ~ "Porsgrunn",
                municipality %in% c("Sandefjord") ~ "Sandefjord",
                municipality %in% c("Skien") ~ "Skien",
                municipality %in% c("Tønsberg") ~ "Tønsberg",
                municipality %in% c("Askøy") ~ "Askøy",
                municipality %in% c("OsHordaland","Fusa") ~ "Os og Fusa",
                municipality %in% c("Flora","Vågsøy") ~ "Flora og Vågsøy",
                municipality %in% c("Førde","Jølster","Gaular","Naustdal") ~ "Førde, Jølster, Gaular og
Naustdal",
                municipality %in% c("Øygarden", "Fjell", "Sund") ~ "Øygarden, Fjell og Sund",
                municipality %in% c("Asker") ~ "Asker",
                municipality %in% c("Askim") ~ "Askim",
                municipality %in% c("Bærum") ~ "Bærum",
                municipality %in% c("Drammen") ~ "Drammen",
                municipality %in% c("Eidsvoll") ~ "Eidsvoll",
                municipality %in% c("Fredrikstad") ~ "Fredrikstad",
                municipality %in% c("Frogn") ~ "Frogn",
                municipality %in% c("Halden") ~ "Halden",
                municipality %in% c("Kongsberg") ~ "Kongsberg",
                municipality %in% c("Lier") ~ "Lier",
                municipality %in% c("Lørenskog", "Skedsmo") ~ "Lørenskog og Skedsmo",
                municipality %in% c("Moss") ~ "Moss",
                municipality %in% c("Nesodden") ~ "Nesodden",
                municipality %in% c("Nittedal") ~ "Nittedal",
                municipality %in% c("Ski","Oppegård") ~ "Ski og Oppegård",
                municipality %in% c("Ringerike") ~ "Ringerike",
                municipality %in% c("Rælingen") ~ "Rælingen",
                municipality %in% c("Sarpsborg") ~ "Sarpsborg",
                municipality %in% c("Ullensaker") ~ "Ullensaker",
                municipality %in% c("Vestby") ~ "Vestby",
                municipality %in% c("Ås") ~ "Ås",
                municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                        "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                        "Rakkestad","Råde","Hobøl","Rygge","VålerØstfold") ~ "Distriktene i Østfold",

                municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                        "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ "Distriktene i Akershus",

                municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                        "Grue", "Åsnes", "VålerHedmark", "Trysil",
                        "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                        "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ "Distriktene i Hedmark",

                municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                        "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                        "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                        "NordreLand","SørAurdal","Etnedal","NordAurdal",
                        "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

                municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                        "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                        "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",

                municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

                municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                        "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

                municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                        "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                        "Valle","Bykle") ~ "Distriktene i Aust-Agder",

                municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                        "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

                municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                        "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                        "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

                municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                        "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                        "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                        "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

                municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                        "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                        "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

                municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                        "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                        "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                        "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                        "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

                municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                        "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                        "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                        "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

                municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                        "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                        "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",

                municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                        "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
"Distriktene i Finnmark",

                municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                        "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                        "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                        "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                        "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

igangsattenebolig <- na.omit(igangsattenebolig)

igangsatteneboligmutleie <- igangsatteneboligmutleie %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") ~ "Oslo",
                municipality %in% c("Trondheim") ~ "Trondheim",
                municipality %in% c("Bergen") ~ "Bergen",
                municipality %in% c("Stavanger") ~ "Stavanger",
                municipality %in% c("Arendal") ~ "Arendal",
                municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
                municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
                municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
                municipality %in% c("Kristiansand") ~ "Kristiansand",
                municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
                municipality %in% c("Sandnes") ~ "Sandnes",
                municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
                municipality %in% c("Elverum") ~ "Elverum",
                municipality %in% c("Gjøvik") ~ "Gjøvik",
                municipality %in% c("Hamar") ~ "Hamar",
                municipality %in% c("Kongsvinger") ~ "Kongsvinger",
                municipality %in% c("Lillehammer") ~ "Lillehammer",
                municipality %in% c("Ringsaker") ~ "Ringsaker",
                municipality %in% c("Stange") ~ "Stange",
                municipality %in% c("Kristiansund") ~ "Kristiansund",
                municipality %in% c("Molde") ~ "Molde",
                municipality %in% c("Orkdal", "Melhus", "Malvik") ~ "Orkdal, Melhus og Malvik",
                municipality %in% c("Steinkjer") ~ "Steinkjer",
                municipality %in% c("Stjørdal") ~ "Stjørdal",
                municipality %in% c("Ålesund") ~ "Ålesund",
                municipality %in% c("Alta") ~ "Alta",
                municipality %in% c("Bodø") ~ "Bodø",
                municipality %in% c("Hammerfest") ~ "Hammerfest",
                municipality %in% c("HarstadHárstták") ~ "Harstad",
                municipality %in% c("Narvik") ~ "Narvik",
                municipality %in% c("Rana") ~ "Rana",
                municipality %in% c("Tromsø") ~ "Tromsø",
                municipality %in% c("Vefsn") ~ "Vefsn",
                municipality %in% c("Bamble") ~ "Bamble",
                municipality %in% c("Færder") ~ "Færder",
                municipality %in% c("Holmestrand") ~ "Holmestrand",
                municipality %in% c("Horten") ~ "Horten",
                municipality %in% c("Kragerø") ~ "Kragerø",
                municipality %in% c("Larvik") ~ "Larvik",
                municipality %in% c("Notodden") ~ "Notodden",
                municipality %in% c("Porsgrunn") ~ "Porsgrunn",
                municipality %in% c("Sandefjord") ~ "Sandefjord",
                municipality %in% c("Skien") ~ "Skien",
                municipality %in% c("Tønsberg") ~ "Tønsberg",
                municipality %in% c("Askøy") ~ "Askøy",
                municipality %in% c("OsHordaland","Fusa") ~ "Os og Fusa",
                municipality %in% c("Flora","Vågsøy") ~ "Flora og Vågsøy",
                municipality %in% c("Førde","Jølster","Gaular","Naustdal") ~ "Førde, Jølster, Gaular og
Naustdal",
                municipality %in% c("Øygarden", "Fjell", "Sund") ~ "Øygarden, Fjell og Sund",
                municipality %in% c("Asker") ~ "Asker",
                municipality %in% c("Askim") ~ "Askim",
                municipality %in% c("Bærum") ~ "Bærum",
                municipality %in% c("Drammen") ~ "Drammen",
                municipality %in% c("Eidsvoll") ~ "Eidsvoll",
                municipality %in% c("Fredrikstad") ~ "Fredrikstad",
                municipality %in% c("Frogn") ~ "Frogn",
                municipality %in% c("Halden") ~ "Halden",
                municipality %in% c("Kongsberg") ~ "Kongsberg",
                municipality %in% c("Lier") ~ "Lier",
                municipality %in% c("Lørenskog", "Skedsmo") ~ "Lørenskog og Skedsmo",
                municipality %in% c("Moss") ~ "Moss",
                municipality %in% c("Nesodden") ~ "Nesodden",
                municipality %in% c("Nittedal") ~ "Nittedal",
                municipality %in% c("Ski","Oppegård") ~ "Ski og Oppegård",
                municipality %in% c("Ringerike") ~ "Ringerike",
                municipality %in% c("Rælingen") ~ "Rælingen",
                municipality %in% c("Sarpsborg") ~ "Sarpsborg",
                municipality %in% c("Ullensaker") ~ "Ullensaker",
                municipality %in% c("Vestby") ~ "Vestby",
                municipality %in% c("Ås") ~ "Ås",
                municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                        "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                        "Rakkestad","Råde","Rygge","VålerØstfold") ~ "Distriktene i Østfold",

                municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                        "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ "Distriktene i Akershus",

                municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                        "Grue", "Åsnes", "VålerHedmark", "Trysil",
                        "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                        "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ "Distriktene i Hedmark",

                municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                        "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                        "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                        "NordreLand","SørAurdal","Etnedal","NordAurdal",
                        "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

                municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                        "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
```

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                    "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",

          municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

          municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                    "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

          municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                    "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                    "Valle","Bykle") ~ "Distriktene i Aust-Agder",

          municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                    "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

          municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                    "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                    "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

          municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                    "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                    "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                    "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

          municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                    "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                    "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

          municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                    "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                    "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                    "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                    "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

          municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                    "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                    "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                    "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

          municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                    "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKáfjordKaivuono",
                    "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",

          municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                    "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
"Distriktene i Finnmark",

          municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                    "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                    "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                    "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                    "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

igangsatteneboligmutleie <- na.omit(igangsatteneboligmutleie)


igangsattverttomansbolig <- igangsattverttomansbolig %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") ~ "Oslo",
          municipality %in% c("Trondheim") ~ "Trondheim",
          municipality %in% c("Bergen") ~ "Bergen",
          municipality %in% c("Stavanger") ~ "Stavanger",
          municipality %in% c("Arendal") ~ "Arendal",
          municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
          municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
          municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
          municipality %in% c("Kristiansand") ~ "Kristiansand",
          municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
          municipality %in% c("Sandnes") ~ "Sandnes",
          municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
          municipality %in% c("Elverum") ~ "Elverum",
          municipality %in% c("Gjøvik") ~ "Gjøvik",
          municipality %in% c("Hamar") ~ "Hamar",
          municipality %in% c("Kongsvinger") ~ "Kongsvinger",
          municipality %in% c("Lillehammer") ~ "Lillehammer",
          municipality %in% c("Ringsaker") ~ "Ringsaker",
          municipality %in% c("Stange") ~ "Stange",
          municipality %in% c("Kristiansund") ~ "Kristiansund",
          municipality %in% c("Molde") ~ "Molde",
          municipality %in% c("Orkdal", "Melhus", "Malvik") ~ "Orkdal, Melhus og Malvik",
          municipality %in% c("Steinkjer") ~ "Steinkjer",
          municipality %in% c("Stjørdal") ~ "Stjørdal",
          municipality %in% c("Ålesund") ~ "Ålesund",
          municipality %in% c("Alta") ~ "Alta",
          municipality %in% c("Bodø") ~ "Bodø",
          municipality %in% c("Hammerfest") ~ "Hammerfest",
          municipality %in% c("HarstadHárstták") ~ "Harstad",
          municipality %in% c("Narvik") ~ "Narvik",
          municipality %in% c("Rana") ~ "Rana",
          municipality %in% c("Tromsø") ~ "Tromsø",
          municipality %in% c("Vefsn") ~ "Vefsn",
          municipality %in% c("Bamble") ~ "Bamble",
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          municipality %in% c("Færder") ~ "Færder",
          municipality %in% c("Holmestrand") ~ "Holmestrand",
          municipality %in% c("Horten") ~ "Horten",
          municipality %in% c("Kragerø") ~ "Kragerø",
          municipality %in% c("Larvik") ~ "Larvik",
          municipality %in% c("Notodden") ~ "Notodden",
          municipality %in% c("Porsgrunn") ~ "Porsgrunn",
          municipality %in% c("Sandefjord") ~ "Sandefjord",
          municipality %in% c("Skien") ~ "Skien",
          municipality %in% c("Tønsberg") ~ "Tønsberg",
          municipality %in% c("Askøy") ~ "Askøy",
          municipality %in% c("OsHordaland","Fusa") ~ "Os og Fusa",
          municipality %in% c("Flora","Vågsøy") ~ "Flora og Vågsøy",
          municipality %in% c("Førde","Jølster","Gaular","Naustdal") ~ "Førde, Jølster, Gaular og
Naustdal",

          municipality %in% c("Øygarden", "Fjell", "Sund") ~ "Øygarden, Fjell og Sund",
          municipality %in% c("Asker") ~ "Asker",
          municipality %in% c("Askim") ~ "Askim",
          municipality %in% c("Bærum") ~ "Bærum",
          municipality %in% c("Drammen") ~ "Drammen",
          municipality %in% c("Eidsvoll") ~ "Eidsvoll",
          municipality %in% c("Fredrikstad") ~ "Fredrikstad",
          municipality %in% c("Frogn") ~ "Frogn",
          municipality %in% c("Halden") ~ "Halden",
          municipality %in% c("Kongsberg") ~ "Kongsberg",
          municipality %in% c("Lier") ~ "Lier",
          municipality %in% c("Lørenskog", "Skedsmo") ~ "Lørenskog og Skedsmo",
          municipality %in% c("Moss") ~ "Moss",
          municipality %in% c("Nesodden") ~ "Nesodden",
          municipality %in% c("Nittedal") ~ "Nittedal",
          municipality %in% c("Ski","Oppegård") ~ "Ski og Oppegård",
          municipality %in% c("Ringerike") ~ "Ringerike",
          municipality %in% c("Rælingen") ~ "Rælingen",
          municipality %in% c("Sarpsborg") ~ "Sarpsborg",
          municipality %in% c("Ullensaker") ~ "Ullensaker",
          municipality %in% c("Vestby") ~ "Vestby",
          municipality %in% c("Ås") ~ "Ås",
          municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                    "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                    "Rakkestad","Råde","Rygge","VålerØstfold") ~ "Distriktene i Østfold",

          municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                    "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ "Distriktene i Akershus",

          municipality %in% c("Løten", "NordOdal", "SørOdal","Eidskog",
                    "Grue", "Åsnes", "VålerHedmark", "Trysil",
                    "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                    "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ "Distriktene i Hedmark",

          municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                    "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                    "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                    "NordreLand","SørAurdal","Etnedal","NordAurdal",
                    "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

          municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                    "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                    "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",

          municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

          municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                    "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

          municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                    "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                    "Valle","Bykle") ~ "Distriktene i Aust-Agder",

          municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                    "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

          municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                    "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                    "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

          municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                    "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                    "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                    "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

          municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                    "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                    "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

          municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                    "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                    "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                    "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                    "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

          municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                    "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                    "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                    "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

          municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                    "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKáfjordKaivuono",
                    "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",
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```
                          municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                            "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

                          municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                            "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                            "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                            "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                            "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

igangsattverttomansbolig <- na.omit(igangsattverttomansbolig)

igangsattrekkehus <- igangsattrekkehus %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
                          municipality %in% c("Trondheim") – "Trondheim",
                          municipality %in% c("Bergen") – "Bergen",
                          municipality %in% c("Stavanger") – "Stavanger",
                          municipality %in% c("Arendal") – "Arendal",
                          municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
                          municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
                          municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
                          municipality %in% c("Kristiansand") – "Kristiansand",
                          municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
                          municipality %in% c("Sandnes") – "Sandnes",
                          municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
                          municipality %in% c("Elverum") – "Elverum",
                          municipality %in% c("Gjøvik") – "Gjøvik",
                          municipality %in% c("Hamar") – "Hamar",
                          municipality %in% c("Kongsvinger") – "Kongsvinger",
                          municipality %in% c("Lillehammer") – "Lillehammer",
                          municipality %in% c("Ringsaker") – "Ringsaker",
                          municipality %in% c("Stange") – "Stange",
                          municipality %in% c("Kristiansund") – "Kristiansund",
                          municipality %in% c("Molde") – "Molde",
                          municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
                          municipality %in% c("Steinkjer") – "Steinkjer",
                          municipality %in% c("Stjørdal") – "Stjørdal",
                          municipality %in% c("Ålesund") – "Ålesund",
                          municipality %in% c("Alta") – "Alta",
                          municipality %in% c("Bodø") – "Bodø",
                          municipality %in% c("Hammerfest") – "Hammerfest",
                          municipality %in% c("HarstadHárstták") – "Harstad",
                          municipality %in% c("Narvik") – "Narvik",
                          municipality %in% c("Rana") – "Rana",
                          municipality %in% c("Tromsø") – "Tromsø",
                          municipality %in% c("Vefsn") – "Vefsn",
                          municipality %in% c("Bamble") – "Bamble",
                          municipality %in% c("Færder") – "Færder",
                          municipality %in% c("Holmestrand") – "Holmestrand",
                          municipality %in% c("Horten") – "Horten",
                          municipality %in% c("Kragerø") – "Kragerø",
                          municipality %in% c("Larvik") – "Larvik",
                          municipality %in% c("Notodden") – "Notodden",
                          municipality %in% c("Porsgrunn") – "Porsgrunn",
                          municipality %in% c("Sandefjord") – "Sandefjord",
                          municipality %in% c("Skien") – "Skien",
                          municipality %in% c("Tønsberg") – "Tønsberg",
                          municipality %in% c("Askøy") – "Askøy",
                          municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
                          municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
                          municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
                          municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
                          municipality %in% c("Asker") – "Asker",
                          municipality %in% c("Askim") – "Askim",
                          municipality %in% c("Bærum") – "Bærum",
                          municipality %in% c("Drammen") – "Drammen",
                          municipality %in% c("Eidsvoll") – "Eidsvoll",
                          municipality %in% c("Fredrikstad") – "Fredrikstad",
                          municipality %in% c("Frogn") – "Frogn",
                          municipality %in% c("Halden") – "Halden",
                          municipality %in% c("Kongsberg") – "Kongsberg",
                          municipality %in% c("Lier) – "Lier",
                          municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
                          municipality %in% c("Moss") – "Moss",
                          municipality %in% c("Nesodden") – "Nesodden",
                          municipality %in% c("Nittedal") – "Nittedal",
                          municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
                          municipality %in% c("Ringerike") – "Ringerike",
                          municipality %in% c("Rælingen") – "Rælingen",
                          municipality %in% c("Sarpsborg") – "Sarpsborg",
                          municipality %in% c("Ullensaker") – "Ullensaker",
                          municipality %in% c("Vestby") – "Vestby",
                          municipality %in% c("Ås) – "Ås",
                          municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                            "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                            "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

                          municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                            "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

                          municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                            "Grue", "Åsnes", "VålerHedmark", "Trysil",
                            "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                            "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",

                          municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                            "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                            "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                            "NordreLand","SørAurdal","Etnedal","NordAurdal",
                            "VestreSlidre","ØystreSlidre","Vang") – "Distriktene i Oppland",

                          municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                            "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
```

```
                            "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – "Distriktene i
Buskerud",

                          municipality %in% c("Svelvik","SandeVestfold","Re") – "Distriktene i Vestfold",

                          municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                            "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – "Distriktene i
Telemark",

                          municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                            "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                            "Valle","Bykle") – "Distriktene i Aust-Agder",

                          municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                            "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – "Distriktene i Vest-
Agder",

                          municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                            "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                            "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – "Distriktene i Rogaland",

                          municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                            "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                            "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                            "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland",

                          municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                            "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                            "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen","Stryn") –
"Distriktene i Sogn og Fjordane",

                          municipality %in%
c("Vanylven","SandeMøreogRomsdal","Ulstein","Hareid","Volda",
                            "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                            "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                            "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                            "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – "Distriktene i Møre
og Romsdal",

                          municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                            "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                            "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                            "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – "Distriktene i Nordland",

                          municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                            "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKáfjordKaivuono",
                            "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – "Distriktene i Troms",

                          municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                            "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

                          municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                            "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                            "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                            "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                            "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
igangsattrekkehus <- na.omit(igangsattrekkehus)


igangsattandresmaahus <- igangsattandresmaahus %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
                          municipality %in% c("Trondheim") – "Trondheim",
                          municipality %in% c("Bergen") – "Bergen",
                          municipality %in% c("Stavanger") – "Stavanger",
                          municipality %in% c("Arendal") – "Arendal",
                          municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
                          municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
                          municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
                          municipality %in% c("Kristiansand") – "Kristiansand",
                          municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
                          municipality %in% c("Sandnes") – "Sandnes",
                          municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
                          municipality %in% c("Elverum") – "Elverum",
                          municipality %in% c("Gjøvik") – "Gjøvik",
                          municipality %in% c("Hamar") – "Hamar",
                          municipality %in% c("Kongsvinger") – "Kongsvinger",
                          municipality %in% c("Lillehammer") – "Lillehammer",
                          municipality %in% c("Ringsaker") – "Ringsaker",
                          municipality %in% c("Stange") – "Stange",
                          municipality %in% c("Kristiansund") – "Kristiansund",
                          municipality %in% c("Molde") – "Molde",
                          municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
                          municipality %in% c("Steinkjer") – "Steinkjer",
                          municipality %in% c("Stjørdal") – "Stjørdal",
                          municipality %in% c("Ålesund") – "Ålesund",
                          municipality %in% c("Alta") – "Alta",
                          municipality %in% c("Bodø") – "Bodø",
                          municipality %in% c("Hammerfest") – "Hammerfest",
                          municipality %in% c("HarstadHárstták") – "Harstad",
                          municipality %in% c("Narvik") – "Narvik",
                          municipality %in% c("Rana") – "Rana",
                          municipality %in% c("Tromsø") – "Tromsø",
                          municipality %in% c("Vefsn") – "Vefsn",
                          municipality %in% c("Bamble") – "Bamble",
                          municipality %in% c("Færder") – "Færder",
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                municipality %in% c("Holmestrand") ~ 'Holmestrand',
                municipality %in% c("Horten") ~ 'Horten',
                municipality %in% c("Kragerø") ~ 'Kragerø',
                municipality %in% c("Larvik") ~ 'Larvik',
                municipality %in% c("Notodden") ~ 'Notodden',
                municipality %in% c("Porsgrunn") ~ 'Porsgrunn',
                municipality %in% c("Sandefjord") ~ 'Sandefjord',
                municipality %in% c("Skien") ~ 'Skien',
                municipality %in% c("Tønsberg") ~ 'Tønsberg',
                municipality %in% c("Askøy") ~ 'Askøy',
                municipality %in% c("OsHordaland","Fusa") ~ 'Os og Fusa',
                municipality %in% c("Flora","Vågsøy") ~ 'Flora og Vågsøy',
                municipality %in% c("Førde",'Jølster","Gaular","Naustdal") ~ 'Førde, Jølster, Gaular og
Naustdal',
                municipality %in% c("Øygarden", "Fjell", "Sund") ~ 'Øygarden, Fjell og Sund',
                municipality %in% c("Asker") ~ 'Asker',
                municipality %in% c("Askim") ~ 'Askim',
                municipality %in% c("Bærum") ~ 'Bærum',
                municipality %in% c("Drammen") ~ 'Drammen',
                municipality %in% c("Eidsvoll") ~ 'Eidsvoll',
                municipality %in% c("Fredrikstad") ~ 'Fredrikstad',
                municipality %in% c("Frogn") ~ 'Frogn',
                municipality %in% c("Halden") ~ 'Halden',
                municipality %in% c("Kongsberg") ~ 'Kongsberg',
                municipality %in% c("Lier") ~ 'Lier',
                municipality %in% c("Lørenskog", 'Skedsmo") ~ 'Lørenskog og Skedsmo',
                municipality %in% c("Moss") ~ 'Moss',
                municipality %in% c("Nesodden") ~ 'Nesodden',
                municipality %in% c("Nittedal") ~ 'Nittedal',
                municipality %in% c("Ski",'Oppegård") ~ 'Ski og Oppegård',
                municipality %in% c("Ringerike") ~ 'Ringerike',
                municipality %in% c("Rælingen") ~ 'Rælingen',
                municipality %in% c("Sarpsborg") ~ 'Sarpsborg',
                municipality %in% c("Ullensaker") ~ 'Ullensaker',
                municipality %in% c("Vestby") ~ 'Vestby',
                municipality %in% c("Ås") ~ 'Ås',
                municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                        "Trøgstad","Spydeberg","Hobøl","Eidsberg","Skiptvet",
                        "Rakkestad","Råde","Rygge","VålerØstfold") ~ 'Distriktene i Østfold',

                municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                        "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ 'Distriktene i Akershus',

                municipality %in% c("Løten", "NordOdal","SørOdal","Eidskog",
                        "Grue", "Åsnes", "VålerHedmark","Trysil",
                        "Åmot","StorElvdal","Rendalen","Engerdal",
                        "Tolga","Tynset","Alvdal","Folldal","OsHedmark") ~ 'Distriktene i Hedmark',

                municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel',
                        "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                        "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                        "NordreLand","SørAurdal","Etnedal","NordAurdal",
                        "VestreSlidre","ØystreSlidre","Vang") ~ 'Distriktene i Oppland',

                municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol',
                        "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                        "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ 'Distriktene i
Buskerud',

                municipality %in% c("Svelvik","SandeVestfold","Re") ~ 'Distriktene i Vestfold',

                municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal',
                        "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke",'Vinje") ~ 'Distriktene i
Telemark',

                municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland',
                        "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland',
                        "Valle","Bykle") ~ 'Distriktene i Aust-Agder',

                municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral',
                        "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ 'Distriktene i Vest-
Agder',

                municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand',
                        "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy',
                        "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ 'Distriktene i Rogaland',

                municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad',
                        "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin',
                        "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen',
                        "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
'Distriktene i Hordaland',

                municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand',
                        "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll',
                        "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
'Distriktene i Sogn og Fjordane',

                municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda',
                        "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven',
                        "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset',
                        "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes',
                        "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ 'Distriktene i Møre
og Romsdal',

                municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug',
                        "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes',
                        "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal',

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen',
                        "Tjeldsund","Evenes","Ballangen","Røst","Værøy",Flakstad',

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ 'Distriktene i Nordland',

                municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu',
                        "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg',

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKáfjordKaivuono',
                        "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ 'Distriktene i Troms',
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                municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy',

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik',
                        "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
'Distriktene i Finnmark',

                municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn',
                        "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen',
                        "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta',

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik',
                        "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger',
                        "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ 'Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
igangsattandresmaahus <- na.omit(igangsattandresmaahus)


igangsattfriboligbygg2et <- igangsattfriboligbygg2et %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") ~ 'Oslo',
                municipality %in% c("Trondheim") ~ 'Trondheim',
                municipality %in% c("Bergen") ~ 'Bergen',
                municipality %in% c("Stavanger") ~ 'Stavanger',
                municipality %in% c("Arendal") ~ 'Arendal',
                municipality %in% c("Grimstad", 'Lillesand") ~ 'Grimstad og Lillesand',
                municipality %in% c("Haugesund","Karmøy") ~ 'Haugesund og Karmøy',
                municipality %in% c("Hå", "Klepp", "Time") ~ 'Hå, Klepp og Time',
                municipality %in% c("Kristiansand") ~ 'Kristiansand',
                municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ 'Lindesnes, Mandal,
Marnardal og Søgne',
                municipality %in% c("Sandnes") ~ 'Sandnes',
                municipality %in% c("Sola", "Randaberg") ~ 'Sola og Randaberg',
                municipality %in% c("Elverum") ~ 'Elverum',
                municipality %in% c("Gjøvik") ~ 'Gjøvik',
                municipality %in% c("Hamar") ~ 'Hamar',
                municipality %in% c("Kongsvinger") ~ 'Kongsvinger',
                municipality %in% c("Lillehammer") ~ 'Lillehammer',
                municipality %in% c("Ringsaker") ~ 'Ringsaker',
                municipality %in% c("Stange") ~ 'Stange',
                municipality %in% c("Kristiansund") ~ 'Kristiansund',
                municipality %in% c("Molde") ~ 'Molde',
                municipality %in% c("Orkdal", "Melhus", "Malvik") ~ 'Orkdal, Melhus og Malvik',
                municipality %in% c("Steinkjer") ~ 'Steinkjer',
                municipality %in% c("Stjørdal") ~ 'Stjørdal',
                municipality %in% c("Ålesund") ~ 'Ålesund',
                municipality %in% c("Alta") ~ 'Alta',
                municipality %in% c("Bodø") ~ 'Bodø',
                municipality %in% c("Hammerfest") ~ 'Hammerfest',
                municipality %in% c("HarstadHárstták") ~ 'Harstad',
                municipality %in% c("Narvik") ~ 'Narvik',
                municipality %in% c("Rana") ~ 'Rana',
                municipality %in% c("Tromsø") ~ 'Tromsø',
                municipality %in% c("Vefsn") ~ 'Vefsn',
                municipality %in% c("Bamble") ~ 'Bamble',
                municipality %in% c("Færder") ~ 'Færder',
                municipality %in% c("Holmestrand") ~ 'Holmestrand',
                municipality %in% c("Horten") ~ 'Horten',
                municipality %in% c("Kragerø") ~ 'Kragerø',
                municipality %in% c("Larvik") ~ 'Larvik',
                municipality %in% c("Notodden") ~ 'Notodden',
                municipality %in% c("Porsgrunn") ~ 'Porsgrunn',
                municipality %in% c("Sandefjord") ~ 'Sandefjord',
                municipality %in% c("Skien") ~ 'Skien',
                municipality %in% c("Tønsberg") ~ 'Tønsberg',
                municipality %in% c("Askøy") ~ 'Askøy',
                municipality %in% c("OsHordaland","Fusa") ~ 'Os og Fusa',
                municipality %in% c("Flora","Vågsøy") ~ 'Flora og Vågsøy',
                municipality %in% c("Førde",'Jølster","Gaular","Naustdal") ~ 'Førde, Jølster, Gaular og
Naustdal',
                municipality %in% c("Øygarden", "Fjell", "Sund") ~ 'Øygarden, Fjell og Sund',
                municipality %in% c("Asker") ~ 'Asker',
                municipality %in% c("Askim") ~ 'Askim',
                municipality %in% c("Bærum") ~ 'Bærum',
                municipality %in% c("Drammen") ~ 'Drammen',
                municipality %in% c("Eidsvoll") ~ 'Eidsvoll',
                municipality %in% c("Fredrikstad") ~ 'Fredrikstad',
                municipality %in% c("Frogn") ~ 'Frogn',
                municipality %in% c("Halden") ~ 'Halden',
                municipality %in% c("Kongsberg") ~ 'Kongsberg',
                municipality %in% c("Lier") ~ 'Lier',
                municipality %in% c("Lørenskog", 'Skedsmo") ~ 'Lørenskog og Skedsmo',
                municipality %in% c("Moss") ~ 'Moss',
                municipality %in% c("Nesodden") ~ 'Nesodden',
                municipality %in% c("Nittedal") ~ 'Nittedal',
                municipality %in% c("Ski",'Oppegård") ~ 'Ski og Oppegård',
                municipality %in% c("Ringerike") ~ 'Ringerike',
                municipality %in% c("Rælingen") ~ 'Rælingen',
                municipality %in% c("Sarpsborg") ~ 'Sarpsborg',
                municipality %in% c("Ullensaker") ~ 'Ullensaker',
                municipality %in% c("Vestby") ~ 'Vestby',
                municipality %in% c("Ås") ~ 'Ås',
                municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                        "Trøgstad","Spydeberg","Eidsberg","Hobøl","Skiptvet',
                        "Rakkestad","Råde","Rygge","VålerØstfold") ~ 'Distriktene i Østfold',

                municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk',
                        "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ 'Distriktene i Akershus',

                municipality %in% c("Løten", "NordOdal","SørOdal","Eidskog',
                        "Grue", "Åsnes", "VålerHedmark","Trysil',
                        "Åmot", "StorElvdal", "Rendalen", "Engerdal',
                        "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ 'Distriktene i Hedmark',

                municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel',
                        "SørFron","Ringebu","Øyer","Gausdal","ØstreToten',
                        "VestreToten","Jevnaker","Lunner","Gran","SøndreLand',
                        "NordreLand","SørAurdal","Etnedal","NordAurdal',
                        "VestreSlidre","ØystreSlidre","Vang") ~ 'Distriktene i Oppland',

                municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol',
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                    "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                    "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – "Distriktene i
Buskerud",

        municipality %in% c("Svelvik","SandeVestfold","Re") – "Distriktene i Vestfold",

        municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                    "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – "Distriktene i
Telemark",

        municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                    "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                    "Valle","Bykle") – "Distriktene i Aust-Agder",

        municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                    "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – "Distriktene i Vest-
Agder",

        municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                    "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                    "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – "Distriktene i Rogaland",

        municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                    "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                    "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                    "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland",

        municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                    "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                    "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") –
"Distriktene i Sogn og Fjordane",

        municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                    "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                    "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                    "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                    "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – "Distriktene i Møre
og Romsdal",

        municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                    "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                    "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                    "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – "Distriktene i Nordland",

        municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                    "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKáfjordKaivuono",
                    "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – "Distriktene i Troms",

        municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                    "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

        municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                    "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                    "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                    "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                    "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
igangsattfriboligbygg2et <- na.omit(igangsattfriboligbygg2et)


igangsattfriboligbygg34et <- igangsattfriboligbygg34et %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
        municipality %in% c("Trondheim") – "Trondheim",
        municipality %in% c("Bergen") – "Bergen",
        municipality %in% c("Stavanger") – "Stavanger",
        municipality %in% c("Arendal") – "Arendal",
        municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
        municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
        municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
        municipality %in% c("Kristiansand") – "Kristiansand",
        municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
        municipality %in% c("Sandnes") – "Sandnes",
        municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
        municipality %in% c("Elverum") – "Elverum",
        municipality %in% c("Gjøvik") – "Gjøvik",
        municipality %in% c("Hamar") – "Hamar",
        municipality %in% c("Kongsvinger") – "Kongsvinger",
        municipality %in% c("Lillehammer") – "Lillehammer",
        municipality %in% c("Ringsaker") – "Ringsaker",
        municipality %in% c("Stange") – "Stange",
        municipality %in% c("Kristiansund") – "Kristiansund",
        municipality %in% c("Molde") – "Molde",
        municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
        municipality %in% c("Steinkjer") – "Steinkjer",
        municipality %in% c("Stjørdal") – "Stjørdal",
        municipality %in% c("Ålesund") – "Ålesund",
        municipality %in% c("Alta") – "Alta",
        municipality %in% c("Bodø") – "Bodø",
        municipality %in% c("Hammerfest") – "Hammerfest",
        municipality %in% c("HarstadHárstták") – "Harstad",
        municipality %in% c("Narvik") – "Narvik",
        municipality %in% c("Rana") – "Rana",
        municipality %in% c("Tromsø") – "Tromsø",
        municipality %in% c("Vefsn") – "Vefsn",

        municipality %in% c("Bamble") – "Bamble",
        municipality %in% c("Færder") – "Færder",
        municipality %in% c("Holmestrand") – "Holmestrand",
        municipality %in% c("Horten") – "Horten",
        municipality %in% c("Kragerø") – "Kragerø",
        municipality %in% c("Larvik") – "Larvik",
        municipality %in% c("Notodden") – "Notodden",
        municipality %in% c("Porsgrunn") – "Porsgrunn",
        municipality %in% c("Sandefjord") – "Sandefjord",
        municipality %in% c("Skien") – "Skien",
        municipality %in% c("Tønsberg") – "Tønsberg",
        municipality %in% c("Askøy") – "Askøy",
        municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
        municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
        municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",

        municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
        municipality %in% c("Asker") – "Asker",
        municipality %in% c("Askim") – "Askim",
        municipality %in% c("Bærum") – "Bærum",
        municipality %in% c("Drammen") – "Drammen",
        municipality %in% c("Eidsvoll") – "Eidsvoll",
        municipality %in% c("Fredrikstad") – "Fredrikstad",
        municipality %in% c("Frogn") – "Frogn",
        municipality %in% c("Halden") – "Halden",
        municipality %in% c("Kongsberg") – "Kongsberg",
        municipality %in% c("Lier") – "Lier",
        municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
        municipality %in% c("Moss") – "Moss",
        municipality %in% c("Nesodden") – "Nesodden",
        municipality %in% c("Nittedal") – "Nittedal",
        municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
        municipality %in% c("Ringerike") – "Ringerike",
        municipality %in% c("Rælingen") – "Rælingen",
        municipality %in% c("Sarpsborg") – "Sarpsborg",
        municipality %in% c("Ullensaker") – "Ullensaker",
        municipality %in% c("Vestby") – "Vestby",
        municipality %in% c("Ås") – "Ås",
        municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                    "Trøgstad","Spydeberg","Eidsberg","Hobøl","Skiptvet",
                    "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

        municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                    "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

        municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                    "Grue", "Åsnes", "VålerHedmark", "Trysil",
                    "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                    "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",

        municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                    "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                    "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                    "NordreLand","SørAurdal","Etnedal","NordAurdal",
                    "VestreSlidre","ØystreSlidre","Vang") – "Distriktene i Oppland",

        municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                    "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                    "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – "Distriktene i
Buskerud",

        municipality %in% c("Svelvik","SandeVestfold","Re") – "Distriktene i Vestfold",

        municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                    "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – "Distriktene i
Telemark",

        municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                    "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                    "Valle","Bykle") – "Distriktene i Aust-Agder",

        municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                    "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – "Distriktene i Vest-
Agder",

        municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                    "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                    "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – "Distriktene i Rogaland",

        municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                    "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                    "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                    "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland",

        municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                    "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                    "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") –
"Distriktene i Sogn og Fjordane",

        municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                    "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                    "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                    "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                    "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – "Distriktene i Møre
og Romsdal",

        municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                    "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                    "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                    "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – "Distriktene i Nordland",

        municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                    "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKáfjordKaivuono",
                    "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – "Distriktene i Troms",
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                         municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                              "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

                    municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                     "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                     "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                         "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                         "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
igangsattfriboligbygg34et <- na.omit(igangsattfriboligbygg34et)


igangsattfriboligbygg5et <- igangsattfriboligbygg5et %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
             municipality %in% c("Trondheim") – "Trondheim",
             municipality %in% c("Bergen") – "Bergen",
             municipality %in% c("Stavanger") – "Stavanger",
             municipality %in% c("Arendal") – "Arendal",
             municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
             municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
             municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
             municipality %in% c("Kristiansand") – "Kristiansand",
             municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
             municipality %in% c("Sandnes") – "Sandnes",
             municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
             municipality %in% c("Elverum") – "Elverum",
             municipality %in% c("Gjøvik") – "Gjøvik",
             municipality %in% c("Hamar") – "Hamar",
             municipality %in% c("Kongsvinger") – "Kongsvinger",
             municipality %in% c("Lillehammer") – "Lillehammer",
             municipality %in% c("Ringsaker") – "Ringsaker",
             municipality %in% c("Stange") – "Stange",
             municipality %in% c("Kristiansund") – "Kristiansund",
             municipality %in% c("Molde") – "Molde",
             municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
             municipality %in% c("Steinkjer") – "Steinkjer",
             municipality %in% c("Stjørdal") – "Stjørdal",
             municipality %in% c("Ålesund") – "Ålesund",
             municipality %in% c("Alta") – "Alta",
             municipality %in% c("Bodø") – "Bodø",
             municipality %in% c("Hammerfest") – "Hammerfest",
             municipality %in% c("HarstadHárstták") – "Harstad",
             municipality %in% c("Narvik") – "Narvik",
             municipality %in% c("Rana") – "Rana",
             municipality %in% c("Tromsø") – "Tromsø",
             municipality %in% c("Vefsn") – "Vefsn",
             municipality %in% c("Bamble") – "Bamble",
             municipality %in% c("Færder") – "Færder",
             municipality %in% c("Holmestrand") – "Holmestrand",
             municipality %in% c("Horten") – "Horten",
             municipality %in% c("Kragerø") – "Kragerø",
             municipality %in% c("Larvik") – "Larvik",
             municipality %in% c("Notodden") – "Notodden",
             municipality %in% c("Porsgrunn") – "Porsgrunn",
             municipality %in% c("Sandefjord") – "Sandefjord",
             municipality %in% c("Skien") – "Skien",
             municipality %in% c("Tønsberg") – "Tønsberg",
             municipality %in% c("Askøy") – "Askøy",
             municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
             municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
             municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
             municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
             municipality %in% c("Asker") – "Asker",
             municipality %in% c("Askim") – "Askim",
             municipality %in% c("Bærum") – "Bærum",
             municipality %in% c("Drammen") – "Drammen",
             municipality %in% c("Eidsvoll") – "Eidsvoll",
             municipality %in% c("Fredrikstad") – "Fredrikstad",
             municipality %in% c("Frogn") – "Frogn",
             municipality %in% c("Halden") – "Halden",
             municipality %in% c("Kongsberg") – "Kongsberg",
             municipality %in% c("Lier") – "Lier",
             municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
             municipality %in% c("Moss") – "Moss",
             municipality %in% c("Nesodden") – "Nesodden",
             municipality %in% c("Nittedal") – "Nittedal",
             municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
             municipality %in% c("Ringerike") – "Ringerike",
             municipality %in% c("Rælingen") – "Rælingen",
             municipality %in% c("Sarpsborg") – "Sarpsborg",
             municipality %in% c("Ullensaker") – "Ullensaker",
             municipality %in% c("Vestby") – "Vestby",
             municipality %in% c("Ås") – "Ås",
             municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                       "Trøgstad","Spydeberg","Eidsberg","Hobøl","Skiptvet",
                       "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

             municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                       "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

             municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                       "Grue", "Åsnes", "VålerHedmark", "Trysil",
                       "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                       "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",

             municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                       "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                       "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                       "NordreLand","SørAurdal","Etnedal","NordAurdal",
                       "VestreSlidre","ØystreSlidre","Vang") – "Distriktene i Oppland",

             municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
```

