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## **Abstract**

Construction plays a vital role in the economic growth of a society. The cost of building materials constitutes a major share of the total cost of construction projects. It is therefore crucial for the shareholders in the construction industry to understand the underlying factors causing price fluctuations in building materials. As such, the thesis examines the price determinants of lumber, steel and concrete in Norway. First, the thesis provides the reader with a theoretical background, which forms the premise for understanding the findings of the thesis.

Secondly, previous research and a survey approach were used to identify the major determinants of the respective building materials in Norway. The effect of the identified determinants on the building material prices in Norway was then analysed by examining price indices, market reports, existing literature etc.

In the end, the thesis identified multiple determinants that influence the price of steel, lumber and concrete in Norway and provides valuable insight into the building material market for shareholders in the construction industry and further research.

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# 1. Introduction

## 1.1 Background

Construction plays a huge role in the development of societies. The construction industry encompasses all work related to the creation of physical infrastructure (e.g., roads, railways, and harbours), other civil engineering work (e.g., dams, irrigation projects, and power plants), all building work (e.g., housing, schools, and hospitals) as well as the essential task of maintenance and repair of existing structures (Wells, 1984). Infrastructure contributes to economic development both by increasing the productivity of various factors, such as labour, and by providing amenities that improve the quality of life (Kessides, 1996). As such it is an industry that plays a vital role in the economic growth of a society. Cost is usually the main constraint, yet construction projects quite frequently end up with cost overruns (Aljohani et al., 2017). One of the biggest expenditures in construction projects are building materials (Oseghale et al., 2021). Fluctuations in material prices can therefore have a significant impact on the total cost of construction projects.

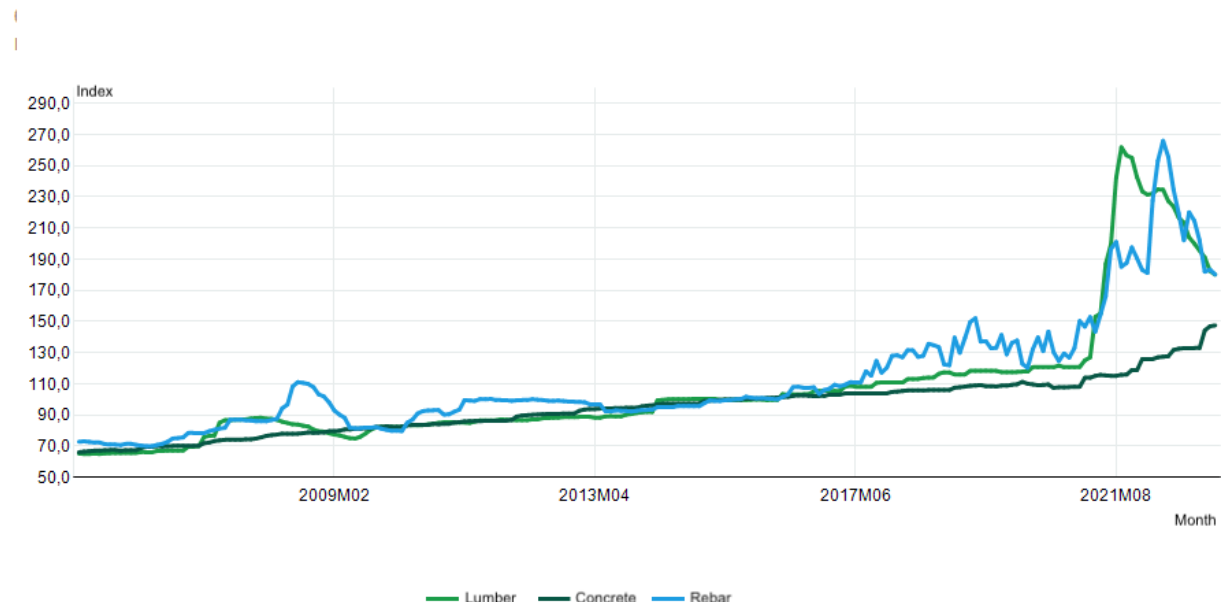


Figure 1. Price index for rebar, concrete and lumber from 2005 to 2022 in Kr. (Statistics Norway, 2023)



Figure 1 shows the monthly index prices of steel rebar, concrete and lumber in Norway from January 2005 to December 2022. Throughout the thesis, lumber refers to sawn timber that can be used as structural components or further manufactured into specific building materials (e.g., railing, interior panel etc.) Visual inspection of the chart shows a clear increase in the price of the respective building materials over the last 18 years. It is also evident that steel has experienced increased price volatility since 2017, while the price of concrete and lumber has been relatively stable until 2021. This stability allowed the construction sector to plan their budgets and projects without worrying about significant fluctuations in these crucial materials. However, the subsequent years brought about unprecedented changes in the price of steel and lumber, characterized by exponential increases followed by rapid decreases.

From January 2021 to September 2021 the price of lumber increased by 117%. The price of steel rebar rose by 51% between December 2020 and August 2021 followed by a drop before increasing again by 47% from February to May in 2022. As of March 2023, the prices of steel rebar and lumber have decreased by 32% and 31% from their peak, respectively. Price fluctuations of such magnitude have not been seen in concrete. However, the price development of concrete in recent years can be characterized by a more rapid growth rate compared to before. Additionally, the price of concrete has continued to rise as of 2023, unlike the price of steel rebar and lumber.

Despite the importance of the topic, no academic research papers were found focusing on understanding the factors affecting the price of building materials in Norway. This paper will therefore analyse the price determinants of some selected building materials using Norway as a study case.

## **1.2 Objective and research question**

The objective of this thesis is to identify and analyse the key determinants that influence the price of lumber, steel and concrete in Norway. Thus, the problem of the thesis is defined as “A study of the price determinants of lumber, steel and concrete in Norway”. This will provide stakeholders in the industry, including builders, contractors, manufacturers and policymakers with valuable insight to optimize procurement strategies and better navigate the

risk of price fluctuations related to building materials. To explore the problem of the thesis a set of research questions has been defined:

- **What are the main price determinants of lumber, steel and concrete?**
- **In what way do they affect the price?**
- **What measures can be taken to mitigate the risk of price fluctuations?**

These questions will be answered in chapters 5 and 6.

### **1.3 Delimitations**

To achieve a workload that was manageable within the time frame available for the master thesis it was decided to focus on three materials used in construction: steel, lumber and concrete. The reason for selecting these materials is that they are the most commonly used materials in construction in terms of quantity (Marinova et al., 2020). Consequently, price fluctuations of these materials will have the largest impact on total construction cost. Furthermore, the study will not consider the different products of these materials, properties or quality, but focus on the materials in general.

### **1.4 Structure**

For the benefit of the reader, the general outline of the thesis is described here. The thesis consists of 6 chapters and contains as follows:

**Chapter 1** introduces the problem of the thesis, including the background, the objective, limitations taken and the overall structure of the thesis.