                              "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                              "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – "Distriktene i
Buskerud",

             municipality %in% c("Svelvik","SandeVestfold","Re") – "Distriktene i Vestfold",

             municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                       "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – "Distriktene i
Telemark",

             municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                       "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                       "Valle","Bykle") – "Distriktene i Aust-Agder",

             municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                       "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – "Distriktene i Vest-
Agder",

             municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                       "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                       "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – "Distriktene i Rogaland",

             municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                       "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                       "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                       "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland",

             municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                       "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                       "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") –
"Distriktene i Sogn og Fjordane",

                            municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                          "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                          "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                          "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                          "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – "Distriktene i Møre
og Romsdal",

                            municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                         "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                         "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                         "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – "Distriktene i Nordland",

             municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                       "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                         "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – "Distriktene i Troms",

                    municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                         "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

                    municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                     "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                     "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                         "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                         "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
igangsattfriboligbygg5et <- na.omit(igangsattfriboligbygg5et)

igangsattsamboligbygg5et <- igangsattsamboligbygg5et %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
             municipality %in% c("Trondheim") – "Trondheim",
             municipality %in% c("Bergen") – "Bergen",
             municipality %in% c("Stavanger") – "Stavanger",
             municipality %in% c("Arendal") – "Arendal",
             municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
             municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
             municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
             municipality %in% c("Kristiansand") – "Kristiansand",
             municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
             municipality %in% c("Sandnes") – "Sandnes",
             municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
             municipality %in% c("Elverum") – "Elverum",
             municipality %in% c("Gjøvik") – "Gjøvik",
             municipality %in% c("Hamar") – "Hamar",
             municipality %in% c("Kongsvinger") – "Kongsvinger",
             municipality %in% c("Lillehammer") – "Lillehammer",
             municipality %in% c("Ringsaker") – "Ringsaker",
             municipality %in% c("Stange") – "Stange",
             municipality %in% c("Kristiansund") – "Kristiansund",
             municipality %in% c("Molde") – "Molde",
             municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
             municipality %in% c("Steinkjer") – "Steinkjer",
             municipality %in% c("Stjørdal") – "Stjørdal",
             municipality %in% c("Ålesund") – "Ålesund",
             municipality %in% c("Alta") – "Alta",
             municipality %in% c("Bodø") – "Bodø",
             municipality %in% c("Hammerfest") – "Hammerfest",
             municipality %in% c("HarstadHárstták") – "Harstad",
             municipality %in% c("Narvik") – "Narvik",
             municipality %in% c("Rana") – "Rana",
             municipality %in% c("Tromsø") – "Tromsø",
             municipality %in% c("Vefsn") – "Vefsn",

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        municipality %in% c("Bamble") – "Bamble",
        municipality %in% c("Færder") – "Færder",
        municipality %in% c("Holmestrand") – "Holmestrand",
        municipality %in% c("Horten") – "Horten",
        municipality %in% c("Kragerø") – "Kragerø",
        municipality %in% c("Larvik") – "Larvik",
        municipality %in% c("Notodden") – "Notodden",
        municipality %in% c("Porsgrunn") – "Porsgrunn",
        municipality %in% c("Sandefjord") – "Sandefjord",
        municipality %in% c("Skien") – "Skien",
        municipality %in% c("Tønsberg") – "Tønsberg",
        municipality %in% c("Askøy") – "Askøy",
        municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
        municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
        municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
        municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
        municipality %in% c("Asker") – "Asker",
        municipality %in% c("Askim") – "Askim",
        municipality %in% c("Bærum") – "Bærum",
        municipality %in% c("Drammen") – "Drammen",
        municipality %in% c("Eidsvoll") – "Eidsvoll",
        municipality %in% c("Fredrikstad") – "Fredrikstad",
        municipality %in% c("Frogn") – "Frogn",
        municipality %in% c("Halden") – "Halden",
        municipality %in% c("Kongsberg") – "Kongsberg",
        municipality %in% c("Lier") – "Lier",
        municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
        municipality %in% c("Moss") – "Moss",
        municipality %in% c("Nesodden") – "Nesodden",
        municipality %in% c("Nittedal") – "Nittedal",
        municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
        municipality %in% c("Ringerike") – "Ringerike",
        municipality %in% c("Rælingen") – "Rælingen",
        municipality %in% c("Sarpsborg") – "Sarpsborg",
        municipality %in% c("Ullensaker") – "Ullensaker",
        municipality %in% c("Vestby") – "Vestby",
        municipality %in% c("Ås") – "Ås",
        municipality %in% c("Hvaler","Aremark","Marker","Rømskog",
                "Trøgstad","Spydeberg","Eidsberg","Hobøl","Skiptvet",
                "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

        municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

        municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                "Grue", "Åsnes", "VålerHedmark", "Trysil",
                "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",

        municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                "NordreLand","SørAurdal","Etnedal","NordAurdal",
                "VestreSlidre","ØystreSlidre","Vang") – "Distriktene i Oppland",

        municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – "Distriktene i
Buskerud",

        municipality %in% c("Svelvik","SandeVestfold","Re") – "Distriktene i Vestfold",

        municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – "Distriktene i
Telemark",

        municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                "Valle","Bykle") – "Distriktene i Aust-Agder",

        municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – "Distriktene i Vest-
Agder",

        municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – "Distriktene i Rogaland",

        municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland",

        municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") –
"Distriktene i Sogn og Fjordane",

        municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – "Distriktene i Møre
og Romsdal",

        municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – "Distriktene i Nordland",

        municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – "Distriktene i Troms",
```

```r
        municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorságuPorsanki","KárášjohkaKarasjok","Lebesby","Gamvik",
                "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

        municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
igangsattsamboligbygg5et <- na.omit(igangsattsamboligbygg5et)


fullforteenebolig <- fullforteenebolig %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
        municipality %in% c("Trondheim") – "Trondheim",
        municipality %in% c("Bergen") – "Bergen",
        municipality %in% c("Stavanger") – "Stavanger",
        municipality %in% c("Arendal") – "Arendal",
        municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
        municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
        municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
        municipality %in% c("Kristiansand") – "Kristiansand",
        municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
        municipality %in% c("Sandnes") – "Sandnes",
        municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
        municipality %in% c("Elverum") – "Elverum",
        municipality %in% c("Gjøvik") – "Gjøvik",
        municipality %in% c("Hamar") – "Hamar",
        municipality %in% c("Kongsvinger") – "Kongsvinger",
        municipality %in% c("Lillehammer") – "Lillehammer",
        municipality %in% c("Ringsaker") – "Ringsaker",
        municipality %in% c("Stange") – "Stange",
        municipality %in% c("Kristiansund") – "Kristiansund",
        municipality %in% c("Molde") – "Molde",
        municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
        municipality %in% c("Steinkjer") – "Steinkjer",
        municipality %in% c("Stjørdal") – "Stjørdal",
        municipality %in% c("Ålesund") – "Ålesund",
        municipality %in% c("Alta") – "Alta",
        municipality %in% c("Bodø") – "Bodø",
        municipality %in% c("Hammerfest") – "Hammerfest",
        municipality %in% c("HarstadHárstták") – "Harstad",
        municipality %in% c("Narvik") – "Narvik",
        municipality %in% c("Rana") – "Rana",
        municipality %in% c("Tromsø") – "Tromsø",
        municipality %in% c("Vefsn") – "Vefsn",
        municipality %in% c("Bamble") – "Bamble",
        municipality %in% c("Færder") – "Færder",
        municipality %in% c("Holmestrand") – "Holmestrand",
        municipality %in% c("Horten") – "Horten",
        municipality %in% c("Kragerø") – "Kragerø",
        municipality %in% c("Larvik") – "Larvik",
        municipality %in% c("Notodden") – "Notodden",
        municipality %in% c("Porsgrunn") – "Porsgrunn",
        municipality %in% c("Sandefjord") – "Sandefjord",
        municipality %in% c("Skien") – "Skien",
        municipality %in% c("Tønsberg") – "Tønsberg",
        municipality %in% c("Askøy") – "Askøy",
        municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
        municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
        municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
        municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
        municipality %in% c("Asker") – "Asker",
        municipality %in% c("Askim") – "Askim",
        municipality %in% c("Bærum") – "Bærum",
        municipality %in% c("Drammen") – "Drammen",
        municipality %in% c("Eidsvoll") – "Eidsvoll",
        municipality %in% c("Fredrikstad") – "Fredrikstad",
        municipality %in% c("Frogn") – "Frogn",
        municipality %in% c("Halden") – "Halden",
        municipality %in% c("Kongsberg") – "Kongsberg",
        municipality %in% c("Lier") – "Lier",
        municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
        municipality %in% c("Moss") – "Moss",
        municipality %in% c("Nesodden") – "Nesodden",
        municipality %in% c("Nittedal") – "Nittedal",
        municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
        municipality %in% c("Ringerike") – "Ringerike",
        municipality %in% c("Rælingen") – "Rælingen",
        municipality %in% c("Sarpsborg") – "Sarpsborg",
        municipality %in% c("Ullensaker") – "Ullensaker",
        municipality %in% c("Vestby") – "Vestby",
        municipality %in% c("Ås") – "Ås",
        municipality %in% c("Hvaler","Aremark","Marker","Rømskog","Hobøl",
                "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

        municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

        municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                "Grue", "Åsnes", "VålerHedmark", "Trysil",
                "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",

        municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                "NordreLand","SørAurdal","Etnedal","NordAurdal",
                "VestreSlidre","ØystreSlidre","Vang") – "Distriktene i Oppland",
```

```r
                    municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                              "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                              "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",
                    municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",
                    municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                              "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",
                    municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                              "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                              "Valle","Bykle") ~ "Distriktene i Aust-Agder",
                    municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                              "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",
                    municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                              "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                              "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",
                    municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                              "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                              "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                              "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",
                    municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                              "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                              "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",
                    municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                              "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                              "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                              "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                              "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",
                    municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                              "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                              "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",
"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                              "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",
"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",
                    municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                              "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",
"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                              "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",
                    municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",
"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                              "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
"Distriktene i Finnmark",
                    municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                              "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                              "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",
"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                              "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                              "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
fullforteenebolig <- na.omit(fullforteenebolig)


fullforteeneboligmutleie <- fullforteeneboligmutleie %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") ~ "Oslo",
                    municipality %in% c("Trondheim") ~ "Trondheim",
                    municipality %in% c("Bergen") ~ "Bergen",
                    municipality %in% c("Stavanger") ~ "Stavanger",
                    municipality %in% c("Arendal") ~ "Arendal",
                    municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
                    municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
                    municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
                    municipality %in% c("Kristiansand") ~ "Kristiansand",
                    municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
                    municipality %in% c("Sandnes") ~ "Sandnes",
                    municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
                    municipality %in% c("Elverum") ~ "Elverum",
                    municipality %in% c("Gjøvik") ~ "Gjøvik",
                    municipality %in% c("Hamar") ~ "Hamar",
                    municipality %in% c("Kongsvinger") ~ "Kongsvinger",
                    municipality %in% c("Lillehammer") ~ "Lillehammer",
                    municipality %in% c("Ringsaker") ~ "Ringsaker",
                    municipality %in% c("Stange") ~ "Stange",
                    municipality %in% c("Kristiansund") ~ "Kristiansund",
                    municipality %in% c("Molde") ~ "Molde",
                    municipality %in% c("Orkdal", "Melhus", "Malvik") ~ "Orkdal, Melhus og Malvik",
                    municipality %in% c("Steinkjer") ~ "Steinkjer",
                    municipality %in% c("Stjørdal") ~ "Stjørdal",
                    municipality %in% c("Ålesund") ~ "Ålesund",
                    municipality %in% c("Alta") ~ "Alta",
                    municipality %in% c("Bodø") ~ "Bodø",
                    municipality %in% c("Hammerfest") ~ "Hammerfest",
                    municipality %in% c("HarstadHárstták") ~ "Harstad",
                    municipality %in% c("Narvik") ~ "Narvik",
                    municipality %in% c("Rana") ~ "Rana",

                    municipality %in% c("Tromsø") ~ "Tromsø",
                    municipality %in% c("Vefsn") ~ "Vefsn",
                    municipality %in% c("Bamble") ~ "Bamble",
                    municipality %in% c("Færder") ~ "Færder",
                    municipality %in% c("Holmestrand") ~ "Holmestrand",
                    municipality %in% c("Horten") ~ "Horten",
                    municipality %in% c("Kragerø") ~ "Kragerø",
                    municipality %in% c("Larvik") ~ "Larvik",
                    municipality %in% c("Notodden") ~ "Notodden",
                    municipality %in% c("Porsgrunn") ~ "Porsgrunn",
                    municipality %in% c("Sandefjord") ~ "Sandefjord",
                    municipality %in% c("Skien") ~ "Skien",
                    municipality %in% c("Tønsberg") ~ "Tønsberg",
                    municipality %in% c("Askøy") ~ "Askøy",
                    municipality %in% c("OsHordaland","Fusa") ~ "Os og Fusa",
                    municipality %in% c("Flora","Vågsøy") ~ "Flora og Vågsøy",
                    municipality %in% c("Førde","Jølster","Gaular","Naustdal") ~ "Førde, Jølster, Gaular og
Naustdal",
                    municipality %in% c("Øygarden", "Fjell", "Sund") ~ "Øygarden, Fjell og Sund",
                    municipality %in% c("Asker") ~ "Asker",
                    municipality %in% c("Askim") ~ "Askim",
                    municipality %in% c("Bærum") ~ "Bærum",
                    municipality %in% c("Drammen") ~ "Drammen",
                    municipality %in% c("Eidsvoll") ~ "Eidsvoll",
                    municipality %in% c("Fredrikstad") ~ "Fredrikstad",
                    municipality %in% c("Frogn") ~ "Frogn",
                    municipality %in% c("Halden") ~ "Halden",
                    municipality %in% c("Kongsberg") ~ "Kongsberg",
                    municipality %in% c("Lier") ~ "Lier",
                    municipality %in% c("Lørenskog", "Skedsmo") ~ "Lørenskog og Skedsmo",
                    municipality %in% c("Moss") ~ "Moss",
                    municipality %in% c("Nesodden") ~ "Nesodden",
                    municipality %in% c("Nittedal") ~ "Nittedal",
                    municipality %in% c("Ski","Oppegård") ~ "Ski og Oppegård",
                    municipality %in% c("Ringerike") ~ "Ringerike",
                    municipality %in% c("Rælingen") ~ "Rælingen",
                    municipality %in% c("Sarpsborg") ~ "Sarpsborg",
                    municipality %in% c("Ullensaker") ~ "Ullensaker",
                    municipality %in% c("Vestby") ~ "Vestby",
                    municipality %in% c("Ås") ~ "Ås",
                    municipality %in% c("Hvaler","Aremark","Marker","Rømskog","Hobøl",
                              "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                              "Rakkestad","Råde","Rygge","VålerØstfold") ~ "Distriktene i Østfold",
                    municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                              "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ "Distriktene i Akershus",
                    municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                              "Grue", "Åsnes", "VålerHedmark", "Trysil",
                              "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                              "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ "Distriktene i Hedmark",
                    municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                              "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                              "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                              "NordreLand","SørAurdal","Etnedal","NordAurdal",
                              "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",
                    municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                              "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                              "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",
                    municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",
                    municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                              "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",
                    municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                              "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                              "Valle","Bykle") ~ "Distriktene i Aust-Agder",
                    municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                              "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",
                    municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                              "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                              "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",
                    municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                              "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                              "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                              "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",
                    municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                              "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                              "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",
                    municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                              "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                              "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                              "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                              "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",
                    municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                              "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                              "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",
"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                              "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",
"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",
                    municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                              "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",
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"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                              "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – 'Distriktene i Troms',

                    municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy',

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                              "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark',

                    municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                              "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                              "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                              "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                              "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – 'Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
fullforteeneboligmutleie <- na.omit(fullforteeneboligmutleie)




fullforteverttomansbolig <- fullforteverttomansbolig %>%
  mutate(municipality = case_when(municipality %in% c('Oslokommune') – 'Oslo',
                    municipality %in% c("Trondheim") – 'Trondheim',
                    municipality %in% c("Bergen") – 'Bergen',
                    municipality %in% c("Stavanger") – 'Stavanger',
                    municipality %in% c("Arendal") – 'Arendal',
                    municipality %in% c("Grimstad", "Lillesand") – 'Grimstad og Lillesand',
                    municipality %in% c("Haugesund","Karmøy") – 'Haugesund og Karmøy',
                    municipality %in% c("Hå", "Klepp", "Time") – 'Hå, Klepp og Time',
                    municipality %in% c("Kristiansand") – 'Kristiansand',
                    municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – 'Lindesnes, Mandal,
Marnardal og Søgne',
                    municipality %in% c("Sandnes") – 'Sandnes',
                    municipality %in% c("Sola", "Randaberg") – 'Sola og Randaberg',
                    municipality %in% c("Elverum") – 'Elverum',
                    municipality %in% c("Gjøvik") – 'Gjøvik',
                    municipality %in% c("Hamar") – 'Hamar',
                    municipality %in% c("Kongsvinger") – 'Kongsvinger',
                    municipality %in% c("Lillehammer") – 'Lillehammer',
                    municipality %in% c("Ringsaker") – 'Ringsaker',
                    municipality %in% c("Stange") – 'Stange',
                    municipality %in% c("Kristiansund") – 'Kristiansund',
                    municipality %in% c("Molde") – 'Molde',
                    municipality %in% c("Orkdal", "Melhus", "Malvik") – 'Orkdal, Melhus og Malvik',
                    municipality %in% c("Steinkjer") – 'Steinkjer',
                    municipality %in% c("Stjørdal") – 'Stjørdal',
                    municipality %in% c("Ålesund") – 'Ålesund',
                    municipality %in% c("Alta") – 'Alta',
                    municipality %in% c("Bodø") – 'Bodø',
                    municipality %in% c("Hammerfest") – 'Hammerfest',
                    municipality %in% c("HarstadHárstták") – 'Harstad',
                    municipality %in% c("Narvik") – 'Narvik',
                    municipality %in% c("Rana") – 'Rana',
                    municipality %in% c("Tromsø") – 'Tromsø',
                    municipality %in% c("Vefsn") – 'Vefsn',
                    municipality %in% c("Bamble") – 'Bamble',
                    municipality %in% c("Færder") – 'Færder',
                    municipality %in% c("Holmestrand") – 'Holmestrand',
                    municipality %in% c("Horten") – 'Horten',
                    municipality %in% c("Kragerø") – 'Kragerø',
                    municipality %in% c("Larvik") – 'Larvik',
                    municipality %in% c("Notodden") – 'Notodden',
                    municipality %in% c("Porsgrunn") – 'Porsgrunn',
                    municipality %in% c("Sandefjord") – 'Sandefjord',
                    municipality %in% c("Skien") – 'Skien',
                    municipality %in% c("Tønsberg") – 'Tønsberg',
                    municipality %in% c("Askøy") – 'Askøy',
                    municipality %in% c("OsHordaland","Fusa") – 'Os og Fusa',
                    municipality %in% c("Flora","Vågsøy") – 'Flora og Vågsøy',
                    municipality %in% c("Førde",'Jølster","Gaular","Naustdal") – 'Førde, Jølster, Gaular og
Naustdal',
                    municipality %in% c("Øygarden", "Fjell", "Sund") – 'Øygarden, Fjell og Sund',
                    municipality %in% c("Asker") – 'Asker',
                    municipality %in% c("Askim") – 'Askim',
                    municipality %in% c("Bærum") – 'Bærum',
                    municipality %in% c("Drammen") – 'Drammen',
                    municipality %in% c("Eidsvoll") – 'Eidsvoll',
                    municipality %in% c("Fredrikstad") – 'Fredrikstad',
                    municipality %in% c("Frogn") – 'Frogn',
                    municipality %in% c("Halden") – 'Halden',
                    municipality %in% c("Kongsberg") – 'Kongsberg',
                    municipality %in% c("Lier") – 'Lier',
                    municipality %in% c("Lørenskog", "Skedsmo") – 'Lørenskog og Skedsmo',
                    municipality %in% c("Moss") – 'Moss',
                    municipality %in% c("Nesodden") – 'Nesodden',
                    municipality %in% c("Nittedal") – 'Nittedal',
                    municipality %in% c("Ski","Oppegård") – 'Ski og Oppegård',
                    municipality %in% c("Ringerike") – 'Ringerike',
                    municipality %in% c("Rælingen") – 'Rælingen',
                    municipality %in% c("Sarpsborg") – 'Sarpsborg',
                    municipality %in% c("Ullensaker") – 'Ullensaker',
                    municipality %in% c("Vestby") – 'Vestby',
                    municipality %in% c("Ås") – 'Ås',
                    municipality %in% c("Hvaler","Aremark","Marker","Rømskog","Hobøl",
                              "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                              "Rakkestad","Råde","Rygge","VålerØstfold") – 'Distriktene i Østfold',

                    municipality %in% c("AurskogHøland","Sørum","Fet",'Enebakk",
                              "Gjerdrum","NesAkershus","Nannestad","Hurdal") – 'Distriktene i Akershus',

                    municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                              "Grue", "Åsnes", "VålerHedmark", "Trysil",
                              "Åmot","StorElvdal", "Rendalen", "Engerdal",
                              "Tolga","Tynset","Alvdal",'Folldal", "OsHedmark") – 'Distriktene i Hedmark',

                    municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                              "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
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                              "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                              "NordreLand","SørAurdal","Etnedal","NordAurdal",
                              "VestreSlidre","ØystreSlidre","Vang") – 'Distriktene i Oppland',

                    municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                              "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                              "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – 'Distriktene i
Buskerud',

                    municipality %in% c("Svelvik","SandeVestfold","Re") – 'Distriktene i Vestfold',

                    municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                              "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – 'Distriktene i
Telemark',

                    municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                              "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                              "Valle","Bykle") – 'Distriktene i Aust-Agder',

                    municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                              "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – 'Distriktene i Vest-
Agder',

                    municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                              "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                              "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – 'Distriktene i Rogaland',

                    municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                              "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                              "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                              "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland',

                    municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                              "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                              "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") –
"Distriktene i Sogn og Fjordane',

                    municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                              "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                              "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                              "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                              "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – 'Distriktene i Møre
og Romsdal',

                    municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                              "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                              "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal',