**Chapter 2** presents relevant pricing theory.

**Chapter 3** describes the production of the materials, and the pricing of these in construction contracts.

**Chapter 4** presents the methodology and the credibility of the survey.

**Chapter 5** includes the results from the survey and the analysis.

**Chapter 6** gives a summary and discussion of the findings, limitation of the thesis and a conclusion.

## **2. Price theory**

The objective of this chapter is to review the most important theory related to the determination of prices. Economic concepts that are relevant to understanding what determines prices will be presented. This will give a deeper understanding of the findings in the thesis.

### **2.1 Demand**

Market demand is defined as the alternative quantities of a product that all consumers in a particular market are willing to buy as price varies and as all other factors are held constant (Tomek & Kaiser, 2014). The slope of the demand curve is negative, which can be explained by the law of demand; Other things being equal, if the price of a commodity falls, the quantity demanded of it will rise and if the price of a commodity rises, its quantity demanded will decline. Thus, there is an inverse relationship between price and quantity demanded, other things being the same (Singh, 2008).

This can be explained by two important concepts, the income effect, and the substitution effect. A decrease in the price of a good is equivalent to an increase in real income; more can be purchased with the same amount of money. The opposite is true when a good increases in price. This is called the income effect (Tomek & Kaiser, 2014). As the price of a good rises, consumers will buy less of that good and purchase other items, this is called the substitution effect (Veseth, 1981).

It is important to distinguish between changes in quantity demanded and changes in demand. The quantity demanded, changes whenever the price changes (movements along the demand curve). Changes in demand only happen when one of the underlying determinants of demand changes and leads to a shift of the demand curve (Veseth, 1981). These determinants can be everything that affects our demand for a good, for example, the level of income, prices of other goods or tastes and preferences.

### **2.1.2 Derived demand**

The term derived demand is used to denote demand schedules for inputs that are used to produce the final product (Tomek & Kaiser, 2014). Firms require inputs not for their own sake but as a means to produce goods and services. The demand for carpenters and building materials rises and falls as the amount of housing construction falls. Thus, the demand for any input is derived from the demand for the goods it helps to produce; for this reason, the demand for all inputs is called a derived demand (Lipsey & Chrystal, 2011).

## **2.2 Supply**

Supply is one of the factors that determine the price in a market. It can be defined as the quantity a seller is willing and able to sell of a product at a given price per unit of time. The law of supply states that “Other things being equal, quantity supplied of a commodity is directly related to the price of the commodity” (Singh, 2008). Assuming normality, when the price of any commodity increases, the profit potential for the seller increases and will therefore sell more if able. Thus, supply will increase. Conversely, as the price of a commodity decreases, the seller will tend to sell less.

Supply depends on multiple factors, but the most important ones are the retail price of the product produced, the price of inputs, the availability of inputs and technology. Anything that can influence the cost of production, or the availability of input will also cause the relationship of supply to change. A change in one of the determinants of supply that induces producers to change the quantity supplied at any price is referred to as a change in supply. A change in supply leads to a shift of the supply curve. Changes in quantity supplied refer to movements along the supply curve (changes in supply only due to changes in the price). (Veseth, 1981)

In figure 2, the supply and demand curves intersect. At this point, the market is said to be in equilibrium. There is no tendency for the market price to change if external factors remain the same (e.g., weather, national income). When the market is not in equilibrium it always exists a

pressure for the price to change. This is because there is either an excess in supply or demand. (Besanko & Braeutigam, 2020)

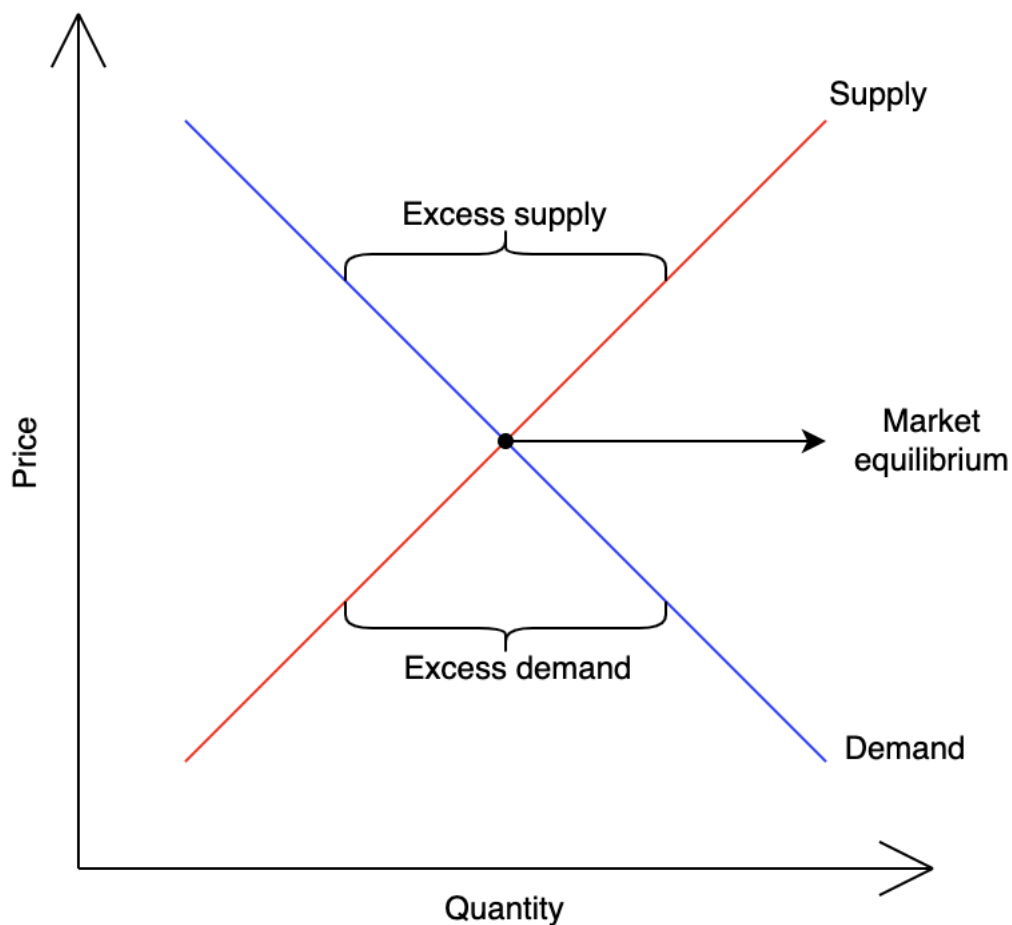


Figure 2. Market equilibrium

## 2.3 Elasticity

Factors that cause the supply and demand curve to change, were briefly explained in the previous chapter. A common way of forecasting changes in the market is to use supply and demand elasticities. Elasticities measure how sensitive supply and demand are to changes in the price. They are often used by market analysts to forecast prices and market changes. If consumers are sensitive to price changes, demand is said to be elastic. When demand is elastic, the change in quantity purchased will be larger relative to the change in price. If a large price increase only leads to a small change in purchases, the demand is said to be inelastic. In this case, consumers are insensitive to price changes. (Tomek & Kaiser, 2014)