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                              "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad',

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – 'Distriktene i Nordland',

                    municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                              "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                              "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – 'Distriktene i Troms',

                    municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy',

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                              "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark',

                    municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                              "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                              "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                              "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                              "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – 'Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
fullforteverttomansbolig <- na.omit(fullforteverttomansbolig)




fullforterekkehus <- fullforterekkehus %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – 'Oslo',
                    municipality %in% c("Trondheim") – 'Trondheim',
                    municipality %in% c("Bergen") – 'Bergen',
                    municipality %in% c("Stavanger") – 'Stavanger',
                    municipality %in% c("Arendal") – 'Arendal',
                    municipality %in% c("Grimstad", "Lillesand") – 'Grimstad og Lillesand',
                    municipality %in% c("Haugesund","Karmøy") – 'Haugesund og Karmøy',
                    municipality %in% c("Hå", "Klepp", "Time") – 'Hå, Klepp og Time',
                    municipality %in% c("Kristiansand") – 'Kristiansand',
                    municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – 'Lindesnes, Mandal,
Marnardal og Søgne',
                    municipality %in% c("Sandnes") – 'Sandnes',
                    municipality %in% c("Sola", "Randaberg") – 'Sola og Randaberg',
                    municipality %in% c("Elverum") – 'Elverum',
                    municipality %in% c("Gjøvik") – 'Gjøvik',
                    municipality %in% c("Hamar") – 'Hamar',
                    municipality %in% c("Kongsvinger") – 'Kongsvinger',
                    municipality %in% c("Lillehammer") – 'Lillehammer',
                    municipality %in% c("Ringsaker") – 'Ringsaker',
                    municipality %in% c("Stange") – 'Stange',
                    municipality %in% c("Kristiansund") – 'Kristiansund',
                    municipality %in% c("Molde") – 'Molde',
                    municipality %in% c("Orkdal", "Melhus", "Malvik") – 'Orkdal, Melhus og Malvik',
                    municipality %in% c("Steinkjer") – 'Steinkjer',
                    municipality %in% c("Stjørdal") – 'Stjørdal',
                    municipality %in% c("Ålesund") – 'Ålesund',
                    municipality %in% c("Alta") – 'Alta',
                    municipality %in% c("Bodø") – 'Bodø',
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                municipality %in% c("Hammerfest") – "Hammerfest",
                municipality %in% c("HarstadHárstták") – "Harstad",
                municipality %in% c("Narvik") – "Narvik",
                municipality %in% c("Rana") – "Rana",
                municipality %in% c("Tromsø") – "Tromsø",
                municipality %in% c("Vefsn") – "Vefsn",
                municipality %in% c("Bamble") – "Bamble",
                municipality %in% c("Færder") – "Færder",
                municipality %in% c("Holmestrand") – "Holmestrand",
                municipality %in% c("Horten") – "Horten",
                municipality %in% c("Kragerø") – "Kragerø",
                municipality %in% c("Larvik") – "Larvik",
                municipality %in% c("Notodden") – "Notodden",
                municipality %in% c("Porsgrunn") – "Porsgrunn",
                municipality %in% c("Sandefjord") – "Sandefjord",
                municipality %in% c("Skien") – "Skien",
                municipality %in% c("Tønsberg") – "Tønsberg",
                municipality %in% c("Askøy") – "Askøy",
                municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
                municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
                municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
                municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
                municipality %in% c("Asker") – "Asker",
                municipality %in% c("Askim") – "Askim",
                municipality %in% c("Bærum") – "Bærum",
                municipality %in% c("Drammen") – "Drammen",
                municipality %in% c("Eidsvoll") – "Eidsvoll",
                municipality %in% c("Fredrikstad") – "Fredrikstad",
                municipality %in% c("Frogn") – "Frogn",
                municipality %in% c("Halden") – "Halden",
                municipality %in% c("Kongsberg") – "Kongsberg",
                municipality %in% c("Lier") – "Lier",
                municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
                municipality %in% c("Moss") – "Moss",
                municipality %in% c("Nesodden") – "Nesodden",
                municipality %in% c("Nittedal") – "Nittedal",
                municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
                municipality %in% c("Ringerike") – "Ringerike",
                municipality %in% c("Rælingen") – "Rælingen",
                municipality %in% c("Sarpsborg") – "Sarpsborg",
                municipality %in% c("Ullensaker") – "Ullensaker",
                municipality %in% c("Vestby") – "Vestby",
                municipality %in% c("Ås") – "Ås",
                municipality %in% c("Hvaler","Aremark","Marker","Rømskog","Hobøl",
                        "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                        "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

                municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                        "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

                municipality %in% c("Løten", "NordOdal", "SørOdal","Eidskog",
                        "Grue", "Åsnes","VålerHedmark", "Trysil",
                        "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                        "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",

                municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                        "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                        "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                        "NordreLand","SørAurdal","Etnedal","NordAurdal",
                        "VestreSlidre","ØystreSlidre","Vang") – "Distriktene i Oppland",

                municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                        "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                        "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – "Distriktene i
Buskerud",

                municipality %in% c("Svelvik","SandeVestfold","Re") – "Distriktene i Vestfold",

                municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                        "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – "Distriktene i
Telemark",

                municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                        "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                        "Valle","Bykle") – "Distriktene i Aust-Agder",

                municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                        "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – "Distriktene i Vest-
Agder",

                municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                        "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                        "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – "Distriktene i Rogaland",

                municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                        "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                        "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                        "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland",

                municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                        "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                        "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") –
"Distriktene i Sogn og Fjordane",

                municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                        "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                        "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                        "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                        "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – "Distriktene i Møre
og Romsdal",

                municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                        "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                        "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                        "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – "Distriktene i Nordland",
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```
                municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                        "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKáfjordKaivuono",
                        "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – "Distriktene i Troms",

                municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                        "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

                municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                        "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                        "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnáaseSnåsa","Lierne","RaarvihkeRøyrvik",
                        "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                        "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

fullforterekkehus <- na.omit(fullforterekkehus)


fullforteandresmaahus <- fullforteandresmaahus %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
                municipality %in% c("Trondheim") – "Trondheim",
                municipality %in% c("Bergen") – "Bergen",
                municipality %in% c("Stavanger") – "Stavanger",
                municipality %in% c("Arendal") – "Arendal",
                municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
                municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
                municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
                municipality %in% c("Kristiansand") – "Kristiansand",
                municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
                municipality %in% c("Sandnes") – "Sandnes",
                municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
                municipality %in% c("Elverum") – "Elverum",
                municipality %in% c("Gjøvik") – "Gjøvik",
                municipality %in% c("Hamar") – "Hamar",
                municipality %in% c("Kongsvinger") – "Kongsvinger",
                municipality %in% c("Lillehammer") – "Lillehammer",
                municipality %in% c("Ringsaker") – "Ringsaker",
                municipality %in% c("Stange") – "Stange",
                municipality %in% c("Kristiansund") – "Kristiansund",
                municipality %in% c("Molde") – "Molde",
                municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
                municipality %in% c("Steinkjer") – "Steinkjer",
                municipality %in% c("Stjørdal") – "Stjørdal",
                municipality %in% c("Ålesund") – "Ålesund",
                municipality %in% c("Alta") – "Alta",
                municipality %in% c("Bodø") – "Bodø",
                municipality %in% c("Hammerfest") – "Hammerfest",
                municipality %in% c("HarstadHárstták") – "Harstad",
                municipality %in% c("Narvik") – "Narvik",
                municipality %in% c("Rana") – "Rana",
                municipality %in% c("Tromsø") – "Tromsø",
                municipality %in% c("Vefsn") – "Vefsn",
                municipality %in% c("Bamble") – "Bamble",
                municipality %in% c("Færder") – "Færder",
                municipality %in% c("Holmestrand") – "Holmestrand",
                municipality %in% c("Horten") – "Horten",
                municipality %in% c("Kragerø") – "Kragerø",
                municipality %in% c("Larvik") – "Larvik",
                municipality %in% c("Notodden") – "Notodden",
                municipality %in% c("Porsgrunn") – "Porsgrunn",
                municipality %in% c("Sandefjord") – "Sandefjord",
                municipality %in% c("Skien") – "Skien",
                municipality %in% c("Tønsberg") – "Tønsberg",
                municipality %in% c("Askøy") – "Askøy",
                municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
                municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
                municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
                municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
                municipality %in% c("Asker") – "Asker",
                municipality %in% c("Askim") – "Askim",
                municipality %in% c("Bærum") – "Bærum",
                municipality %in% c("Drammen") – "Drammen",
                municipality %in% c("Eidsvoll") – "Eidsvoll",
                municipality %in% c("Fredrikstad") – "Fredrikstad",
                municipality %in% c("Frogn") – "Frogn",
                municipality %in% c("Halden") – "Halden",
                municipality %in% c("Kongsberg") – "Kongsberg",
                municipality %in% c("Lier") – "Lier",
                municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
                municipality %in% c("Moss") – "Moss",
                municipality %in% c("Nesodden") – "Nesodden",
                municipality %in% c("Nittedal") – "Nittedal",
                municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
                municipality %in% c("Ringerike") – "Ringerike",
                municipality %in% c("Rælingen") – "Rælingen",
                municipality %in% c("Sarpsborg") – "Sarpsborg",
                municipality %in% c("Ullensaker") – "Ullensaker",
                municipality %in% c("Vestby") – "Vestby",
                municipality %in% c("Ås") – "Ås",
                municipality %in% c("Hvaler","Aremark","Marker","Rømskog","Hobøl",
                        "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                        "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

                municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                        "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

                municipality %in% c("Løten", "NordOdal", "SørOdal","Eidskog",
                        "Grue", "Åsnes","VålerHedmark", "Trysil",
                        "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                        "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",
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                    municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                                        "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                                        "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                                        "NordreLand","SørAurdal","Etnedal","NordAurdal",
                                        "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

                    municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                                        "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                                        "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",

                    municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

                    municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                                        "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

                    municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                                        "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                                        "Valle","Bykle") ~ "Distriktene i Aust-Agder",

                    municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                                        "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

                    municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                                        "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                                        "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

                    municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                                        "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                                        "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                                        "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

                    municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                                        "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                                        "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

                    municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                                        "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                                        "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                                        "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                                        "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

                    municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                                        "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                                        "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                                        "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

                    municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                                        "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                                        "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",

                    municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                                        "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
"Distriktene i Finnmark",

                    municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                                        "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                                        "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                                        "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                                        "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
fullforteandresmaahus <- na.omit(fullforteandresmaahus)



fullfortefriboligbygg2et <- fullfortefriboligbygg2et %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") ~ "Oslo",
                    municipality %in% c("Trondheim") ~ "Trondheim",
                    municipality %in% c("Bergen") ~ "Bergen",
                    municipality %in% c("Stavanger") ~ "Stavanger",
                    municipality %in% c("Arendal") ~ "Arendal",
                    municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
                    municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
                    municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
                    municipality %in% c("Kristiansand") ~ "Kristiansand",
                    municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
                    municipality %in% c("Sandnes") ~ "Sandnes",
                    municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
                    municipality %in% c("Elverum") ~ "Elverum",
                    municipality %in% c("Gjøvik") ~ "Gjøvik",
                    municipality %in% c("Hamar") ~ "Hamar",
                    municipality %in% c("Kongsvinger") ~ "Kongsvinger",
                    municipality %in% c("Lillehammer") ~ "Lillehammer",
                    municipality %in% c("Ringsaker") ~ "Ringsaker",
                    municipality %in% c("Stange") ~ "Stange",
                    municipality %in% c("Kristiansund") ~ "Kristiansund",
                    municipality %in% c("Molde") ~ "Molde",
                    municipality %in% c("Orkdal", "Melhus", "Malvik") ~ "Orkdal, Melhus og Malvik",
                    municipality %in% c("Steinkjer") ~ "Steinkjer",
                    municipality %in% c("Stjørdal") ~ "Stjørdal",

                    municipality %in% c("Ålesund") ~ "Ålesund",
                    municipality %in% c("Alta") ~ "Alta",
                    municipality %in% c("Bodø") ~ "Bodø",
                    municipality %in% c("Hammerfest") ~ "Hammerfest",
                    municipality %in% c("HarstadHárstták") ~ "Harstad",
                    municipality %in% c("Narvik") ~ "Narvik",
                    municipality %in% c("Rana") ~ "Rana",
                    municipality %in% c("Tromsø") ~ "Tromsø",
                    municipality %in% c("Vefsn") ~ "Vefsn",
                    municipality %in% c("Bamble") ~ "Bamble",
                    municipality %in% c("Færder") ~ "Færder",
                    municipality %in% c("Holmestrand") ~ "Holmestrand",
                    municipality %in% c("Horten") ~ "Horten",
                    municipality %in% c("Kragerø") ~ "Kragerø",
                    municipality %in% c("Larvik") ~ "Larvik",
                    municipality %in% c("Notodden") ~ "Notodden",
                    municipality %in% c("Porsgrunn") ~ "Porsgrunn",
                    municipality %in% c("Sandefjord") ~ "Sandefjord",
                    municipality %in% c("Skien") ~ "Skien",
                    municipality %in% c("Tønsberg") ~ "Tønsberg",
                    municipality %in% c("Askøy") ~ "Askøy",
                    municipality %in% c("OsHordaland","Fusa") ~ "Os og Fusa",
                    municipality %in% c("Flora","Vågsøy") ~ "Flora og Vågsøy",
                    municipality %in% c("Førde","Jølster","Gaular","Naustdal") ~ "Førde, Jølster, Gaular og
Naustdal",

                    municipality %in% c("Øygarden", "Fjell", "Sund") ~ "Øygarden, Fjell og Sund",
                    municipality %in% c("Asker") ~ "Asker",
                    municipality %in% c("Askim") ~ "Askim",
                    municipality %in% c("Bærum") ~ "Bærum",
                    municipality %in% c("Drammen") ~ "Drammen",
                    municipality %in% c("Eidsvoll") ~ "Eidsvoll",
                    municipality %in% c("Fredrikstad") ~ "Fredrikstad",
                    municipality %in% c("Frogn") ~ "Frogn",
                    municipality %in% c("Halden") ~ "Halden",
                    municipality %in% c("Kongsberg") ~ "Kongsberg",
                    municipality %in% c("Lier") ~ "Lier",
                    municipality %in% c("Lørenskog", "Skedsmo") ~ "Lørenskog og Skedsmo",
                    municipality %in% c("Moss") ~ "Moss",
                    municipality %in% c("Nesodden") ~ "Nesodden",
                    municipality %in% c("Nittedal") ~ "Nittedal",
                    municipality %in% c("Ski","Oppegård") ~ "Ski og Oppegård",
                    municipality %in% c("Ringerike") ~ "Ringerike",
                    municipality %in% c("Rælingen") ~ "Rælingen",
                    municipality %in% c("Sarpsborg") ~ "Sarpsborg",
                    municipality %in% c("Ullensaker") ~ "Ullensaker",
                    municipality %in% c("Vestby") ~ "Vestby",
                    municipality %in% c("Ås") ~ "Ås",
                    municipality %in% c("Hvaler","Aremark","Marker","Rømskog","Hobøl",
                                        "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                                        "Rakkestad","Råde","Rygge","VålerØstfold") ~ "Distriktene i Østfold",

                    municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                                        "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ "Distriktene i Akershus",

                    municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                                        "Grue", "Åsnes", "VålerHedmark", "Trysil",
                                        "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                                        "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ "Distriktene i Hedmark",

                    municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                                        "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                                        "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                                        "NordreLand","SørAurdal","Etnedal","NordAurdal",
                                        "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

                    municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                                        "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                                        "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",

                    municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

                    municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                                        "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

                    municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                                        "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                                        "Valle","Bykle") ~ "Distriktene i Aust-Agder",

                    municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                                        "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

                    municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                                        "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                                        "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

                    municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                                        "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                                        "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                                        "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

                    municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                                        "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                                        "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

                    municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                                        "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                                        "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                                        "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                                        "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

                    municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                                        "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                                        "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
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                          "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

                municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                          "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                          "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",

                municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                          "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
"Distriktene i Finnmark",

                municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                          "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                          "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                          "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                          "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

fullførtefriboligbygg2et <- na.omit(fullførtefriboligbygg2et)


fullførtefriboligbygg34et <- fullførtefriboligbygg34et %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") ~ "Oslo",
                municipality %in% c("Trondheim") ~ "Trondheim",
                municipality %in% c("Bergen") ~ "Bergen",
                municipality %in% c("Stavanger") ~ "Stavanger",
                municipality %in% c("Arendal") ~ "Arendal",
                municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
                municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
                municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
                municipality %in% c("Kristiansand") ~ "Kristiansand",
                municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
                municipality %in% c("Sandnes") ~ "Sandnes",
                municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
                municipality %in% c("Elverum") ~ "Elverum",
                municipality %in% c("Gjøvik") ~ "Gjøvik",
                municipality %in% c("Hamar") ~ "Hamar",
                municipality %in% c("Kongsvinger") ~ "Kongsvinger",
                municipality %in% c("Lillehammer") ~ "Lillehammer",
                municipality %in% c("Ringsaker") ~ "Ringsaker",
                municipality %in% c("Stange") ~ "Stange",
                municipality %in% c("Kristiansund") ~ "Kristiansund",
                municipality %in% c("Molde") ~ "Molde",
                municipality %in% c("Orkdal", "Melhus", "Malvik") ~ "Orkdal, Melhus og Malvik",
                municipality %in% c("Steinkjer") ~ "Steinkjer",
                municipality %in% c("Stjørdal") ~ "Stjørdal",
                municipality %in% c("Ålesund") ~ "Ålesund",
                municipality %in% c("Alta") ~ "Alta",
                municipality %in% c("Bodø") ~ "Bodø",
                municipality %in% c("Hammerfest") ~ "Hammerfest",
                municipality %in% c("HarstadHárstták") ~ "Harstad",
                municipality %in% c("Narvik") ~ "Narvik",
                municipality %in% c("Rana") ~ "Rana",
                municipality %in% c("Tromsø") ~ "Tromsø",
                municipality %in% c("Vefsn") ~ "Vefsn",
                municipality %in% c("Bamble") ~ "Bamble",
                municipality %in% c("Færder") ~ "Færder",
                municipality %in% c("Holmestrand") ~ "Holmestrand",
                municipality %in% c("Horten") ~ "Horten",
                municipality %in% c("Kragerø") ~ "Kragerø",
                municipality %in% c("Larvik") ~ "Larvik",
                municipality %in% c("Notodden") ~ "Notodden",
                municipality %in% c("Porsgrunn") ~ "Porsgrunn",
                municipality %in% c("Sandefjord") ~ "Sandefjord",
                municipality %in% c("Skien") ~ "Skien",
                municipality %in% c("Tønsberg") ~ "Tønsberg",
                municipality %in% c("Askøy") ~ "Askøy",
                municipality %in% c("OsHordaland","Fusa") ~ "Os og Fusa",
                municipality %in% c("Flora","Vågsøy") ~ "Flora og Vågsøy",
                municipality %in% c("Førde","Jølster","Gaular","Naustdal") ~ "Førde, Jølster, Gaular og
Naustdal",
                municipality %in% c("Øygarden", "Fjell", "Sund") ~ "Øygarden, Fjell og Sund",
                municipality %in% c("Asker") ~ "Asker",
                municipality %in% c("Askim") ~ "Askim",
                municipality %in% c("Bærum") ~ "Bærum",
                municipality %in% c("Drammen") ~ "Drammen",
                municipality %in% c("Eidsvoll") ~ "Eidsvoll",
                municipality %in% c("Fredrikstad") ~ "Fredrikstad",
                municipality %in% c("Frogn") ~ "Frogn",
                municipality %in% c("Halden") ~ "Halden",
                municipality %in% c("Kongsberg") ~ "Kongsberg",
                municipality %in% c("Lier") ~ "Lier",
                municipality %in% c("Lørenskog", "Skedsmo") ~ "Lørenskog og Skedsmo",
                municipality %in% c("Moss") ~ "Moss",
                municipality %in% c("Nesodden") ~ "Nesodden",
                municipality %in% c("Nittedal") ~ "Nittedal",
                municipality %in% c("Ski","Oppegård") ~ "Ski og Oppegård",
                municipality %in% c("Ringerike") ~ "Ringerike",
                municipality %in% c("Rælingen") ~ "Rælingen",
                municipality %in% c("Sarpsborg") ~ "Sarpsborg",
                municipality %in% c("Ullensaker") ~ "Ullensaker",
                municipality %in% c("Vestby") ~ "Vestby",
                municipality %in% c("Ås") ~ "Ås",
                municipality %in% c("Hvaler","Aremark","Marker","Rømskog","Hobøl",
                          "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                          "Rakkestad","Råde","Rygge","VålerØstfold") ~ "Distriktene i Østfold",