When talking about elasticities it is also important to understand how this affects supply and demand in the short and long term. In the short term, both supply and demand are often inelastic. If for example the price of Christmas trees suddenly increases, the producers won't have the opportunity to increase production immediately. It takes years from planting a tree to it getting big enough to sell. A price increase will not elicit a big increase in production. In the long run, however, say a few years, the producer will be able to plant and grow more trees. The supply is therefore said to be inelastic in the short run and elastic in the long run. This is also often the case for demand. If for example the price of gas increases, people still must go to work or drive their kids to school and therefore won't have the opportunity to suddenly stop buying gas. In the long run, however, if the high prices persist, people will find other alternatives, for example like switching to an electric car. (Tomek & Kaiser, 2014)

## **2.4 Market structure**

### **Perfect competition**

In a market with perfect competition, there are many small sellers which sell identical products. In this type of market, the seller has no influence on the market price. The market price is determined by aggregate supply and demand. If the seller tries to increase their price the buyers will change supplier. This type of market structure represents an extreme case and doesn't exist in the real world. The closest we get to this type of market is international raw material trade. (Hoff & Helbæk, 2018)

### **Monopoly**

Monopoly represents the other extreme case, where there only exists one producer or provider of a good in the market. Here the producer has full power over the market price and can in principle determine the price itself. The number of buyers in this market is directly linked to the price. The higher the price, the less demand for the good and vice versa. (Hoff & Helbæk, 2018)

### **Oligopoly**

In between perfect competition and monopoly, you have what is called oligopoly. Oligopoly is characterized by a few producers which dominate the market. Due to the large market share of each producer, there exists an interdependent relationship between the firms. Market decisions

one company makes have direct consequences for the others. The price in this market is determined by the market, but each firm can influence the price for instance by reducing their supply, due to their size. (Hoff & Helbæk, 2018)

### **Monopolistic competition**

Monopolistic competition is characterized by many firms, differentiated products and a lack of dominating market shares. Because of differentiated products, each company can be regarded as a monopoly. This is the most common type of market structure in the industrialized world and is the result of each company`s work to differentiate their product from the rest. (Hoff & Helbæk, 2018)

## **2.5 Macroeconomic policy**

Macroeconomic policy refers to the actions taken by the government or central banks to influence and manage the economic state of a country. The goal of macroeconomic policy is to establish a stable economic environment to ensure strong and sustainable economic growth. The foundational elements of macroeconomic policy are fiscal policy, monetary policy and exchange rate policy. (Dolamore, n.d.)

### **Fiscal policy**

Fiscal policy is implemented through the state budget and serves as the most important tool of the government for managing the aggregated demand in the economy. The state budget determines the allocation of state revenue and expenditures which impacts economic activity, price trends, resource utilization and income distribution among the population. (Meinich, 2021)

### **Monetary policy**

Monetary policy refers to the measures taken by the monetary authority to increase or reduce the money supply in the economy (Dutta, 2006). The main goal of monetary policy is to ensure a low and stable level of inflation. The most important tool in monetary policy is the policy rate, which is set by the Committee of monetary policy and financial stability. Usually, the policy rate is set eight times a year. (Norges Bank, 2020) Higher policy rate makes borrowing more expensive. Conversely, a lower policy rate makes borrowing cheaper. (Dutta, 2006)

Monetary policy instruments are also the most important tools for influencing the exchange rate, previously referred to with more specialized terms like “currency policy” and “exchange rate policy” (Thomassen, 2023).

## **2.6 Exchange rate**

The exchange rate is the number of units of a country’s own currency that must be paid for one unit of a foreign currency (Meinich, 2022). The degree to which the price of a good is affected by exchange rates depends on the type of good and quantity being imported by a country, the need to import raw materials to produce the good locally and whether local goods are traded internationally (Windapo & Cattell, 2012). The exchange rates are determined by a lot of different factors but can be simplest explained with supply and demand. In a trade between two currencies, any supply of one currency is equal to a demand for the other currency and vice versa (Copeland, 2005).

If for example the Norwegian krone is cheap compared to other currencies the demand for kroner will be higher and the supply will be smaller. The lower the price; in other words, the higher the relative value of the other currency (Copeland, 2005). Therefore, if the exchange rate increases, import becomes more expensive while export becomes more profitable.



## 2.7 Inflation

In Norway, the consumer price index (figure 3) is used to measure inflation, which occurs when the prices of goods and services progressively increase. The consumer price index shows the average price development of all goods and services in Norway. Inflation is said to be high when the general buying power of the population is reduced. This happens when the price of goods and services increases more than the wage growth. (Aursand, 2022)

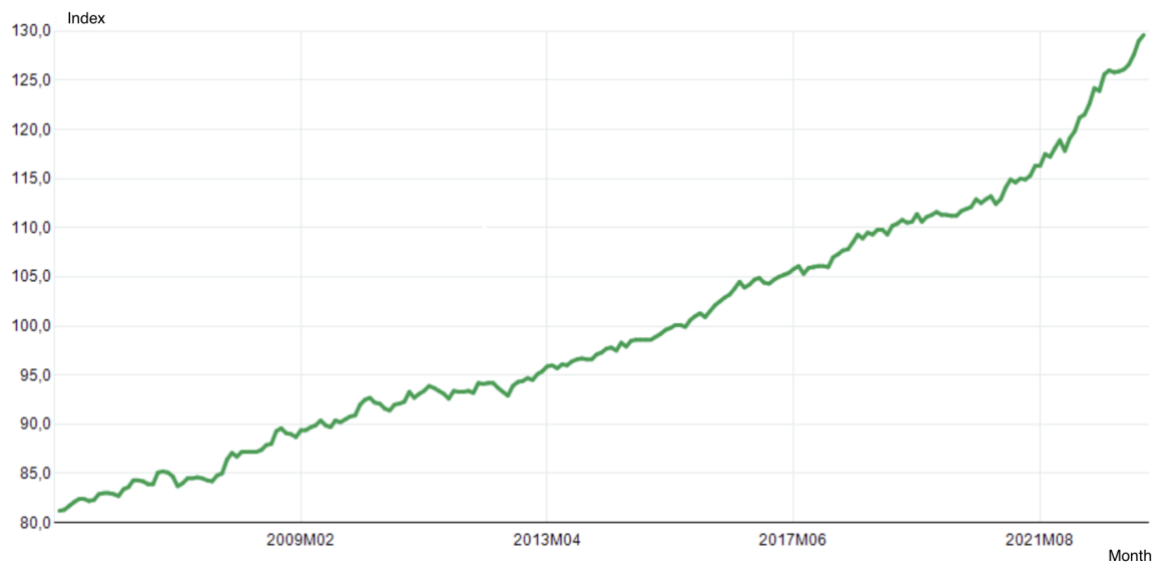


Figure 3. Consumer price index Norway 2005-2023. (Statistics Norway, n.d.-a)

### 3. Production method, cost, and contract

This chapter describes how building material of steel, lumber and concrete is produced. The objective of this is to understand what determines the production cost. It is important to understand this because the cost of production affects the quantity supplied, thus affecting the selling price as mentioned in chapter 2.2. It is safe to assume that the goal of firms is to maximize their profit. If production costs increase, firms would earn less money at a given price, motivating them to produce less of the good (Khan Academy, 2023).

#### 3.1 Steel

Today, there are two main methods of producing steel, blast furnace and basic oxygen furnace or an electrical arc furnace. The main difference between these production methods is that blast furnace and basic oxygen furnace uses iron ore, lime, and coal while the electrical arc furnace uses mainly electricity and scrap metal (Norsk Stål, n.d.). 40 percent of the steel produced in Europe is produced by electric arc furnaces (Mckinsey & Company, 2021).



Figure 4. Map of EU steel production sites (Eurofer, 2021)

Figure 4 gives an overview of where steel is produced in Europe, excluding non-EU countries. In Norway, all steel production takes place by recycling scrap metal and melting it in electrical steel furnaces (Solberg et al., 2023). There is currently only one steel producer in Norway, Celsa Armeringsstål AS located in Mo i Rana (Blakstad, 2021).

### 3.2 Lumber

To produce building materials of lumber, trees are first cut down by machines and trimmed, then transported to sawmills. Here, the bark is removed from the logs and cut with electric saws. After that, the materials are dried using byproduct of the lumber to produce heat (Svanæs, 2004). This process is illustrated in figure 5 below.

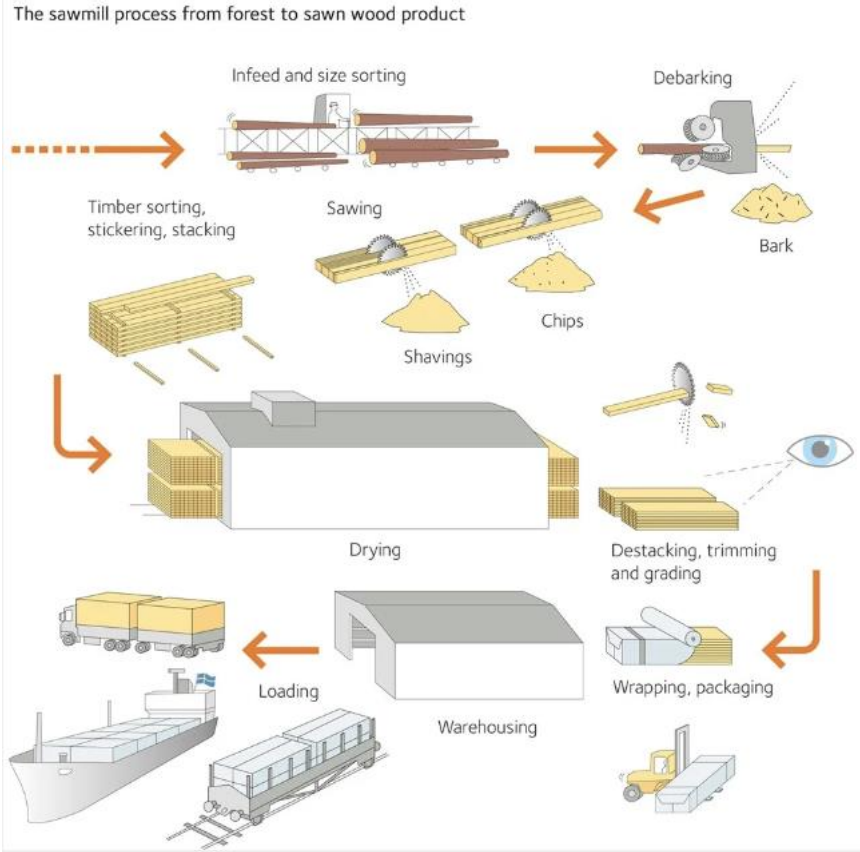


Figure 5. Production process of sawn wood (Swedish Wood, n.d.)

Approximately 2.5 million cubic meters of lumber is produced in Norway annually, which roughly corresponds to the annual consumption. Around 28 percent of this is exported, mainly to Sweden, Denmark, Germany, Great Britain, Belgium, and the Netherlands. 30 percent of

Norway’s annual consumption of lumber is imported, primarily from Sweden. The lumber products are mainly bought for construction, directly from the manufacturers or through merchants. (Foslie, 2020)

### 3.3 Concrete and cement

Concrete is made by mixing cement, water and crushed stone (Årtun et al., 2023). Since fresh concrete starts to harden within a couple of hours, it is usually produced close to the building site. Concrete factories are often situated near the production of crushed stone or sand. (Heidelberg Materials, n.d.-a)

The cement is made by burning limestone together with for example quartz and slate. This mix is crushed and heated in rotating ovens at a temperature of approximately 1450 degrees Celsius. From this, you get what is called clinker, which then is ground together with gypsum to produce cement (Heidelberg Materials, 2023). The ovens used for the burning use coal, propane, waste oil and old car tires as fuel (Årtun et al., 2023). The production of cement emits an extremely large amount of CO<sub>2</sub>, approximately one ton of CO<sub>2</sub> per ton of clinker, which makes it very harmful to the environment if no measures are taken (Heidelberg Materials, 2023). The manufacturing process of cement is illustrated in figure 6.