                municipality %in% c("AurskogHøland","Sørum","Fet",Enebakk",
                          "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ "Distriktene i Akershus",

                municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",


                          "Grue", "Åsnes", "VålerHedmark", "Trysil",
                          "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                          "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ "Distriktene i Hedmark",

                municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                          "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                          "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                          "NordreLand","SørAurdal","Etnedal","NordAurdal",
                          "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

                municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                          "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                          "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") ~ "Distriktene i
Buskerud",

                municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

                municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                          "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

                municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                          "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                          "Valle","Bykle") ~ "Distriktene i Aust-Agder",

                municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                          "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

                municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                          "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                          "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

                municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                          "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                          "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                          "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

                municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                          "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                          "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

                municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                          "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                          "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                          "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                          "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

                municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                          "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                          "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                          "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

                municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                          "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                          "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",

                municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                          "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
"Distriktene i Finnmark",

                municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                          "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                          "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                          "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                          "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

fullførtefriboligbygg34et <- na.omit(fullførtefriboligbygg34et)


fullførtefriboligbygg5et <- fullførtefriboligbygg5et %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") ~ "Oslo",
                municipality %in% c("Trondheim") ~ "Trondheim",
                municipality %in% c("Bergen") ~ "Bergen",
                municipality %in% c("Stavanger") ~ "Stavanger",
                municipality %in% c("Arendal") ~ "Arendal",
                municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
                municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
                municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
                municipality %in% c("Kristiansand") ~ "Kristiansand",
                municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
                municipality %in% c("Sandnes") ~ "Sandnes",
                municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
                municipality %in% c("Elverum") ~ "Elverum",
                municipality %in% c("Gjøvik") ~ "Gjøvik",
                municipality %in% c("Hamar") ~ "Hamar",
                municipality %in% c("Kongsvinger") ~ "Kongsvinger",
                municipality %in% c("Lillehammer") ~ "Lillehammer",
                municipality %in% c("Ringsaker") ~ "Ringsaker",
                municipality %in% c("Stange") ~ "Stange",
                municipality %in% c("Kristiansund") ~ "Kristiansund",
                municipality %in% c("Molde") ~ "Molde",
```

```
                municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
                municipality %in% c("Steinkjer") – "Steinkjer",
                municipality %in% c("Stjørdal") – "Stjørdal",
                municipality %in% c("Ålesund") – "Ålesund",
                municipality %in% c("Alta") – "Alta",
                municipality %in% c("Bodø") – "Bodø",
                municipality %in% c("Hammerfest") – "Hammerfest",
                municipality %in% c("HarstadHárstták") – "Harstad",
                municipality %in% c("Narvik") – "Narvik",
                municipality %in% c("Rana") – "Rana",
                municipality %in% c("Tromsø") – "Tromsø",
                municipality %in% c("Vefsn") – "Vefsn",
                municipality %in% c("Bamble") – "Bamble",
                municipality %in% c("Færder") – "Færder",
                municipality %in% c("Holmestrand") – "Holmestrand",
                municipality %in% c("Horten") – "Horten",
                municipality %in% c("Kragerø") – "Kragerø",
                municipality %in% c("Larvik") – "Larvik",
                municipality %in% c("Notodden") – "Notodden",
                municipality %in% c("Porsgrunn") – "Porsgrunn",
                municipality %in% c("Sandefjord") – "Sandefjord",
                municipality %in% c("Skien") – "Skien",
                municipality %in% c("Tønsberg") – "Tønsberg",
                municipality %in% c("Askøy") – "Askøy",
                municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
                municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
                municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
                municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
                municipality %in% c("Asker") – "Asker",
                municipality %in% c("Askim") – "Askim",
                municipality %in% c("Bærum") – "Bærum",
                municipality %in% c("Drammen") – "Drammen",
                municipality %in% c("Eidsvoll") – "Eidsvoll",
                municipality %in% c("Fredrikstad") – "Fredrikstad",
                municipality %in% c("Frogn") – "Frogn",
                municipality %in% c("Halden") – "Halden",
                municipality %in% c("Kongsberg") – "Kongsberg",
                municipality %in% c("Lier") – "Lier",
                municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
                municipality %in% c("Moss") – "Moss",
                municipality %in% c("Nesodden") – "Nesodden",
                municipality %in% c("Nittedal") – "Nittedal",
                municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
                municipality %in% c("Ringerike") – "Ringerike",
                municipality %in% c("Rælingen") – "Rælingen",
                municipality %in% c("Sarpsborg") – "Sarpsborg",
                municipality %in% c("Ullensaker") – "Ullensaker",
                municipality %in% c("Vestby") – "Vestby",
                municipality %in% c("Ås") – "Ås",
                municipality %in% c("Hvaler","Aremark","Marker","Rømskog","Hobøl",
                    "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                    "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

                municipality %in% c("AurskogHøland","Sørum","Fet",Enebakk",
                    "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",

                municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                    "Grue", "Åsnes", "VålerHedmark", "Trysil",
                    "Åmot","StorElvdal", "Rendalen", "Engerdal",
                    "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") – "Distriktene i Hedmark",

                municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                    "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                    "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                    "NordreLand","SørAurdal","Etnedal","NordAurdal",
                    "VestreSlidre","ØystreSlidre","Vang") – "Distriktene i Oppland",

                municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                    "Sigdal","Krødsherad","Modum","ØvreEiker",NedreEiker",
                    "Røyken","Hurum","Flesberg","Rollag","NoreogUvdal") – "Distriktene i
Buskerud",

                municipality %in% c("Svelvik","SandeVestfold","Re") – "Distriktene i Vestfold",

                municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                    "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") – "Distriktene i
Telemark",

                municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                    "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                    "Valle","Bykle") – "Distriktene i Aust-Agder",

                municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                    "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") – "Distriktene i Vest-
Agder",

                municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                    "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                    "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") – "Distriktene i Rogaland",

                municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                    "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                    "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                    "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") –
"Distriktene i Hordaland",

                municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                    "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                    "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") –
"Distriktene i Sogn og Fjordane",

                municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                    "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                    "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                    "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                    "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") – "Distriktene i Møre
og Romsdal",

                municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                    "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
```

```
                    "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

    "FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                        "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

    "Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") – "Distriktene i Nordland",

                municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                    "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

    "Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                        "Skjervøy","NordreisaRáisaRaisi","Kvænangen") – "Distriktene i Troms",

                municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

    "Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                        "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") –
"Distriktene i Finnmark",

                municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                    "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                    "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

    "Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                        "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                        "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") – "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))

fullfortefriboligbygg5et <- na.omit(fullfortefriboligbygg5et)


fullfortesamboligbygg5et <- fullfortesamboligbygg5et %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") – "Oslo",
                municipality %in% c("Trondheim") – "Trondheim",
                municipality %in% c("Bergen") – "Bergen",
                municipality %in% c("Stavanger") – "Stavanger",
                municipality %in% c("Arendal") – "Arendal",
                municipality %in% c("Grimstad", "Lillesand") – "Grimstad og Lillesand",
                municipality %in% c("Haugesund","Karmøy") – "Haugesund og Karmøy",
                municipality %in% c("Hå", "Klepp", "Time") – "Hå, Klepp og Time",
                municipality %in% c("Kristiansand") – "Kristiansand",
                municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") – "Lindesnes, Mandal,
Marnardal og Søgne",
                municipality %in% c("Sandnes") – "Sandnes",
                municipality %in% c("Sola", "Randaberg") – "Sola og Randaberg",
                municipality %in% c("Elverum") – "Elverum",
                municipality %in% c("Gjøvik") – "Gjøvik",
                municipality %in% c("Hamar") – "Hamar",
                municipality %in% c("Kongsvinger") – "Kongsvinger",
                municipality %in% c("Lillehammer") – "Lillehammer",
                municipality %in% c("Ringsaker") – "Ringsaker",
                municipality %in% c("Stange") – "Stange",
                municipality %in% c("Kristiansund") – "Kristiansund",
                municipality %in% c("Molde") – "Molde",
                municipality %in% c("Orkdal", "Melhus", "Malvik") – "Orkdal, Melhus og Malvik",
                municipality %in% c("Steinkjer") – "Steinkjer",
                municipality %in% c("Stjørdal") – "Stjørdal",
                municipality %in% c("Ålesund") – "Ålesund",
                municipality %in% c("Alta") – "Alta",
                municipality %in% c("Bodø") – "Bodø",
                municipality %in% c("Hammerfest") – "Hammerfest",
                municipality %in% c("HarstadHárstták") – "Harstad",
                municipality %in% c("Narvik") – "Narvik",
                municipality %in% c("Rana") – "Rana",
                municipality %in% c("Tromsø") – "Tromsø",
                municipality %in% c("Vefsn") – "Vefsn",
                municipality %in% c("Bamble") – "Bamble",
                municipality %in% c("Færder") – "Færder",
                municipality %in% c("Holmestrand") – "Holmestrand",
                municipality %in% c("Horten") – "Horten",
                municipality %in% c("Kragerø") – "Kragerø",
                municipality %in% c("Larvik") – "Larvik",
                municipality %in% c("Notodden") – "Notodden",
                municipality %in% c("Porsgrunn") – "Porsgrunn",
                municipality %in% c("Sandefjord") – "Sandefjord",
                municipality %in% c("Skien") – "Skien",
                municipality %in% c("Tønsberg") – "Tønsberg",
                municipality %in% c("Askøy") – "Askøy",
                municipality %in% c("OsHordaland","Fusa") – "Os og Fusa",
                municipality %in% c("Flora","Vågsøy") – "Flora og Vågsøy",
                municipality %in% c("Førde","Jølster","Gaular","Naustdal") – "Førde, Jølster, Gaular og
Naustdal",
                municipality %in% c("Øygarden", "Fjell", "Sund") – "Øygarden, Fjell og Sund",
                municipality %in% c("Asker") – "Asker",
                municipality %in% c("Askim") – "Askim",
                municipality %in% c("Bærum") – "Bærum",
                municipality %in% c("Drammen") – "Drammen",
                municipality %in% c("Eidsvoll") – "Eidsvoll",
                municipality %in% c("Fredrikstad") – "Fredrikstad",
                municipality %in% c("Frogn") – "Frogn",
                municipality %in% c("Halden") – "Halden",
                municipality %in% c("Kongsberg") – "Kongsberg",
                municipality %in% c("Lier") – "Lier",
                municipality %in% c("Lørenskog", "Skedsmo") – "Lørenskog og Skedsmo",
                municipality %in% c("Moss") – "Moss",
                municipality %in% c("Nesodden") – "Nesodden",
                municipality %in% c("Nittedal") – "Nittedal",
                municipality %in% c("Ski","Oppegård") – "Ski og Oppegård",
                municipality %in% c("Ringerike") – "Ringerike",
                municipality %in% c("Rælingen") – "Rælingen",
                municipality %in% c("Sarpsborg") – "Sarpsborg",
                municipality %in% c("Ullensaker") – "Ullensaker",
                municipality %in% c("Vestby") – "Vestby",
                municipality %in% c("Ås") – "Ås",
                municipality %in% c("Hvaler","Aremark","Marker","Rømskog","Hobøl",
                    "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                    "Rakkestad","Råde","Rygge","VålerØstfold") – "Distriktene i Østfold",

                municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                    "Gjerdrum","NesAkershus","Nannestad","Hurdal") – "Distriktene i Akershus",
```

```r
                 municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                            "Grue", "Åsnes", "VålerHedmark", "Trysil",
                            "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                            "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ "Distriktene i Hedmark",

                 municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                            "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                            "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                            "NordreLand","SørAurdal","Etnedal","NordAurdal",
                            "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

                 municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                            "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                            "Røyken","Hurum","Flesberg","Rollag","NøreogUvdal") ~ "Distriktene i
Buskerud",

                 municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

                 municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                            "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

                 municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                            "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                            "Valle","Bykle") ~ "Distriktene i Aust-Agder",

                 municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                            "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

                 municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                            "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                            "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

                 municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                            "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                            "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                            "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

                 municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                            "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                            "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

                 municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                            "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                            "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                            "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                            "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

                 municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                            "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                            "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",

"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                            "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",

"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

                 municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                            "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",

"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKáfjordKaivuono",
                            "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",

                 municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",

"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                            "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
"Distriktene i Finnmark",

                 municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                            "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                            "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",

"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                            "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                            "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ "Distriktene i
Trøndelag")) %>%
  group_by(municipality, variable) %>% summarise(value=sum(value))
fullfortesamboligbygg5et <- na.omit(fullfortesamboligbygg5et)

# lager et datasett med alle boligtypene samlet og summert
# Igangsatt
igangsatt_totalt <- rbind(igangsattenebolig,igangsatteneboligmutleie,igangsattverttomansbolig,
                    igangsattrekkehus,igangsattandresmaahus,igangsattfriboligbygg2et,
                    igangsattfriboligbygg34et,igangsattfriboligbygg5et,igangsattsamboligbygg5et)

igangsatt_totalt <- igangsatt_totalt %>%
  group_by(municipality, variable) %>%
  summarise(value = sum(value))


# Fullført
fullforte_totalt <- rbind(fullforteenebolig,fullforteeneboligmutleie,fullforteverttomansbolig,
                    fullforterekkehus,fullforteandresmaahus,fullfortefriboligbygg2et,
                    fullfortefriboligbygg34et,fullfortefriboligbygg5et,fullfortesamboligbygg5et)

fullforte_totalt <- fullforte_totalt %>%
  group_by(municipality, variable) %>%
  summarize(value = sum(value))