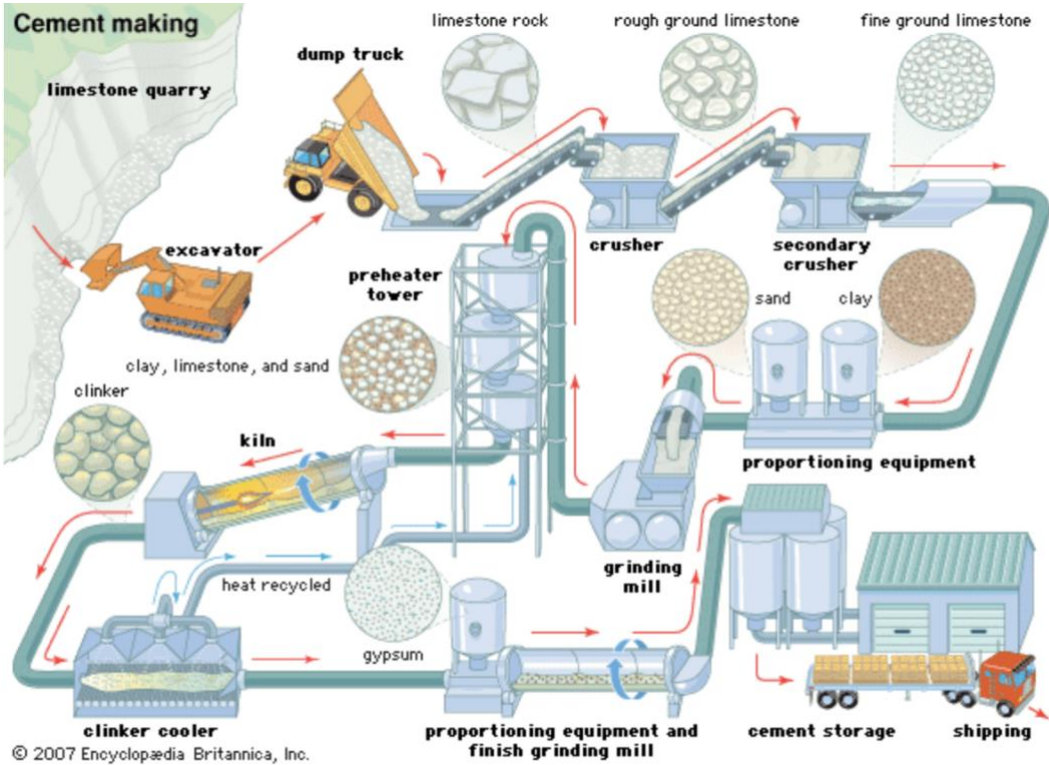


Figure 6. Cement manufacturing process (Lea & Mason, 2022)

In 2016, a total of 1.745 million tons of cement was manufactured at Norway's only cement factories located in Brevik and Kjøpsvik, with the majority intended for use within Norway. This constituted a marked share of 75%. The remaining portion of cement, amounting to 0.6 million tons in 2016, was imported into Norway, primarily from Germany, Denmark, Sweden and the Netherlands. (Vågero, 2020)

### **3.4 How are price fluctuations of materials accounted for in the contract?**

Potential consequences of price fluctuations in building materials depend on the provisions in the contract. The underlying framework of industry-accepted contracts like NS 8405/06 and NS 8407, is based on price fluctuations being captured by price adjustments according to an index (MEF, 2021). Index adjustments entail modifying-agreed upon monetary amounts with price fluctuations, expressed by a price index (SNL, 2022). Usually, it is the customer that decides whether index adjustment should be included in the contract and which index to use (Gulliksen & Almås, 2022).

There exist three relevant provisions for changing already ongoing public contracts:

#### **1. Amendment clauses**

If amendment clauses are included in the procurement documents, changes can be made according to these. It must be clear from the amendment clause, which changes can be made, to what extent and under what conditions. Additionally, the clauses must be so clear that relevant changes to the contract can be made without negotiation between the parties. Furthermore, the clause must not change the overall character of the contract. (Direktoratet for forvaltning og økonomistyring, 2023)

#### **2. Limited price increase**

Changes that lead to limited price increases can be allowed. The price increase must be lower than the threshold values given in the procurement regulations (FOA), which are the regulations on public procurement in Norway. The price increase must also be lower than 10% of the original contract value for services and goods and less than 15% for construction contracts. (Direktoratet for forvaltning og økonomistyring, 2023)

### **3. Unforeseen circumstances**

Changes due to unforeseen circumstances which couldn't be predicted by the client, can be made if the overall character of the contract doesn't change and if the changes lead to a price increase under 50% of the original value of the contract. Changes in the market or legislative changes can be examples of this if it couldn't be known in advance. (Direktoratet for forvaltning og økonomistyring, 2023)

It is important to note that changes in the contract due to unforeseen circumstances are rarely accepted. There is limited legal precedent in this area, and it would require substantial evidence for such a claim to succeed in court (MEF, 2021).

## 4. Methodology

The research design used for this study was a descriptive survey. This research method was adopted from similar studies done in other countries. “Examining the trends in building material prices: built environment stakeholders’ perspectives” by Windapo & Cattell and “Major determinants of prices increase of building materials on Ghanaian construction market” by Danso & Obeng-Ahenkora, both made use of a survey approach. The survey made it possible to gather information not available from other sources.

The survey was used to identify the major price determinants of the materials in Norway. Nine determinants that were found in previous studies were used. The respondents rated each determinant on a numeric rating scale, from lowest influence (1) to highest influence (5). The population of the study was contractors, building material suppliers, builders, and wholesalers. The questionnaire was sent out to a selected sample of 82, out of which 19 questionnaires were retrieved. This indicates a response rate of 23 percent. The selected sample of 82 was taken from *Construction: The 10 largest in 2020* (Førde, 2021b) and *The Accounts 2020: Listing of buildings, the first 100 and largest companies* (Førde, 2021a).

Because of different production methods, input factors and different markets, the selected determinants affect the price of the three building materials to different degrees. The survey was therefore divided into three parts. One each for lumber, steel, and concrete. The respondents could rate the influence of the different price determinants, individually for each material. The respondents were also asked about their level of experience. 17 of the 19 respondents stated that they had more than 10 years of experience, whereas one had 5-9 years of experience and one had under 5 years (see table 1).

Furthermore, the relationship between the determinants and the material prices is studied using market reports, price indices and public interviews/statements from established companies in the construction industry.

## **4.1 Choice of determinants**

Previous research indicates that there exists some consensus on what the main factors influencing building material prices are. According to (Windapo & Cattell, 2012), the established economic factors that contribute to changes in building material prices are supply and demand, transportation, energy costs, raw material and input costs, inflation, crude oil prices and exchange rates. A study done by (Danso & Obeng-Ahenkora, 2018) on the Ghanaian construction market showed that crude oil prices, energy costs, local taxes and charges, raw material prices and cost of transportation are some of the main determinants of prices of building materials. (Zhou & Zhao, 2013) identified supply and demand, national macro policy, the value of building materials, exchange rate, inflation, and influence from the national market as the main drivers of building material prices in China. Based on this the following determinants were decided to be most relevant for the survey: demand, supply, price of raw materials, price of electricity, cost of transportation, price of crude oil, exchange rate, inflation, and national macro policy.

## **4.2 Credibility of the data**

To get the most reliable results from the survey, the population of the study was chosen to be contractors, builders, material suppliers and wholesalers in the construction industry. These are the disciplines that deal with building material prices the closest in the industry. The respondents were also selected only if their work included one of the three materials studied, in a way where they would have enough information to give educated answers. In this way, reliable and accurate answers were acquired. This is reinforced by the level of experience of the respondents which can be seen in table 1 below; with 17 of 19 respondents having more than 10 years of experience.

However, something can be said about the sample size of the survey. A larger sample size increases the credibility of the data. The number of respondents needed for a reliable result, varies for different surveys. Factors like population size, type of study, variance of the answers or quality of the respondents will all affect the sample size needed for a reliable result. The population size of potential respondents in the Norwegian construction industry is relatively small compared to many other countries. It was therefore difficult to acquire a number of respondents that is generally statistically acceptable. In this case, the population



size was small, and with the factors mentioned above it was determined that 19 respondents were sufficient for the study.