# Innvandring og utvandring
innvandring <- read_excel("Innvandring.xlsx")
```

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colnames(innvandring) <- innvandring[3,]
utvandring <- innvandring[-c(1,2,3,5:58),c(53:104)]
innvandring <- innvandring[-c(1,2,3,5:58),c(1:52)]
utvandring$municipality <- "hele landet"
innvandring$municipality <- "hele landet"

innvandring <- innvandring %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable

utvandring <- utvandring %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding

# Befolkningstetthet
befolkningstetthet <- read_excel("FolkeLandArealKm2.xlsx")
colnames(befolkningstetthet) <- befolkningstetthet[3,]
names(befolkningstetthet)[1:1] <- paste("municipality")
befolkningstetthet <- befolkningstetthet[-c(1:3,427:478),]
befolkningstetthet$municipality <- gsub("[^\\p{L}]+", "", befolkningstetthet$municipality, perl = TRUE)

befolkningstetthet <- befolkningstetthet %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable
befolkningstetthet <- befolkningstetthet[order(befolkningstetthet$municipality),]


befolkningstetthet$value <- gsub("[[:space:]]", "", befolkningstetthet$value)
befolkningstetthet$value <- as.numeric(befolkningstetthet$value)

befolkningstetthet <- befolkningstetthet %>%
  mutate(municipality = case_when(municipality %in% c("Oslokommune") ~ "Oslo",
              municipality %in% c("Trondheim") ~ "Trondheim",
              municipality %in% c("Bergen") ~ "Bergen",
              municipality %in% c("Stavanger") ~ "Stavanger",
              municipality %in% c("Arendal") ~ "Arendal",
              municipality %in% c("Grimstad", "Lillesand") ~ "Grimstad og Lillesand",
              municipality %in% c("Haugesund","Karmøy") ~ "Haugesund og Karmøy",
              municipality %in% c("Hå", "Klepp", "Time") ~ "Hå, Klepp og Time",
              municipality %in% c("Kristiansand") ~ "Kristiansand",
              municipality %in% c("Lindesnes", "Mandal", "Marnardal", "Søgne") ~ "Lindesnes, Mandal,
Marnardal og Søgne",
              municipality %in% c("Sandnes") ~ "Sandnes",
              municipality %in% c("Sola", "Randaberg") ~ "Sola og Randaberg",
              municipality %in% c("Elverum") ~ "Elverum",
              municipality %in% c("Gjøvik") ~ "Gjøvik",
              municipality %in% c("Hamar") ~ "Hamar",
              municipality %in% c("Kongsvinger") ~ "Kongsvinger",
              municipality %in% c("Lillehammer") ~ "Lillehammer",
              municipality %in% c("Ringsaker") ~ "Ringsaker",
              municipality %in% c("Stange") ~ "Stange",
              municipality %in% c("Kristiansund") ~ "Kristiansund",
              municipality %in% c("Molde") ~ "Molde",
              municipality %in% c("Orkdal", "Melhus", "Malvik") ~ "Orkdal, Melhus og Malvik",
              municipality %in% c("Steinkjer") ~ "Steinkjer",
              municipality %in% c("Stjørdal") ~ "Stjørdal",
              municipality %in% c("Ålesund") ~ "Ålesund",
              municipality %in% c("Alta") ~ "Alta",
              municipality %in% c("Bodø") ~ "Bodø",
              municipality %in% c("Hammerfest") ~ "Hammerfest",
              municipality %in% c("HarstadHárstták") ~ "Harstad",
              municipality %in% c("Narvik") ~ "Narvik",
              municipality %in% c("Rana") ~ "Rana",
              municipality %in% c("Tromsø") ~ "Tromsø",
              municipality %in% c("Vefsn") ~ "Vefsn",
              municipality %in% c("Bamble") ~ "Bamble",
              municipality %in% c("Færder") ~ "Færder",
              municipality %in% c("Holmestrand") ~ "Holmestrand",
              municipality %in% c("Horten") ~ "Horten",
              municipality %in% c("Kragerø") ~ "Kragerø",
              municipality %in% c("Larvik") ~ "Larvik",
              municipality %in% c("Notodden") ~ "Notodden",
              municipality %in% c("Porsgrunn") ~ "Porsgrunn",
              municipality %in% c("Sandefjord") ~ "Sandefjord",
              municipality %in% c("Skien") ~ "Skien",
              municipality %in% c("Tønsberg") ~ "Tønsberg",
              municipality %in% c("Askøy") ~ "Askøy",
              municipality %in% c("OsHordaland","Fusa") ~ "Os og Fusa",
              municipality %in% c("Flora","Vågsøy") ~ "Flora og Vågsøy",
              municipality %in% c("Førde","Jølster","Gaular","Naustdal") ~ "Førde, Jølster, Gaular og
Naustdal",
              municipality %in% c("Øygarden", "Fjell", "Sund") ~ "Øygarden, Fjell og Sund",
              municipality %in% c("Asker") ~ "Asker",
              municipality %in% c("Askim") ~ "Askim",
              municipality %in% c("Bærum") ~ "Bærum",
              municipality %in% c("Drammen") ~ "Drammen",
              municipality %in% c("Eidsvoll") ~ "Eidsvoll",
              municipality %in% c("Fredrikstad") ~ "Fredrikstad",
              municipality %in% c("Frogn") ~ "Frogn",
              municipality %in% c("Halden") ~ "Halden",
              municipality %in% c("Kongsberg") ~ "Kongsberg",
              municipality %in% c("Lier") ~ "Lier",
              municipality %in% c("Lørenskog", "Skedsmo") ~ "Lørenskog og Skedsmo",
              municipality %in% c("Moss") ~ "Moss",
              municipality %in% c("Nesodden") ~ "Nesodden",
              municipality %in% c("Nittedal") ~ "Nittedal",
              municipality %in% c("Ski","Oppegård") ~ "Ski og Oppegård",
              municipality %in% c("Ringerike") ~ "Ringerike",
              municipality %in% c("Rælingen") ~ "Rælingen",
              municipality %in% c("Sarpsborg") ~ "Sarpsborg",
              municipality %in% c("Ullensaker") ~ "Ullensaker",
              municipality %in% c("Vestby") ~ "Vestby",
              municipality %in% c("Ås") ~ "Ås",
              municipality %in% c("Hvaler","Aremark","Marker","Rømskog","Hobøl",
                        "Trøgstad","Spydeberg","Eidsberg","Skiptvet",
                        "Rakkestad","Råde","Rygge","VålerØstfold") ~ "Distriktene i Østfold",

              municipality %in% c("AurskogHøland","Sørum","Fet","Enebakk",
                        "Gjerdrum","NesAkershus","Nannestad","Hurdal") ~ "Distriktene i Akershus",
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```r
                municipality %in% c("Løten", "NordOdal", "SørOdal", "Eidskog",
                          "Grue", "Åsnes", "VålerHedmark", "Trysil",
                          "Åmot", "StorElvdal", "Rendalen", "Engerdal",
                          "Tolga","Tynset","Alvdal","Folldal", "OsHedmark") ~ "Distriktene i Hedmark",

                municipality %in% c("Dovre","Lesja","Skjåk","Lom","Vågå","NordFron","Sel",
                          "SørFron","Ringebu","Øyer","Gausdal","ØstreToten",
                          "VestreToten","Jevnaker","Lunner","Gran","SøndreLand",
                          "NordreLand","SørAurdal","Etnedal","NordAurdal",
                          "VestreSlidre","ØystreSlidre","Vang") ~ "Distriktene i Oppland",

                municipality %in% c("Hole","Flå","NesBuskerud","Gol","Hemsedal","Ål","Hol",
                          "Sigdal","Krødsherad","Modum","ØvreEiker","NedreEiker",
                          "Røyken","Hurum","Flesberg","Rollag","NøreogUvdal") ~ "Distriktene i
Buskerud",

                municipality %in% c("Svelvik","SandeVestfold","Re") ~ "Distriktene i Vestfold",

                municipality %in% c("Siljan","Drangedal","Nome","BøTelemark","Sauherad","Tinn","Hjartdal",
                          "Seljord","Kviteseid","Nissedal","Fyresdal","Tokke","Vinje") ~ "Distriktene i
Telemark",

                municipality %in% c("Risør","Gjerstad","Vegårshei","Tvedestrand","Froland",
                          "Birkenes","Åmli","Iveland","EvjeogHornnes","Bygland",
                          "Valle","Bykle") ~ "Distriktene i Aust-Agder",

                municipality %in% c("Farsund","Flekkefjord","Vennesla","Songdalen","Åseral",
                          "Audnedal","Lyngdal","Hægebostad","Kvinesdal","Sirdal") ~ "Distriktene i Vest-
Agder",

                municipality %in% c("Eigersund","Sokndal","Lund","Bjerkreim","Gjesdal","Forsand",
                          "Strand","Hjelmeland","Suldal","Sauda","Finnøy","Rennesøy",
                          "Kvitsøy","Bokn","Tysvær","Utsira","Vindafjord") ~ "Distriktene i Rogaland",

                municipality %in% c("Etne","Sveio","Bømlo","Stord","Fitjar","Tysnes","Kvinnherad",
                          "Jondal","Odda","Ullensvang","Eidfjord","Ulvik","Granvin",
                          "Voss","Kvam","Samnanger","Austevoll","Vaksdal","Modalen",
                          "Osterøy","Meland","Radøy","Lindås","Austrheim","Fedje","Masfjorden") ~
"Distriktene i Hordaland",

                municipality %in% c("Gulen","Solund","Hyllestad","Høyanger","Vik","Balestrand",
                          "Leikanger","Sogndal","Aurland","Lærdal","Årdal","Luster","Askvoll",
                          "Fjaler","Bremanger","Selje","Eid","Hornindal","Gloppen", "Stryn") ~
"Distriktene i Sogn og Fjordane",

                municipality %in%
c("Vanylven","SandeMøreogRomsdal","HerøyMøreogRomsdal","Ulstein","Hareid","Volda",
                          "Ørsta","Ørskog","Norddal","Stranda","Stordal","Sykkylven",
                          "Skodje","Sula","Giske","Haram","Vestnes","Rauma","Nesset",
                          "Midsund","Sandøy","Aukra","Fræna","Eide","Averøy","Gjemnes",
                          "Tingvoll","Sunndal","Surnadal","Halsa","Smøla","Aure") ~ "Distriktene i Møre
og Romsdal",

                municipality %in%
c("Bindal","Sømna","Brønnøy","Vega","Vevelstad","HerøyNordland","Alstahaug",
                          "Leirfjord","Grane","Hattfjelldal","Dønna","Nesna","Hemnes",
                          "Lurøy","Træna","Rødøy","Meløy","Gildeskål","Beiarn","Saltdal",
"FauskeFuossko","Sørfold","Steigen","HamarøyHábmer","DivtasvuodnaTysfjord","Lødingen",
                          "Tjeldsund","Evenes","Ballangen","Røst","Værøy","Flakstad",
"Vestvågøy","Vågan","Hadsel","BøNordland","Øksnes","SortlandSuortá","Andøy","Moskenes") ~ "Distriktene i Nordland",

                municipality %in% c("Kvæfjord","Skånland","Ibestad","Gratangen","LoabákLavangen","Bardu",
                          "Salangen","Målselv","Sørreisa","Dyrøy","Tranøy","Torsken","Berg",
"Lenvik","Balsfjord","Karlsøy","Lyngen","StorfjordOmasvuotnaOmasvuono","GáivuotnaKåfjordKaivuono",
                          "Skjervøy","NordreisaRáisaRaisi","Kvænangen") ~ "Distriktene i Troms",

                municipality %in%
c("Vardø","Vadsø","GuovdageaidnuKautokeino","Loppa","Hasvik","Kvalsund","Måsøy",
"Nordkapp","PorsangerPorsánguPorsanki","KárásjohkaKarasjok","Lebesby","Gamvik",
                          "Berlevåg","DeatnuTana","UnjárgaNesseby","Båtsfjord","SørVaranger") ~
"Distriktene i Finnmark",

                municipality %in%
c("Namsos","Hemne","Snillfjord","Hitra","Frøya","Ørland","Agdenes","Bjugn",
                          "Åfjord","Roan","Osen","Oppdal","Rennebu","Meldal","Røros","Holtålen",
                          "MidtreGauldal","Skaun","Klæbu","Selbu","Tydal","Meråker","Frosta",
"Levanger","Verdal","Verran","Namdalseid","SnåaseSnåsa","Lierne","RaarvihkeRøyrvik",
                          "Namsskogan","Grong","Høylandet","Overhalla","Fosnes","Flatanger",
                          "Vikna","Nærøy","Leka","Inderøy","Indre Fosen","Rindal") ~ "Distriktene i
Trøndelag")) %>%
    group_by(municipality, variable) %>% summarise(value=mean(value))

befolkningstetthet <- na.omit(befolkningstetthet)


# Byggekostnadsindeks
byggekostindeks <- read_excel("Byggindeks.xlsx")
colnames(byggekostindeks) <- byggekostindeks[3,]
names(byggekostindeks)[1:1] <- paste("municipality")
byggekostindeks <- byggekostindeks[-c(1:3,5:53),]
byggekostindeks$municipality <- "hele landet"

byggekostindeks <- byggekostindeks %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable

byggekostindeks$value <- as.numeric(byggekostindeks$value)
# er dette rett framgangsmåte?
byggekostindeks$value <- byggekostindeks$value+35.7


# Gjeld husholdning
gjeldhusholdning <- read_excel("Gjeldsrate (1).xlsx")
colnames(gjeldhusholdning) <- gjeldhusholdning[3,]
# gjeldsrate
```

```r
gjeldsratehusholdning <- gjeldhusholdning[-c(1:3,5:60),c(1:69)]
names(gjeldsratehusholdning)[1:1] <- paste("municipality")
gjeldsratehusholdning$municipality <- "hele landet"

gjeldsratehusholdning <- gjeldsratehusholdning %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable


# gjeldsvekst
gjeldsveksthusholdning <- gjeldhusholdning[-c(1:3,5:60),c(1,70:137)]
names(gjeldsveksthusholdning)[1:1] <- paste("municipality")
gjeldsveksthusholdning$municipality <- "hele landet"

gjeldsveksthusholdning <- gjeldsveksthusholdning %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable



# BNP
BNPprInnbygger <- read_excel("BNP.xlsx")
colnames(BNPprInnbygger) <- BNPprInnbygger[3,]
BNPprInnbygger <- BNPprInnbygger[-c(1:3,5:50),]
# removing all NA colums
BNPprInnbygger <- BNPprInnbygger[,colSums(is.na(BNPprInnbygger))<nrow(BNPprInnbygger)]
BNPprInnbygger$municipality <- "hele landet"


BNPprInnbygger <- BNPprInnbygger %>%
  gather(variable, value, -`municipality`) %>%
  mutate(variable = factor(variable)) %>%
  as.data.frame() # melting with years as desiding variable

# airbnb alt mulig M

# bolig lagt ut for salg kommuner distrikter Q

# Bolig liggetid åpent marked kommuner distrikter Q

# Prisindeks bolig kommuner distrikter Q

# Solgte bolig kommuner distrikter Q

# usolgte bolig kommuner distrikter Q

# Kvm pris store kommuner enebolig Q

# Kvm pris store kommuner smaahus Q

# Kvm pris store kommuner blokk  Q

# husholdningsinntekt etter skatt kommuner Y

# antall husholdninger i kommuner Y

# arbeidsledighet kommuner M

# arbeidsledighet i prosent kommuner M

# Utlånsrente bolig hele landet Q

# Gjennomsnittlig boliglånsrente hele landet Y

# utlånsrente nye boliglån hele landet M

# Folkemengde befolkning pr kommunen Y

# Innvandring hele landet Q

# utvandring hele landet Q

# Befolkningstetthet pr kommune Y

# Byggekostnadsindeks hele landet M

# Gjeldsrate husholdning hele landet Q

# Gjeldsvekst husholdning hele landet Q

# BNP pr innbygger hele landet Y

# igangsattenebolig "111 Enebolig") Q

# igangsatteneboligmutleie "112 Enebolig med hybelleilighet, sokkelleilighet o.l.") Q

# igangsattverttomansbolig "121 Del av tomannsbolig, vertikaldelt") Q

# igangsattrekkehus "131 Rekkehus") Q

# igangsattandresmaahus "136 Andre småhus med 3 boliger eller flere") Q

# igangsattfriboligbygg2et "141 Store frittliggende boligbygg på 2 etasjer") Q

# igangsattfriboligbygg34et "142 Store frittliggende boligbygg på 3 og 4 etasjer") Q

# igangsattfriboligbygg5et "143 Store frittliggende boligbygg på 5 etasjer eller over") Q

# igangsattsamboligbygg5et "146 Stort sammenbygd boligbygg på 5 etasjer eller over") Q

# fullforteenebolig "111 Enebolig") Q

# fullforteeneboligmutleie "112 Enebolig med hybelleilighet, sokkelleilighet o.l.") Q

# fullforteverttomansbolig "121 Del av tomannsbolig, vertikaldelt") Q

# fullforterekkehus "131 Rekkehus") Q
```

```r
# fullforteandresmaahus "136 Andre småhus med 3 boliger eller flere") Q

# fullfortefriboligbygg2et "141 Store frittliggende boligbygg på 2 etasjer") Q

# fullfortefriboligbygg34et "142 Store frittliggende boligbygg på 3 og 4 etasjer") Q

# fullfortefriboligbygg5et "143 Store frittliggende boligbygg på 5 etasjer eller over") Q

# fullfortesamboligbygg5et "146 Stort sammenbygd boligbygg på 5 etasjer eller over") Q

# Igangsatt_totalt alle boligtyper Q

# fullforte_totalt alle boligtyper Q


# test <- KvPrisEnebolig %>%
#   filter(municipality %in% c("Arendal", "Ålesund", "Tromsø","Alta","Bodø")) %>%
#   filter(variable %in% c("2019K4","2018K3"))


# when mean
# test %>% mutate(municipality = case_when(municipality %in% c("Arendal","Ålesund") ~ "Region1",
#                          municipality %in% c("Tromsø","Alta") ~ "Region2",
#                          municipality %in% c("Bodø") ~ "Bodø")) %>%
#   group_by(municipality, variable) %>% summarise(value=mean(value))

# when addition
# test %>% mutate(municipality = case_when(municipality %in% c("Arendal","Ålesund") ~ "Region1",
#                          municipality %in% c("Tromsø","Alta") ~ "Region2",
#                          municipality %in% c("Bodø") ~ "Bodø")) %>%
#   group_by(municipality, variable) %>% summarise(value=sum(value))

################################################################
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######################### Datasett klargjort
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#
AirData#######################################################
##############
#
Priceindex#####################################################
###########
#
Sold_region####################################################
###########
#
UnSold_region##################################################
###########
#
advertised_houses_region#######################################
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#
salestime_houses_region########################################
#######
#
KvPrisEnebolig#################################################
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#
KvPrisSmaahus##################################################
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#
KvPrisBlokk####################################################
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#
Hinc###########################################################
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#
NumHousehold###################################################
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#
unemploy#######################################################
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unemployprob###################################################
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rente##########################################################
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aarrente#######################################################
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#
mndrente#######################################################
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#
Folkemengde####################################################
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igangsattenebolig##############################################
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igangsatteneboligmutleie#######################################
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#
igangsattverttomansbolig#######################################
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#
igangsattrekkehus##############################################
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#
igangsattandresmaahus##########################################
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#
igangsattfriboligbygg2et#######################################
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```r
#
igangsattfriboligbygg34et######################################
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#
igangsattfriboligbygg5et#######################################
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igangsattsamboligbygg5et#######################################
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fullforteenebolig##############################################
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fullforteeneboligmutleie#######################################
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fullforteverttomansbolig#######################################
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fullforterekkehus##############################################
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fullfortefriboligbygg34et######################################
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fullfortefriboligbygg5et#######################################
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fullfortesamboligbygg5et#######################################
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#
fullforte_totalt##############################################
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#
Igangsatt_totalt##############################################
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#
innvandring####################################################
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#
utvandring#####################################################
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NetImmigration#################################################
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#
gjeldsratehusholdning##########################################
#######
# byggekostindeks
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#
#
gjeldsveksthusholdning#########################################
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#
BNPprInnbygger#################################################
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#
befolkningstetthet#############################################
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################
################################# Merge
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# starter med byggekostinndeks for å lage fullstending datasett pr mnd alt skal
# merges inn i

# byggekostinndeks
ym = str_split_fixed(byggekostindeks$variable, "M", 2)
byggekostindeks$year = as.numeric(ym[,1])
byggekostindeks$month = as.numeric(ym[,2])
byggekostindeks$date_start = as.Date(paste(byggekostindeks$year, byggekostindeks$month, 1, sep="-"), "%Y-%m-%d")
byggekostindeks <- byggekostindeks[,c(6,1,3)]

colnames(byggekostindeks) <- c("date_start","municipality", "buildCostInd")

col1 <- as.data.frame(rep(byggekostindeks$date_start, each = 87)) #repeating the dates for all regions
col2 <- as.data.frame(rep(unique(AirData$municipality), times = 204)) #repeating regions for all dates
# 12mnd*17years=204
col3 <- as.data.frame(rep(byggekostindeks$buildCostInd,each = 87))#repeating all values
byggekostindeks <- cbind(col1,col2,col3)
colnames(byggekostindeks) <- c("date_start","variable","buildCostInd")

byggekostindeks$variable <- as.factor(byggekostindeks$variable)
byggekostindeks$date_start <- as.Date(byggekostindeks$date_start)


# Priceindex
#str(Priceindex)
Priceindex$date_start <- as.character(Priceindex$date_start)
Priceindex$date_start <- str_replace_all(Priceindex$date_start, c("K1" = "-01-01", "K2" = "-04-01",
                                          "K3" = "-07-01", "K4" = "-10-01"))
Priceindex$date_start <- as.Date(Priceindex$date_start)
Priceindex$variable <- as.factor(Priceindex$variable)
colnames(Priceindex) <- c("variable","date_start","house_P_index")

df1 <- left_join(byggekostindeks,Priceindex, by = c("date_start" = "date_start", "variable" = "variable"))
colnames(df1) <- c("date_start","municipality", "buildCostInd","house_P_index")
```

```r
# Airbnb
AirData$municipality <- as.factor(AirData$municipality)
colnames(AirData) <- c("date_start","municipality","AIRrev", "AIRroomBook",
        "AIRroomAv" ,"AIRrevprUn", "AIRadr","AIRrevPAU","AIRavaUn")

df1 <- left_join(df1,AirData, by = c("date_start" = "date_start", "municipality" = "municipality"))

#df1[is.na(df1)] <- 0

#  Sold regions
#str(Sold_region)

Sold_region$date_start <- as.character(Sold_region$date_start)
Sold_region$date_start <- str_replace_all(Sold_region$date_start, c("K1" = "-01-01", "K2" = "-04-01",
                    "K3" = "-07-01", "K4" = "-10-01"))
Sold_region$date_start <- as.Date(Sold_region$date_start)

Sold_region$variable <- as.factor(Sold_region$variable)
colnames(Sold_region) <- c("municipality","date_start","soldHouses")

df1 <- left_join(df1,Sold_region, by = c("date_start" = "date_start", "municipality" = "municipality"))


# UnSold_region
#str(UnSold_region)

UnSold_region$date_start <- as.character(UnSold_region$date_start)
UnSold_region$date_start <- str_replace_all(UnSold_region$date_start, c("K1" = "-01-01", "K2" = "-04-01",
                    "K3" = "-07-01", "K4" = "-10-01"))
UnSold_region$date_start <- as.Date(UnSold_region$date_start)

UnSold_region$variable <- as.factor(UnSold_region$variable)
colnames(UnSold_region) <- c("municipality","date_start","UnSoldHouses")

df1 <- left_join(df1,UnSold_region, by = c("date_start" = "date_start", "municipality" = "municipality"))


# Houses for sale region
#str(advertised_houses_region)

advertised_houses_region$date_start <- as.character(advertised_houses_region$date_start)
advertised_houses_region$date_start <- str_replace_all(advertised_houses_region$date_start, c("K1" = "-01-01",
"K2" = "-04-01",
                    "K3" = "-07-01", "K4" = "-10-01"))
advertised_houses_region$date_start <- as.Date(advertised_houses_region$date_start)

advertised_houses_region$variable <- as.factor(advertised_houses_region$variable)
colnames(advertised_houses_region) <- c("municipality","date_start","HousesForSale")

df1 <- left_join(df1,advertised_houses_region, by = c("date_start" = "date_start", "municipality" = "municipality"))


# salestime _per house_region
#str(salestime_houses_region)
salestime_houses_region$date_start <- as.character(salestime_houses_region$date_start)
salestime_houses_region$date_start <- str_replace_all(salestime_houses_region$date_start, c("K1" = "-01-01", "K2"
= "-04-01",
                    "K3" = "-07-01", "K4" = "-10-01"))
salestime_houses_region$date_start <- as.Date(salestime_houses_region$date_start)

salestime_houses_region$variable <- as.factor(salestime_houses_region$variable)
colnames(salestime_houses_region) <- c("municipality","date_start","SalestimeHouses")

df1 <- left_join(df1,salestime_houses_region, by = c("date_start" = "date_start", "municipality" = "municipality"))


# Household income
#str(Hinc)
Hinc$variable <- as.character(Hinc$variable)
df1$year <- substring(df1$date_start, 1,4)
Hinc$municipality <- as.factor(Hinc$municipality)
colnames(Hinc) <- c("municipality","date_start","HouseHinc")
df1 <- left_join(df1, Hinc, by= c("year" = "date_start", "municipality" = "municipality"))


# Households in the region
#str(NumHousehold)
NumHousehold$variable <- as.character(NumHousehold$variable)
NumHousehold$municipality <- as.factor(NumHousehold$municipality)
colnames(NumHousehold) <- c("municipality","date_start","householdsInReg")
df1 <- left_join(df1, NumHousehold, by= c("year" = "date_start", "municipality" = "municipality"))


# unemployment pr region
#sum(is.na(unemploy))
unemploy$variable <- as.character(unemploy$variable)
unemploy$municipality <- as.factor(unemploy$municipality)
ym = str_split_fixed(unemploy$variable, "M", 2)
unemploy$year = as.numeric(ym[,1])
unemploy$month = as.numeric(ym[,2])
unemploy$date_start = as.Date(paste(unemploy$year, unemploy$month, 1, sep="-"), "%Y-%m-%d")
unemploy <- unemploy[,c(6,1,3)]
colnames(unemploy) <- c("date_start","municipality","unemployment")
df1 <- left_join(df1, unemploy, by= c("date_start" = "date_start", "municipality" = "municipality"))


# unemployprob pr region
#str(unemployprob)
unemployprob$variable <- as.character(unemployprob$variable)
unemployprob$municipality <- as.factor(unemployprob$municipality)
ym = str_split_fixed(unemployprob$variable, "M", 2)
unemployprob$year = as.numeric(ym[,1])
unemployprob$month = as.numeric(ym[,2])
unemployprob$date_start = as.Date(paste(unemployprob$year, unemployprob$month, 1, sep="-"), "%Y-%m-%d")
unemployprob <- unemployprob[,c(6,1,3)]

colnames(unemployprob) <- c("date_start","municipality","unemploymentPerc")
df1 <- left_join(df1, unemployprob, by= c("date_start" = "date_start", "municipality" = "municipality"))
```

```r
# rente
rente$variable <- as.character(rente$variable)
rente$variable <- str_replace_all(rente$variable, c("K1" = "-01-01", "K2" = "-04-01",
                    "K3" = "-07-01", "K4" = "-10-01"))
rente$variable <- as.Date(rente$variable)
colnames(rente) <- c("region","date_start","LendRateHouse")

df1 <- left_join(df1, rente, by= c("date_start" = "date_start"))
df1 <- df1[,-21]


# årsrente
#str(aarrente)
aarrente$variable <- as.character(aarrente$variable)
colnames(aarrente) <- c("region","date_start","AveHouseLendRate")
df1 <- left_join(df1, aarrente, by= c("year" = "date_start"))
df1 <- df1[,-22]


# monthly rente
#str(mndrente)
mndrente$variable <- as.character(mndrente$variable)
ym = str_split_fixed(mndrente$variable, "M", 2)
mndrente$year = as.numeric(ym[,1])
mndrente$month = as.numeric(ym[,2])
mndrente$date_start = as.Date(paste(mndrente$year, mndrente$month, 1, sep="-"), "%Y-%m-%d")
mndrente <- mndrente[,c(6,1,3)]
colnames(mndrente) <- c("date_start","region","LendRateNewLoans")

df1 <- left_join(df1, mndrente, by= c("date_start" = "date_start"))
df1 <- df1[,-23]


# Folkemengde
#str(Folkemengde)
Folkemengde$municipality <- as.factor(Folkemengde$municipality)
Folkemengde$variable <- as.character(Folkemengde$variable)
colnames(Folkemengde) <- c("municipality","date_start","Population")

df1 <- left_join(df1, Folkemengde, by= c("year" = "date_start", "municipality" = "municipality"))


# immigration
#str(innvandring)
innvandring$variable <- as.character(innvandring$variable)
innvandring$variable <- str_replace_all(innvandring$variable, c("K1" = "-01-01", "K2" = "-04-01",
                    "K3" = "-07-01", "K4" = "-10-01"))
innvandring$variable <- as.Date(innvandring$variable)
innvandring$value <- as.numeric(innvandring$value)

colnames(innvandring) <- c("region","date_start","Immigration")

df1 <- left_join(df1, innvandring, by= c("date_start" = "date_start"))

df1 <- df1[,-25]


# emigration
#str(utvandring)
utvandring$variable <- as.character(utvandring$variable)
utvandring$variable <- str_replace_all(utvandring$variable, c("K1" = "-01-01", "K2" = "-04-01",
                    "K3" = "-07-01", "K4" = "-10-01"))
utvandring$variable <- as.Date(utvandring$variable)
utvandring$value <- as.numeric(utvandring$value)

colnames(utvandring) <- c("region","date_start","Emigration")

df1 <- left_join(df1, utvandring, by= c("date_start" = "date_start"))

df1 <- df1[,-26]

# net immigration
innvandring$NetImmigration <- innvandring$Immigration-utvandring$Emigration
innvandring <- innvandring[,c(1,2,4)]
df1 <- left_join(df1, innvandring, by= c("date_start" = "date_start"))
df1 <- df1[,-27]


# gjeldsratehusholdning
#str(gjeldsratehusholdning)
gjeldsratehusholdning$variable <- as.character(gjeldsratehusholdning$variable)
gjeldsratehusholdning$variable <- str_replace_all(gjeldsratehusholdning$variable, c("K1" = "-01-01", "K2" = "-04-01",
                    "K3" = "-07-01", "K4" = "-10-01"))
gjeldsratehusholdning$variable <- as.Date(gjeldsratehusholdning$variable)
gjeldsratehusholdning$value <- as.numeric(gjeldsratehusholdning$value)

colnames(gjeldsratehusholdning) <- c("region","date_start","DebtRateHousehold")
df1 <- left_join(df1, gjeldsratehusholdning, by= c("date_start" = "date_start"))
df1 <- df1[,-28]


# gjeldsveksthusholdning
#str(gjeldsveksthusholdning)
gjeldsveksthusholdning$variable <- as.character(gjeldsveksthusholdning$variable)
gjeldsveksthusholdning$variable <- str_replace_all(gjeldsveksthusholdning$variable, c("K1" = "-01-01", "K2" = "-04-01",
                    "K3" = "-07-01", "K4" = "-10-01"))
gjeldsveksthusholdning$variable <- as.Date(gjeldsveksthusholdning$variable)
gjeldsveksthusholdning$value <- as.numeric(gjeldsveksthusholdning$value)

colnames(gjeldsveksthusholdning) <- c("region","date_start","DebtGrowthHousehold")
df1 <- left_join(df1, gjeldsveksthusholdning, by= c("date_start" = "date_start"))
df1 <- df1[,-29]


# BNP
#str(BNPprInnbygger)
BNPprInnbygger$variable <- as.character(BNPprInnbygger$variable)
BNPprInnbygger$value <- as.numeric(BNPprInnbygger$value)
colnames(BNPprInnbygger) <- c("region","date_start","BNPinhabitant")
df1 <- left_join(df1, BNPprInnbygger, by= c("year" = "date_start"))
df1 <- df1[,-30]
```

```r
# befolkningstetthet
#str(befolkningstetthet)

befolkningstetthet$variable <- as.character(befolkningstetthet$variable)
befolkningstetthet$municipality <- as.factor(befolkningstetthet$municipality)
colnames(befolkningstetthet) <- c("municipality","date_start","PopulationDens")

df1 <- left_join(df1, befolkningstetthet, by= c("year" = "date_start", "municipality"="municipality"))


# kvmpris enebolig
#str(KvPrisEnebolig)

KvPrisEnebolig$variable <- as.character(KvPrisEnebolig$variable)
KvPrisEnebolig$variable <- str_replace_all(KvPrisEnebolig$variable, c("K1" = "-01-01", "K2" = "-04-01",
                                                                      "K3" = "-07-01", "K4" = "-10-01"))
KvPrisEnebolig$variable <- as.Date(KvPrisEnebolig$variable)
df1$municipality <- as.character(df1$municipality)
#KvPrisEnebolig$municipality <- as.factor(KvPrisEnebolig$municipality)

colnames(KvPrisEnebolig) <- c("municipality","date_start","KvmPriceEnebo")
df1 <- left_join(df1, KvPrisEnebolig, by= c("date_start" = "date_start", "municipality"="municipality"))


# kvmpris blokk
#str(KvPrisBlokk)

KvPrisBlokk$variable <- as.character(KvPrisBlokk$variable)
KvPrisBlokk$variable <- str_replace_all(KvPrisBlokk$variable, c("K1" = "-01-01", "K2" = "-04-01",
                                                                "K3" = "-07-01", "K4" = "-10-01"))
KvPrisBlokk$variable <- as.Date(KvPrisBlokk$variable)
#KvPrisEnebolig$municipality <- as.factor(KvPrisEnebolig$municipality)

colnames(KvPrisBlokk) <- c("municipality","date_start","KvmPriceBlokk")
df1 <- left_join(df1, KvPrisBlokk, by= c("date_start" = "date_start", "municipality"="municipality"))


# kvmpris smaahus
KvPrisSmaahus$variable <- as.character(KvPrisSmaahus$variable)
KvPrisSmaahus$variable <- str_replace_all(KvPrisSmaahus$variable, c("K1" = "-01-01", "K2" = "-04-01",
                                                                    "K3" = "-07-01", "K4" = "-10-01"))
KvPrisSmaahus$variable <- as.Date(KvPrisSmaahus$variable)
#KvPrisEnebolig$municipality <- as.factor(KvPrisEnebolig$municipality)

colnames(KvPrisSmaahus) <- c("municipality","date_start","KvmPriceSmaahus")
df1 <- left_join(df1, KvPrisSmaahus, by= c("date_start" = "date_start", "municipality"="municipality"))


# igangsatt enebolog
#str(igangsattenebolig)
df1$municipality <- as.factor(df1$municipality)
igangsattenebolig$municipality <- as.factor(igangsattenebolig$municipality)
igangsattenebolig$variable <- as.character(igangsattenebolig$variable)
igangsattenebolig$variable <- str_replace_all(igangsattenebolig$variable, c("K1" = "-01-01", "K2" = "-04-01",
                                                                            "K3" = "-07-01", "K4" = "-10-01"))
igangsattenebolig$variable <- as.Date(igangsattenebolig$variable)
colnames(igangsattenebolig) <- c("municipality","date_start","InitiatedProp1")
df1 <- left_join(df1, igangsattenebolig, by= c("date_start" = "date_start", "municipality"="municipality"))



# igangsatteneboligmutleie
igangsatteneboligmutleie$municipality <- as.factor(igangsatteneboligmutleie$municipality)
igangsatteneboligmutleie$variable <- as.character(igangsatteneboligmutleie$variable)
igangsatteneboligmutleie$variable <- str_replace_all(igangsatteneboligmutleie$variable, c("K1" = "-01-01", "K2" = "-04-
01",
                                                                                          "K3" = "-07-01", "K4" = "-10-01"))
igangsatteneboligmutleie$variable <- as.Date(igangsatteneboligmutleie$variable)
colnames(igangsatteneboligmutleie) <- c("municipality","date_start","InitiatedProp2")
df1 <- left_join(df1, igangsatteneboligmutleie, by= c("date_start" = "date_start", "municipality"="municipality"))


# igangsattverttomansbolig
igangsattverttomansbolig$municipality <- as.factor(igangsattverttomansbolig$municipality)
igangsattverttomansbolig$variable <- as.character(igangsattverttomansbolig$variable)
igangsattverttomansbolig$variable <- str_replace_all(igangsattverttomansbolig$variable, c("K1" = "-01-01", "K2" = "-
04-01",
                                                                                          "K3" = "-07-01", "K4" = "-10-01"))
igangsattverttomansbolig$variable <- as.Date(igangsattverttomansbolig$variable)
colnames(igangsattverttomansbolig) <- c("municipality","date_start","InitiatedProp3")
df1 <- left_join(df1, igangsattverttomansbolig, by= c("date_start" = "date_start", "municipality"="municipality"))


# igangsattrekkehus
igangsattrekkehus$municipality <- as.factor(igangsattrekkehus$municipality)
igangsattrekkehus$variable <- as.character(igangsattrekkehus$variable)
igangsattrekkehus$variable <- str_replace_all(igangsattrekkehus$variable, c("K1" = "-01-01", "K2" = "-04-01",
                                                                            "K3" = "-07-01", "K4" = "-10-01"))
igangsattrekkehus$variable <- as.Date(igangsattrekkehus$variable)
colnames(igangsattrekkehus) <- c("municipality","date_start","InitiatedProp4")
df1 <- left_join(df1, igangsattrekkehus, by= c("date_start" = "date_start", "municipality"="municipality"))


# igangsattandresmaahus
igangsattandresmaahus$municipality <- as.factor(igangsattandresmaahus$municipality)
igangsattandresmaahus$variable <- as.character(igangsattandresmaahus$variable)
igangsattandresmaahus$variable <- str_replace_all(igangsattandresmaahus$variable, c("K1" = "-01-01", "K2" = "-04-
01",
                                                                                    "K3" = "-07-01", "K4" = "-10-01"))
igangsattandresmaahus$variable <- as.Date(igangsattandresmaahus$variable)
colnames(igangsattandresmaahus) <- c("municipality","date_start","InitiatedProp5")
df1 <- left_join(df1, igangsattandresmaahus, by= c("date_start" = "date_start", "municipality"="municipality"))


# igangsattfriboligbygg2et
igangsattfriboligbygg2et$municipality <- as.factor(igangsattfriboligbygg2et$municipality)
igangsattfriboligbygg2et$variable <- as.character(igangsattfriboligbygg2et$variable)
igangsattfriboligbygg2et$variable <- str_replace_all(igangsattfriboligbygg2et$variable, c("K1" = "-01-01", "K2" = "-04-
01",
                                                                                          "K3" = "-07-01", "K4" = "-10-01"))
igangsattfriboligbygg2et$variable <- as.Date(igangsattfriboligbygg2et$variable)
colnames(igangsattfriboligbygg2et) <- c("municipality","date_start","InitiatedProp6")
df1 <- left_join(df1, igangsattfriboligbygg2et, by= c("date_start" = "date_start", "municipality"="municipality"))


# igangsattfriboligbygg34et
igangsattfriboligbygg34et$municipality <- as.factor(igangsattfriboligbygg34et$municipality)
igangsattfriboligbygg34et$variable <- as.character(igangsattfriboligbygg34et$variable)
igangsattfriboligbygg34et$variable <- str_replace_all(igangsattfriboligbygg34et$variable, c("K1" = "-01-01", "K2" = "-
04-01",
                                                                                            "K3" = "-07-01", "K4" = "-10-01"))
igangsattfriboligbygg34et$variable <- as.Date(igangsattfriboligbygg34et$variable)
colnames(igangsattfriboligbygg34et) <- c("municipality","date_start","InitiatedProp7")
df1 <- left_join(df1, igangsattfriboligbygg34et, by= c("date_start" = "date_start", "municipality"="municipality"))


# igangsattfriboligbygg5et
igangsattfriboligbygg5et$municipality <- as.factor(igangsattfriboligbygg5et$municipality)
igangsattfriboligbygg5et$variable <- as.character(igangsattfriboligbygg5et$variable)
igangsattfriboligbygg5et$variable <- str_replace_all(igangsattfriboligbygg5et$variable, c("K1" = "-01-01", "K2" = "-04-
01",
                                                                                          "K3" = "-07-01", "K4" = "-10-01"))
igangsattfriboligbygg5et$variable <- as.Date(igangsattfriboligbygg5et$variable)
colnames(igangsattfriboligbygg5et) <- c("municipality","date_start","InitiatedProp8")
df1 <- left_join(df1, igangsattfriboligbygg5et, by= c("date_start" = "date_start", "municipality"="municipality"))


# igangsattsamboligbygg5et
igangsattsamboligbygg5et$municipality <- as.factor(igangsattsamboligbygg5et$municipality)
igangsattsamboligbygg5et$variable <- as.character(igangsattsamboligbygg5et$variable)
igangsattsamboligbygg5et$variable <- str_replace_all(igangsattsamboligbygg5et$variable, c("K1" = "-01-01", "K2" = "-
04-01",
                                                                                          "K3" = "-07-01", "K4" = "-10-01"))
igangsattsamboligbygg5et$variable <- as.Date(igangsattsamboligbygg5et$variable)
colnames(igangsattsamboligbygg5et) <- c("municipality","date_start","InitiatedProp9")
df1 <- left_join(df1, igangsattsamboligbygg5et, by= c("date_start" = "date_start", "municipality"="municipality"))


# fullforteenebolig
fullforteenebolig$municipality <- as.factor(fullforteenebolig$municipality)
fullforteenebolig$variable <- as.character(fullforteenebolig$variable)
fullforteenebolig$variable <- str_replace_all(fullforteenebolig$variable, c("K1" = "-01-01", "K2" = "-04-01",
                                                                            "K3" = "-07-01", "K4" = "-10-01"))
fullforteenebolig$variable <- as.Date(fullforteenebolig$variable)
colnames(fullforteenebolig) <- c("municipality","date_start","CompletedProp1")
df1 <- left_join(df1, fullforteenebolig, by= c("date_start" = "date_start", "municipality"="municipality"))


# fullforteneboligmutleie
fullforteeneboligmutleie$municipality <- as.factor(fullforteeneboligmutleie$municipality)
fullforteeneboligmutleie$variable <- as.character(fullforteeneboligmutleie$variable)
fullforteeneboligmutleie$variable <- str_replace_all(fullforteeneboligmutleie$variable, c("K1" = "-01-01", "K2" = "-04-
01",
                                                                                          "K3" = "-07-01", "K4" = "-10-01"))
fullforteeneboligmutleie$variable <- as.Date(fullforteeneboligmutleie$variable)
colnames(fullforteeneboligmutleie) <- c("municipality","date_start","CompletedProp2")
df1 <- left_join(df1, fullforteeneboligmutleie, by= c("date_start" = "date_start", "municipality"="municipality"))


####
# fullforteverttomansbolig
fullforteverttomansbolig$municipality <- as.factor(fullforteverttomansbolig$municipality)
fullforteverttomansbolig$variable <- as.character(fullforteverttomansbolig$variable)
fullforteverttomansbolig$variable <- str_replace_all(fullforteverttomansbolig$variable, c("K1" = "-01-01", "K2" = "-04-
01",
                                                                                          "K3" = "-07-01", "K4" = "-10-01"))
fullforteverttomansbolig$variable <- as.Date(fullforteverttomansbolig$variable)
colnames(fullforteverttomansbolig) <- c("municipality","date_start","CompletedProp3")
df1 <- left_join(df1, fullforteverttomansbolig, by= c("date_start" = "date_start", "municipality"="municipality"))


# fullforterekkehus
fullforterekkehus$municipality <- as.factor(fullforterekkehus$municipality)
fullforterekkehus$variable <- as.character(fullforterekkehus$variable)
fullforterekkehus$variable <- str_replace_all(fullforterekkehus$variable, c("K1" = "-01-01", "K2" = "-04-01",
                                                                            "K3" = "-07-01", "K4" = "-10-01"))
fullforterekkehus$variable <- as.Date(fullforterekkehus$variable)
colnames(fullforterekkehus) <- c("municipality","date_start","CompletedProp4")
df1 <- left_join(df1, fullforterekkehus, by= c("date_start" = "date_start", "municipality"="municipality"))


# fullforteandresmaahus
fullforteandresmaahus$municipality <- as.factor(fullforteandresmaahus$municipality)
fullforteandresmaahus$variable <- as.character(fullforteandresmaahus$variable)
fullforteandresmaahus$variable <- str_replace_all(fullforteandresmaahus$variable, c("K1" = "-01-01", "K2" = "-04-01",
```

```
                              "K3" = "-07-01", "K4" = "-10-01"))       df1$LendRateHouse <- na.locf(df1$LendRateHouse, na.rm = F)
fullforteandresmaahus$variable <- as.Date(fullforteandresmaahus$variable)    df1$Immigration <- na.locf(df1$Immigration, na.rm = F)
colnames(fullforteandresmaahus) <- c("municipality","date_start","CompletedProp5")   df1$Emigration <- na.locf(df1$Emigration, na.rm = F)
df1 <- left_join(df1, fullforteandresmaahus, by= c("date_start" = "date_start", "municipality"="municipality"))   df1$NetImmigration <- na.locf(df1$NetImmigration, na.rm = F)
                                                                             df1$DebtRateHousehold <- na.locf(df1$DebtRateHousehold, na.rm = F)
                                                                             df1$DebtGrowthHousehold <- na.locf(df1$DebtGrowthHousehold, na.rm = F)

# fullfortefriboligbygg2et                                                   df1$InitiatedProp1 <- na.locf(df1$InitiatedProp1, na.rm = F)
fullfortefriboligbygg2et$municipality <- as.factor(fullfortefriboligbygg2et$municipality)   df1$InitiatedProp2 <- na.locf(df1$InitiatedProp2, na.rm = F)
fullfortefriboligbygg2et$variable <- as.character(fullfortefriboligbygg2et$variable)   df1$InitiatedProp3 <- na.locf(df1$InitiatedProp3, na.rm = F)
fullfortefriboligbygg2et$variable <- str_replace_all(fullfortefriboligbygg2et$variable, c("K1" = "-01-01", "K2" = "-04-01",   df1$InitiatedProp4 <- na.locf(df1$InitiatedProp4, na.rm = F)
                              "K3" = "-07-01", "K4" = "-10-01"))       df1$InitiatedProp5 <- na.locf(df1$InitiatedProp5, na.rm = F)
fullfortefriboligbygg2et$variable <- as.Date(fullfortefriboligbygg2et$variable)   df1$InitiatedProp6 <- na.locf(df1$InitiatedProp6, na.rm = F)
colnames(fullfortefriboligbygg2et) <- c("municipality","date_start","CompletedProp6")   df1$InitiatedProp7 <- na.locf(df1$InitiatedProp7, na.rm = F)
df1 <- left_join(df1, fullfortefriboligbygg2et, by= c("date_start" = "date_start", "municipality"="municipality"))   df1$InitiatedProp8 <- na.locf(df1$InitiatedProp8, na.rm = F)
                                                                             df1$InitiatedProp9 <- na.locf(df1$InitiatedProp9, na.rm = F)
                                                                             df1$InitiatedPropTot <- na.locf(df1$InitiatedPropTot, na.rm = F)
                                                                             df1$CompletedProp1 <- na.locf(df1$CompletedProp1, na.rm = F)
                                                                             df1$CompletedProp2 <- na.locf(df1$CompletedProp2, na.rm = F)
# fullfortefriboligbygg34et                                                  df1$CompletedProp3 <- na.locf(df1$CompletedProp3, na.rm = F)
fullfortefriboligbygg34et$municipality <- as.factor(fullfortefriboligbygg34et$municipality)   df1$CompletedProp4 <- na.locf(df1$CompletedProp4, na.rm = F)
fullfortefriboligbygg34et$variable <- as.character(fullfortefriboligbygg34et$variable)   df1$CompletedProp5 <- na.locf(df1$CompletedProp5, na.rm = F)
fullfortefriboligbygg34et$variable <- str_replace_all(fullfortefriboligbygg34et$variable, c("K1" = "-01-01", "K2" = "-04-   df1$CompletedProp6 <- na.locf(df1$CompletedProp6, na.rm = F)
01",                                                                         df1$CompletedProp7 <- na.locf(df1$CompletedProp7, na.rm = F)
                              "K3" = "-07-01", "K4" = "-10-01"))       df1$CompletedProp8 <- na.locf(df1$CompletedProp8, na.rm = F)
fullfortefriboligbygg34et$variable <- as.Date(fullfortefriboligbygg34et$variable)   df1$CompletedProp9 <- na.locf(df1$CompletedProp9, na.rm = F)
colnames(fullfortefriboligbygg34et) <- c("municipality","date_start","CompletedProp7")   df1$CompletedPropTot <- na.locf(df1$CompletedPropTot, na.rm = F)
df1 <- left_join(df1, fullfortefriboligbygg34et, by= c("date_start" = "date_start", "municipality"="municipality"))
                                                                             df1$unemployment <- na.locf(df1$unemployment, na.rm = F)
                                                                             df1$unemploymentPerc <- na.locf(df1$unemploymentPerc, na.rm = F)

# fullfortefriboligbygg5et                                                   # HousesForSale# bolig lagt ut for salg kommuner distrikter Q
fullfortefriboligbygg5et$municipality <- as.factor(fullfortefriboligbygg5et$municipality)   # SalestimeHouses# Bolig liggetid åpent marked kommuner distrikter Q
fullfortefriboligbygg5et$variable <- as.character(fullfortefriboligbygg5et$variable)   # house_P_index# Prisindeks bolig kommuner distrikter Q
fullfortefriboligbygg5et$variable <- str_replace_all(fullfortefriboligbygg5et$variable, c("K1" = "-01-01", "K2" = "-04-01",   # soldHouses# Solgte bolig kommuner distrikter Q
                              "K3" = "-07-01", "K4" = "-10-01"))       # UnSoldHouses# usolgte bolig kommuner distrikter Q
fullfortefriboligbygg5et$variable <- as.Date(fullfortefriboligbygg5et$variable)   # KvmPriceEnebo# Kvm pris store kommuner enebolig Q
colnames(fullfortefriboligbygg5et) <- c("municipality","date_start","CompletedProp8")   # KvmPriceSmaahus# Kvm pris store kommuner smaahus Q
df1 <- left_join(df1, fullfortefriboligbygg5et, by= c("date_start" = "date_start", "municipality"="municipality"))   # KvmPriceBlokk# Kvm pris store kommuner blokk  Q
                                                                             # LendRateHouse# Utlånsrente bolig hele landet Q
                                                                             # Immigration# Innvandring hele landet Q
                                                                             # Emigration# utvandring hele landet Q
# fullfortesamboligbygg5et                                                   # NetImmigration# netto innvandring hele landet Q
fullfortesamboligbygg5et$municipality <- as.factor(fullfortesamboligbygg5et$municipality)   # DebtRateHousehold# Gjeldsrate husholdning hele landet Q
fullfortesamboligbygg5et$variable <- as.character(fullfortesamboligbygg5et$variable)   # DebtGrowthHousehold# Gjeldsvekst husholdning hele landet Q
fullfortesamboligbygg5et$variable <- str_replace_all(fullfortesamboligbygg5et$variable, c("K1" = "-01-01", "K2" = "-04-   # InitiatedProp1
01",                                                                         # InitiatedProp2
                              "K3" = "-07-01", "K4" = "-10-01"))       # InitiatedProp3
fullfortesamboligbygg5et$variable <- as.Date(fullfortesamboligbygg5et$variable)   # InitiatedProp4
colnames(fullfortesamboligbygg5et) <- c("municipality","date_start","CompletedProp9")   # InitiatedProp5
df1 <- left_join(df1, fullfortesamboligbygg5et, by= c("date_start" = "date_start", "municipality"="municipality"))   # InitiatedProp6
                                                                             # InitiatedProp7
                                                                             # InitiatedProp8
                                                                             # InitiatedProp9
# fullfortetotalt                                                            # CompletedProp1
fullforte_totalt$municipality <- as.factor(fullforte_totalt$municipality)    # CompletedProp2
fullforte_totalt$variable <- as.character(fullforte_totalt$variable)         # CompletedProp3
fullforte_totalt$variable <- str_replace_all(fullforte_totalt$variable, c("K1" = "-01-01", "K2" = "-04-01",   # CompletedProp4
                              "K3" = "-07-01", "K4" = "-10-01"))       # CompletedProp5
fullforte_totalt$variable <- as.Date(fullforte_totalt$variable)              # CompletedProp6
colnames(fullforte_totalt) <- c("municipality","date_start","CompletedPropTot")   # CompletedProp7
df1 <- left_join(df1, fullforte_totalt, by= c("date_start" = "date_start", "municipality"="municipality"))   # CompletedProp8
                                                                             # CompletedProp9
                                                                             # CompletedPropTot
# Igangsatt_totalt                                                           # InitiatedPropTot
igangsatt_totalt$municipality <- as.factor(igangsatt_totalt$municipality)
igangsatt_totalt$variable <- as.character(igangsatt_totalt$variable)         # setter inn 0 for første dataobservasjon
igangsatt_totalt$variable <- str_replace_all(igangsatt_totalt$variable, c("K1" = "-01-01", "K2" = "-04-01",   max.date <- '2005-12-01'
                              "K3" = "-07-01", "K4" = "-10-01"))       df1$KvmPriceEnebo[is.na(df1$KvmPriceEnebo) & df1$date_start <= max.date] <- 0
igangsatt_totalt$variable <- as.Date(igangsatt_totalt$variable)              df1$KvmPriceSmaahus[is.na(df1$KvmPriceSmaahus) & df1$date_start <= max.date] <- 0
colnames(igangsatt_totalt) <- c("municipality","date_start","InitiatedPropTot")   df1$KvmPriceBlokk[is.na(df1$KvmPriceBlokk) & df1$date_start <= max.date] <- 0
df1 <- left_join(df1, igangsatt_totalt, by= c("date_start" = "date_start", "municipality"="municipality"))
                                                                             max.date <- '2004-12-01'
                                                                             df1$HouseHinc[is.na(df1$HouseHinc) & df1$date_start <= max.date] <- 0
#################################################################             df1$householdsInReg[is.na(df1$householdsInReg) & df1$date_start <= max.date] <- 0
#################
#################################################################             max.date <- '2008-09-01'
#################                                                             df1$LendRateHouse[is.na(df1$LendRateHouse) & df1$date_start <= max.date] <- 0
############################### cleaning
####################################                                         max.date <-  '2013-11-01'
###################### ferdig merge alle datasett inn i df1 ##################   df1$LendRateNewLoans[is.na(df1$LendRateNewLoans) & df1$date_start <= max.date] <- 0
#################################################################
#################                                                             max.date <- '2006-12-01'
#################################################################
                                                                             df1$Population[is.na(df1$Population) & df1$date_start <= max.date] <- 0
# re arranging                                                               df1$Immigration[is.na(df1$Immigration) & df1$date_start <= max.date] <- 0
df1 <- df1[,c(1,16,2:15,17:54)]                                              df1$Emigration[is.na(df1$Emigration) & df1$date_start <= max.date] <- 0
df1 <- df1[order(df1$municipality),]                                         df1$NetImmigration[is.na(df1$NetImmigration) & df1$date_start <= max.date] <- 0
                                                                             df1$PopulationDens[is.na(df1$PopulationDens) & df1$date_start <= max.date] <- 0
#str(df1)
#colnames(df1)                                                               df1[is.na(df1)] <- 0
# bruker zoo for å fylle inn NA's på kvartalvise data
                                                                             df1$AIRrevPerHouse <- df1$AIRrev/df1$householdsInReg
df1$HousesForSale <- na.locf(df1$HousesForSale, na.rm = F)                   df1[is.na(df1)] <- 0
df1$SalestimeHouses <- na.locf(df1$SalestimeHouses, na.rm = F)
df1$house_P_index <- na.locf(df1$house_P_index, na.rm = F)                   df1 <- df1[,c(1:6,55,7:54)]
df1$soldHouses <- na.locf(df1$soldHouses, na.rm = F)
df1$UnSoldHouses <- na.locf(df1$UnSoldHouses, na.rm = F)
#df1$KvmPriceEnebo <- na.locf(df1$KvmPriceEnebo, na.rm = F)                  # this is the file used for the master assignment
#df1$KvmPriceSmaahus <- na.locf(df1$KvmPriceSmaahus, na.rm = F)              #writexl::write_xlsx(df1,path = "masterdata.xlsx")
#df1$KvmPriceBlokk <- na.locf(df1$KvmPriceBlokk, na.rm = F)                  save(df1, file = "masterdataMODIFISERT.Rdata")
                                                                             #save(df1, file = "masterdata.Rdata")
```