*Table 1. Demographic characteristics of respondents*

<b>Occupation</b>	<b>Contractor</b>	<b>Client</b>	<b>Material producer</b>	<b>wholesaler</b>
<b>Experience</b>				
<5 years		1		
5-9 years		1		
≥10 years	12	2	2	1
<b>Total</b>	<b>12</b>	<b>4</b>	<b>2</b>	<b>1</b>

## 5. Results and analysis

### 5.1 Supply and demand

The degree supply affects the price of the building materials differs greatly according to the respondents of the survey (tables 2-4). Supply was ranked as the most influential determinant of the steel price, receiving a mean score of 4,47. For lumber and concrete, it was ranked third and fifth with scores of 3,88 and 3,35 respectively. Demand scored substantially higher for lumber and steel with mean scores of 4.12 and 4.41 respectively, compared to concrete for which demand received a mean score of 3.59. Indicating that lumber and steel are more affected by supply and demand conditions than concrete.

*Table 2. Respondents' perception on price determinants of lumber*

S/N	Determinants	1	2	3	4	5	Total	Mean	Rank
1	Demand	0	0	3	9	5	17	4.12	1
2	Price of raw materials	0	0	3	9	5	17	4.12	1
3	Supply	0	1	5	6	5	17	3.88	2
4	Cost of transportation	0	3	3	10	1	17	3.53	3
5	Inflation	1	3	6	6	1	17	3.18	4
6	Price of electricity	1	3	8	5	0	17	2.89	5
7	Exchange rate	4	3	6	3	1	17	2.65	6
8	National macro policy	2	6	6	3	0	17	2.59	7
9	Price of crude oil	3	3	10	1	0	17	2.53	8

*Table 3. Respondents' perception on price determinants of steel*

S/N	Determinants	1	2	3	4	5	Total	Mean	Rank
1	Supply	0	0	0	9	8	17	4.47	1
2	Demand	0	0	1	8	8	17	4.41	2
3	Price of raw materials	0	0	1	10	6	17	4.29	3
4	Price of electricity	0	0	1	13	3	17	4.12	4
5	Exchange rate	0	1	2	10	4	17	4.00	5
6	Cost of transportation	0	3	3	9	2	17	3.59	6
7	Inflation	0	2	7	7	1	17	3.41	7
8	Price of crude oil	0	4	6	7	0	17	3.18	8
9	National macro policy	2	3	10	2	0	17	2.71	9

*Table 4. Respondents' perception on price determinants of concrete*

S/N	Determinants	1	2	3	4	5	Total	Mean	Rank
1	Price of raw materials	0	1	3	8	5	17	4.00	1
2	Price of electricity	0	0	5	9	3	17	3.88	2
3	Demand	1	1	5	7	3	17	3.59	3
4	Cost of transportation	0	2	7	5	3	17	3.53	4
5	Supply	1	1	7	7	1	17	3.35	5
6	Inflation	1	2	8	6	0	17	3.12	6
7	Price of crude oil	1	4	5	7	0	17	3.06	7
8	Exchange rate	2	4	5	4	1	16	2.88	8
9	National macro policy	2	5	4	6	0	17	2.82	9

Most of the concrete and lumber used in Norway is produced nationally (Vågero, 2020) (Foslie, 2020). That’s not the case for steel, which is mostly imported from Europe and Asia (Slommerud, 2013). The price of steel is therefore largely influenced by the supply and demand conditions of the international steel market. As one can see from Figure 7, China is the dominant player in the global steel market, producing more than 50% of the world’s steel as well as being the largest consumer of steel in the world. Supply and demand shocks in China will therefore impact the price of steel globally (Norconsult, 2021).

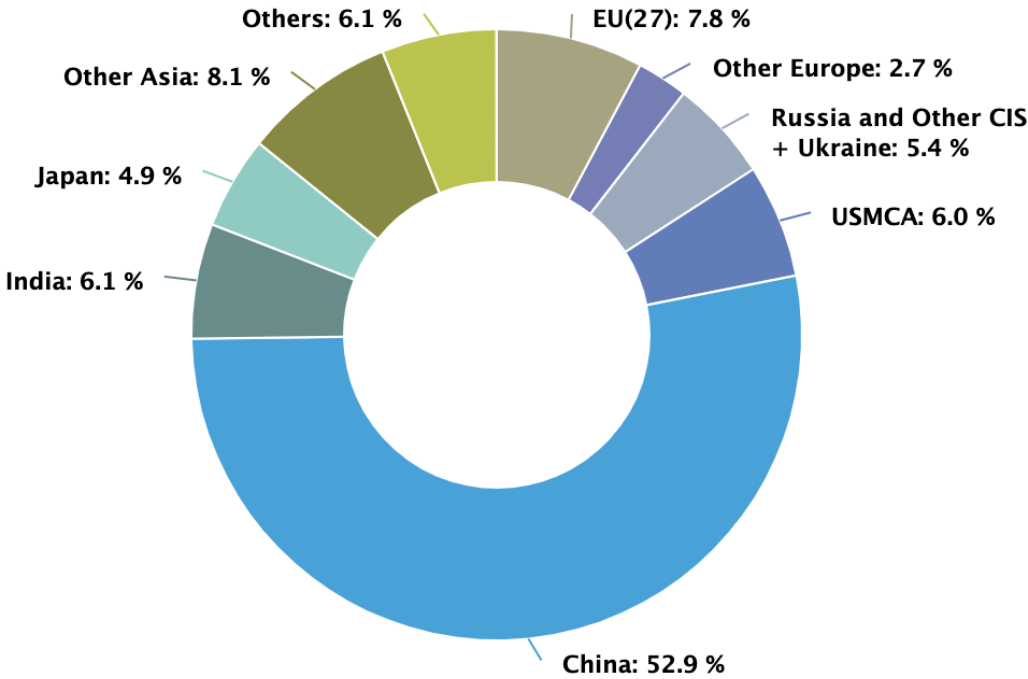


Figure 7. Geographical distribution of global crude steel production 2021 (World Steel Association, n.d.)

Macroeconomist Sara Midgard said in 2022 that the steel price was expected to decrease, despite increasing electricity prices and CO2 fees, because of the influence China has on the global steel market (Byggeindustrien, 2022a), indicating the major impact China has on the global steel market. This is also confirmed in a market report done by Norconsult, which states that low steel prices and less demand for steel in China push the prices in Norway down (Norconsult, 2021). Conversely, higher demand for steel in China pushes the price up, which was a driver behind the rising steel price in 2021 according to Norconsult.

The price of steel in Norway is also highly influenced by the European steel market. In the second half of 2020, the price of steel increased rapidly, mainly caused by the reduced production capacity of the European steel mills together with rising demand for steel. (Norsk Stål, 2020a)

According to the market manager Tom Frode Hansen in Norsk Stål AS, it is the construction of roads, bridges, railways, and other infrastructure which is the biggest driver for the steel demand. He also stated that a decline in the housing market will have an effect, but to a smaller extent (Aga, 2017). Another important driver of the demand for steel is the automotive industry. According to *The European Steel Association*, the automotive industry is the second biggest consumer of steel after the construction industry (Eurofer, 2022). The activity of this sector will therefore directly impact the overall steel demand and ultimately influence the price. This is further reinforced by the price announcement of Norsk Stål in October 2020 which states that increased activity in the European market, especially the automotive industry pushes steel prices up (Norsk Stål, 2020b).

The price of lumber is also greatly impacted by supply and demand conditions of the international market. This can be seen by the rapid price increase in 2021, which resulted from supply and demand shocks due to the pandemic. A lot of industries closed down, and demand for construction materials was expected to plummet. This led to many producers of lumber cutting down their production. However, due to a boom in home construction, the demand for lumber increased unexpectedly, both locally and globally. As a result, the competition for lumber rose significantly which led to record high prices both globally and in Norway. (Norconsult, 2021)

Additionally, bark beetles infected vast areas of the Canadian forest, destroying large amounts of lumber. As a result, the demand for European lumber increased drastically, which led to higher lumber prices in Norway (Steinset, 2021). *Petter Knutsen*, Communication director in *Byggmakker*, explained this by saying;

*“Now when Norwegian sawmills see that they can charge higher prices by exporting abroad, the prices also increase here.”* (Lorvik, 2021)

This illustrates the connectedness in the global economy and the importance of the balance between supply and demand. Disrupts in one region can have far-reaching consequences elsewhere.

Another important driver of the demand for lumber is the commissioning of detached houses which according to Statistics Norway, constitutes approximately 48% of all residences in Norway (Statistics Norway, n.d.-d). As of 2023, high energy and fuel prices, increased interest rates and general economic uncertainty, are well felt in the lumber market (AT Skog, 2023). Activity related to cabin and housing construction has fallen dramatically, which has led to sawmills experiencing a significant decline in the sale of lumber. According to *Prognosesenteret* the commission of new houses and cabins fell by 17% from 2021 to 2022 (Bjørneng, 2023). As a result, the price of lumber has fallen to the pre-pandemic prices, which can be seen in figure 1. The effect of this is counteracted to a certain extent by the attractiveness and sustainability of lumber and therefore takes market shares from other types of material (Moelven, 2023).

The renovation and maintenance market is also an important market for material suppliers but is often talked little about. However, it constitutes approximately 50% of the EU total construction market (Sante, 2022). In 2015, the CEO of *Prognosesenteret* Bjørn Mangor Birkeland stated that this market would become the most important market for the building material sector in Norway (Brekhus, 2015).

In general, the demand for this market is relatively stable, especially compared to the new construction sector. Furthermore, demand can even rise during an economic crisis. For instance, when homeowners face difficulties in selling their homes, they may opt to improve their current home. Building materials that are less used in this industry are concrete, bricks and cement. (Sante, 2022)

In Norway, the supply and pricing of concrete are largely influenced by two key factories located within the country. The vast majority of cement used in Norway is manufactured at these two factories. Their operation has a direct influence on the availability and pricing of cement, thereby significantly affecting the supply and cost of concrete in Norway. Concrete production in Norway is therefore highly dependent on the production capacity of these factories. Any disrupts or limitations in the production process can lead to reduced supply

levels and potential price increases for concrete. In February 2022 an incident occurred at both of the factories, which halted the production for several weeks. As a consequence there was a large shortage in the supply of cement (Byggeindustrien, 2022b).

In reality, there are no substitutes for ready-mixed concrete. Therefore, the products price elasticity is considered to be low. This implies that price increases will not lead to equivalent declines in sales volume. Due to the low-price elasticity, companies in a dominant position have strong motives to increase prices. Consequently, it is reasonable to assume that the players in the ready-mixed concrete market have limited incentives to engage in competition, but rather exercise collective market power (Norwegian Competition Authority, 2004).

### 5.2 Exchange rate

Looking at the survey results (tables 2-4), the exchange rate is perceived by the participants of the survey to have little effect on the price of lumber and concrete both receiving a mean score below 3. For steel, it was ranked as the fifth most influential determinant, which can quickly be interpreted as moderate. However, if we take a closer look at the scoring of the influence the exchange rate has on the price of steel, it is perceived as having a major influence on the price with a mean score of 4. This is also confirmed in a market report done by Norsk Stål, one of the largest steel suppliers in Norway; the price of steel in Norway is largely influenced by the exchange rate, as most imported steel is settled in EUR or USD (Norsk Stål, 2020a).

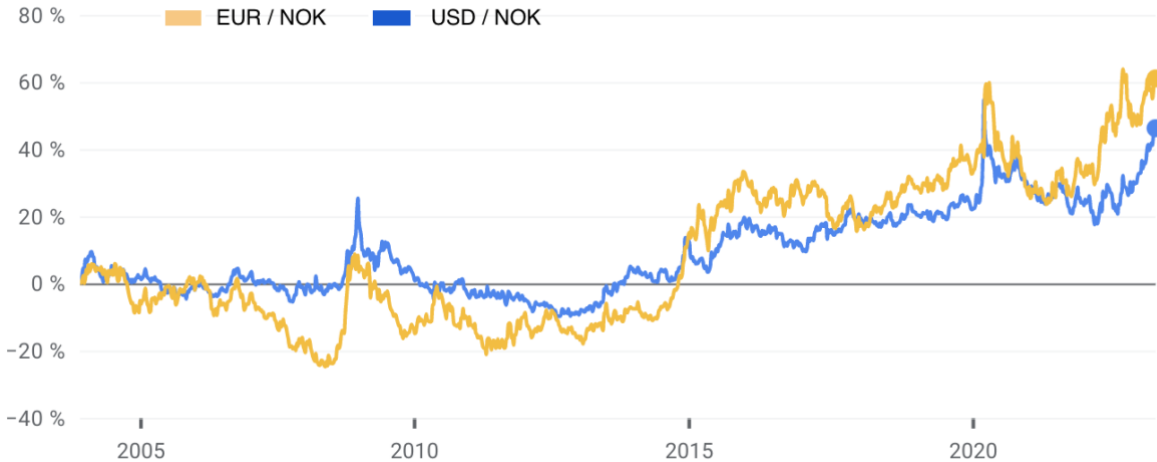


Figure 8. Exchange rate daily percentage change 2003 to 2023. (Google Finance, n.d.)

Figure 8 shows the evolution of the exchange rate from EUR and USD to NOK. By visual inspection of the graph, it is clear that the overall trend has been upwards, indicating that steel has become more expensive to import, compared to before. In the long term, the exchange rate is dependent on the oil price and price levels compared to abroad, while in the short term, it is affected by international financial turmoil and interest rate differential compared to other countries (Bernhardsen & Røisland, 2000). As most of the lumber and concrete used in Norway is produced locally, the exchange rate won't have the same effect on the price of these materials. However, lumber producers might choose to increase their export if the value of Kroner is further weakened, which may increase the price of lumber in Norway to a certain extent.