B.2 Analysis

```
suppressMessages(library(tidyverse))
suppressMessages(library(lubridate))
suppressMessages(library(plm))
suppressMessages(library(panelr))
suppressMessages(library(extrafont))
suppressMessages(library(ggplot2))
suppressMessages(library(knitr))
suppressMessages(library(stargazer))
suppressMessages(library(lmtest))


options(digits = 3) # number of decimals
#options(OutDec= ",") # "," in output
options(scipen=9999999) # scientific notification off


# med rettet data
load(file = "masterdataMODIFISERT.Rdata")


# As tidyverse tibble
dframe <- as_tibble(df1)
# Variables for quarter and year
dframe <- dframe %>% mutate(year=year(date_start),
                    quarter=quarter(date_start))


# Making quarterly data
dframeqtr <- dframe %>% group_by(municipality,year,quarter) %>%
 summarise(house_P_index=mean(house_P_index),
        AIRrevprUn=sum(AIRrevprUn),
        HouseHinc=mean(HouseHinc),
        soldHouses=mean(soldHouses),
        unemployment=mean(unemployment),
        unemploymentPerc=mean(unemploymentPerc),
        HousesForSale=mean(HousesForSale),
        Population=mean(Population),
        AveHouseLendRate=mean(AveHouseLendRate),
        BNPinhabitant=mean(BNPinhabitant),
        InitiatedProp2=mean(InitiatedProp2),
        CompletedProp2=mean(CompletedProp2),
        KvmPriceEnebo=sum(KvmPriceEnebo),
        KvmPriceBlokk=sum(KvmPriceBlokk),
        KvmPriceSmaahus=sum(KvmPriceSmaahus),
        NetImmigration=mean(NetImmigration))


# Only using data from 2016 in dframeqtr
dframeqtr <- dframeqtr %>% filter(year>=2016) %>%
 group_by(municipality) %>% mutate(t=1:length(municipality))

dframeAirbnb <- dframeqtr
dframeAirbnb <- ungroup(dframeAirbnb)

dframeqtr <- filter(dframeqtr,unemploymentPerc>0.05)
#dframeqtr <- filter(dframeqtr,unemployment>20)


# Creating a panel data set
dframeqtr <- ungroup(dframeqtr)
dframeqtrPR <- panel_data(dframeqtr, id = municipality, wave = t)

# Lots of missing values in kvmpricesmaahus
# dframeqtr %>% filter(KvmPriceSmaahus==0)
dframeqtr2 <- filter(dframeqtr,KvmPriceEnebo>0)
dframeqtr3 <- filter(dframeqtr,KvmPriceBlokk>0)
dframeqtr4 <- filter(dframeqtr,KvmPriceSmaahus>0)

# PLM
dframeqtrPD <- pdata.frame(dframeqtr, index=c("municipality", "t"))
dframeqtrPD2 <- pdata.frame(dframeqtr2, index=c("municipality", "t"))
dframeqtrPD3 <- pdata.frame(dframeqtr3, index=c("municipality", "t"))
dframeqtrPD4 <- pdata.frame(dframeqtr4, index=c("municipality", "t"))


# Hovedmodell
# fit1 <- wbm(log(house_P_index) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
#           log(HousesForSale) + InitiatedProp2 + CompletedProp2 |
log(AveHouseLendRate) + log(BNPinhabitant), data=dframeqtrPR)

#summary(fit1)
```

```
fit1.wit <- plm(log(house_P_index) ~ log(AIRrevprUn + 1) + log(HouseHinc)  +
log(unemploymentPerc) +
            log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) + log(BNPinhabitant),
            data=dframeqtrPD,  model = "within")

#summary(fit1.wit)

#log(lag(AIRrevprUn + 1,k = 1))

fit1.wit.multi <- fit1.wit

suppressMessages(library(rockchalk))


fit1.wit <- plm(log(house_P_index) ~ log(AIRrevprUn + 1) + log(HouseHinc)  +
log(unemploymentPerc) +
            log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate),
            data=dframeqtrPD,  model = "within")

#summary(fit1.wit)

#log(lag(AIRrevprUn + 1,k = 1))


fit1.fd <- plm(log(house_P_index) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
            log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) ,
            data=dframeqtrPD, model = "fd")

#summary(fit1.fd)


# library(nlme)
# fit1.lme <- lme(log(house_P_index) ~ 1 + log(AIRrevprUn+1) + log(HouseHinc)
+ log(unemploymentPerc) +
#           log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) ,
#           random = ~1 | municipality,
#           correlation = corAR1(),
#            data=dframeqtrPD)
#
# summary(fit1.lme)


# fit1.bet <- plm(log(house_P_index) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
#           log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) ,
#            data=dframeqtrPD,  model = "between")


# Modell for å underbygge hovedmodell
fit2 <- wbm(log(KvmPriceEnebo) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
         log(HousesForSale) + InitiatedProp2 + CompletedProp2 |
log(AveHouseLendRate) ,
         data=filter(dframeqtrPR, KvmPriceEnebo>0))

# PLM
fit2.wit <- plm(log(KvmPriceEnebo) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
            log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) ,
            data=dframeqtrPD2,  model = "within")

fit2.fd <- plm(log(KvmPriceEnebo) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
            log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) ,
            data=dframeqtrPD2,  model = "fd")

#summary(fit2) #Resultat av undermodell
#broom::tidy(fit2) #Resultat av undermodell


# Modell for å underbygge hovedmodell
fit3 <- wbm(log(KvmPriceBlokk) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
```

```
        log(HousesForSale) + InitiatedProp2 + CompletedProp2 |
log(AveHouseLendRate) ,
        data=filter(dframeqtrPR, KvmPriceBlokk>0))


# PLM
fit3.wit <- plm(log(KvmPriceBlokk) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
        log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) ,
        data=dframeqtrPD3,  model = "within")

fit3.fd <- plm(log(KvmPriceBlokk) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
        log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) ,
        data=dframeqtrPD3,  model = "fd")



#summary(fit3) #Resultat av undermodell
#broom::tidy(fit3) #Resultat av undermodell


# Modell for å underbygge hovedmodell
fit4 <- wbm(log(KvmPriceSmaahus) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
        log(HousesForSale) + InitiatedProp2 + CompletedProp2 |
log(AveHouseLendRate) ,
        data=filter(dframeqtrPR, KvmPriceSmaahus>0))

# PLM
fit4.wit <- plm(log(KvmPriceSmaahus) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
        log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) ,
        data=dframeqtrPD4,  model = "within")

fit4.fd <- plm(log(KvmPriceSmaahus) ~ log(AIRrevprUn+1) + log(HouseHinc) +
log(unemploymentPerc) +
        log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) ,
        data=dframeqtrPD4,  model = "fd")

dfplot <- df1 %>%
  filter(municipality %in%
c("Oslo","Tromsø","Bergen","Trondheim","Ålesund","Stavanger","Kristiansand",
        "Fredrikstad","Distriktene i Troms","Distriktene i
Nordland", "Distriktene i Østfold","Bodø"))

dfplot2 <- df1 %>%
  filter(municipality %in%
c("Oslo","Tromsø","Bergen","Sandnes","Ålesund","Stavanger","Kristiansand",
        "Fredrikstad","Halden","Drammen",
"Bærum","Bodø"))

dfplots16 <- dfplot %>% filter(date_start >= "2016-01-01")

dfplots05 <- dfplot %>%
  filter(date_start >= "2005-01-01")

dfplots062 <- dfplot2 %>%
  filter(date_start >= "2006-01-01")

sqmplot1 <- filter(dfplots062,KvmPriceEnebo>0)
sqmplot2 <- filter(dfplots062,KvmPriceBlokk>0)
sqmplot3 <- filter(dfplots062,KvmPriceSmaahus>0)

dfplots06 <- dfplot %>%
  filter(date_start >= "2006-01-01")

dfplotnorway <- dfplot[1:204,]
dfplotnorway$municipality <- "Norway"

test1 <- pbgtest(fit1.wit, order = 4)
test2 <- pbnftest(fit1.wit)

hei1 <- broom::tidy(test1)
hei2 <- broom::tidy(test2)
```

```
hei1 <- hei1[,-4]
hei2 <- hei2[,-2]


fit1.ols <- lm(log(house_P_index) ~ log(HouseHinc)+unemploymentPerc+
                log(HousesForSale)+InitiatedProp2+
                CompletedProp2 +
log(AveHouseLendRate),data=dframeqtr)

SSER = broom::glance(fit1.ols)$deviance
SSEU = broom::glance(fit1.wit)$deviance
N = length(fixef(fit1.wit))
NT = length(dframeqtrPD$municipality)
K = length(coef(fit1.wit))

dframeqtrPD <- dframeqtrPD %>%  mutate(districts =
case_when(startsWith(as.character(municipality),"Distriktene")~1,TRUE~0))

# mellom distrikt og ikke distrikt
fit1.wit.2 <- lm(log(house_P_index) ~ districts+ log(AIRrevprUn+1)  +
                log(districts*AIRrevprUn+1) +log(HouseHinc) +
log(unemploymentPerc) +
                log(HousesForSale) + InitiatedProp2 + CompletedProp2 +
log(AveHouseLendRate) ,
                data=dframeqtrPD)

suppressMessages(library(broom))

# kode for individuelle airbnb effekter
fitted <- dframeAirbnb %>%
  group_by(municipality) %>%
  do(fit = lm(log(house_P_index) ~ log(AIRrevprUn+1)  + log(HouseHinc) +
                unemploymentPerc + log(HousesForSale) + InitiatedProp2 +
                CompletedProp2 + log(AveHouseLendRate) , data = .))



airbnb <- fitted %>%
  tidy(fit) %>%
  filter(term=="log(AIRrevprUn + 1)") %>% arrange(-estimate)

airbnb <- as.data.frame(airbnb)

colnames(airbnb) <-
c("Region","Variable","Estimate","Std.error","T.statistic","P.value")

airbnb$Variable <- c(rep("log(AIRrevprUn)",87))
```