### **5.3 Price of raw materials**

The price of raw materials received a mean score of 4.12, 4.29 and 4.00 for lumber steel, and concrete respectively (tables 2-4), which indicates that it is a major determinant for all three materials. For concrete, it was identified as the most influential price determinant.

The building material industry is dependent on raw materials to make their products. Logging contractors and sawmills purchase stands of trees as sawlog stumpage to produce lumber. Upon arrival at the mill, the logs are typically processed within 1 to 3 weeks. The resulting lumber is characterized into different product grades, in preparation for further processing and sale to secondary manufacturers (Luppold & Havlicek, Jr., 1981). The price of the logs is therefore the starting point for the price of lumber.

Furthermore, many producers of wood materials start with lumber as their raw material. The price of lumber is highly influenced by free competition in the international market, making the international price of lumber the starting point for determining the price of finished wood materials in Norway. (Finstad, 2021)

Concrete consists of multiple raw materials and is therefore subjected to price changes of different materials. However, sand, stone, cement, and water which are the main input factors for concrete, are all easily accessible and produced nationally (Norconsult, 2021). Cement constitutes a major share of the total costs for producing ready-mixed concrete and almost all manufacturers of ready-mixed concrete in Norway buy their cement from Norcem

(Norwegian Competition Authority, 2004). In 2021, Svein Eriksson from Norcem stated that the price of cement has been stable for the last 20 years mainly due to the short-hauled components (Olsen, 2021). As a result, the price of concrete hasn't experienced price fluctuations like steel and lumber.

However, the implementation of higher CO<sub>2</sub> fees for the production of cement have has a major impact on the price of concrete. According to *Norconsult*, the price of concrete was expected to rise from 2021, due to an increase in the price of cement, caused by higher electricity prices and CO<sub>2</sub> fees. They also stated that electricity prices were expected to decrease, but higher CO<sub>2</sub> fees would keep the prices of cement high in the future (Norconsult, 2021). At the turn of the year 2021/2022 Norcem announced a 25-20% increase in their cement prices, which was among other things due to higher CO<sub>2</sub> quotas (Brekhus, 2021).

Higher CO<sub>2</sub> fees will also affect the cost of producing steel. On May 10, 2023, the European Commission signed a legislation called the Carbon Border Adjustment Mechanism, affecting imports of goods to the EU whose production is carbon intensive and at the most significant risk of carbon leakage, like cement, iron and steel (EU, n.d.). The main consequence of this legislation is that importers to the EU shall have the same costs for emissions as producers in the EU (Norsk stål, 2023). It is not clear whether this will significantly affect the price of steel, but it may become a factor in the future.

Iron ore, coal and scrap steel are the three main ingredients in steel production. In 2021 it was estimated that the global steel industry consumed about 2.3 billion tons of iron ore, 1.1 billion tons of metallurgical coal and 680 million tons of recycled steel to produce crude steel (World Steel Association, 2023). Iron ore has been observed to have high volatility in terms of global prices (Ewees et al., 2020). The production cost of steel is highly impacted by the price of iron ore and directly impacts the profit of steel enterprises.

*Hellmer & Ekstrand* found that China's demand for iron ore was the main driver behind the global iron ore price (Hellmer & Ekstrand, 2013). As mentioned, in the spring of 2021, China's steel production was unusually high due to the increasing demand for steel. As a consequence, they had to cut production in the fall to avoid exceeding their quota. Steel producers were forced to sell iron ore at a low price, resulting in the price of iron ore falling



by 58% from July to November. Cheap iron ore led to a 30% drop in the price of steel in China from November to January (Norconsult, 2021).

A high level of industry concentration exists on the supply side of iron ore. Australia and Brazil dominate the world's export of iron ore, collectively accounting for approximately two-thirds of the world's exports (USGS, n.d.). This substantial market share suggests potential control over the iron market. Consequently, Brazil and Australia may be able to affect the global iron ore market price and command a higher premium price (Su et al., 2017).

The price of scrap metal correlates closely with the price of iron ore and coal, according to Norsk Stål (Norsk stål, 2022). Coal constitutes about 89% of a blast furnace-basic oxygen furnace energy consumption and 11% of an electric arc furnace (World Steel Association, 2019). Surging coal prices will therefore have a significant effect on the cost of producing steel, ultimately affecting the steel price.

#### **5.4 Price of electricity**

As can be seen from the survey results, the price of electricity was ranked as the second most influential determinant of the price of concrete, receiving a mean score of 3.88. Since most of the energy sources for concrete production come from coal or alternative fuel it seems surprising that the price of electricity could impact the price of concrete to that extent.

According to a report done by *Cembureau* in 2020 electricity accounts for circa 12% of the energy used for the production of cement, where 50% is used for raw material preparation and clinker production, 43% for cement grinding and the remaining for raw material extraction, fuel grinding and for packing and loading. (Cembureau, 2020).

However, according to Rootzén & Johnsen, the average cost of electricity for a Nordic cement plant is 9,6 euro per ton of cement, while the combined cost for the rest of the fuel is 7,4 euro (Rootzén & Johnsson, 2016). It is important to note that there are large geographical differences in the electricity price, this cost can therefore vary greatly between production sites. Nevertheless, it supports the participant's perception that the price of electricity is a major determinant of the price of concrete. This is also supported by a market report done by *Norconsult* in 2021, which stated that the price of concrete was expected to increase due to higher electricity prices as well as higher CO<sub>2</sub> fees (Norconsult, 2021).

The price of steel was also perceived by the participants of the survey as being highly influenced by the price of electricity, with a mean score of 4,12. Steel production is highly energy intensive. The cost of energy, therefore, constitutes a significant portion of the cost of producing steel, ranging from 20-40%. In Norway, all steel production is done with electrical arc furnaces, which the main source of energy comes from electricity, about 50%. Blast furnaces which are used in 75% of global steel production use around 7% of electricity as its energy source. (World Steel Association, 2019). Higher electricity prices will therefore undoubtedly affect the cost of producing steel. This is also mentioned in the market report from *Norconsult* where they state that lower electricity cost will reduce the production costs of steel, seen in isolation.

The price of electricity was perceived as having a moderate effect on the price of lumber, receiving a mean score of 2.89. Sawmills use both electricity and heat in the production process of lumber. Almost all lumber is dried in kilns in Norway, which constitutes most of the energy consumption. The heat being used for the drying process comes from internal byproducts (waste biomass). Electricity is mainly used for sawing, grinding and fans for the drying kilns (Anderson, 2012). Historically, the cost of energy has been a small part of the sawmill`s total cost due to low electricity prices and little demand for the byproducts in Norway. (Olsson, 2020)

The price of electricity skyrocket in 2020 as can be seen in figure 9, which affected the production costs of concrete, lumber, and steel materials to varying degrees, depending on the consumption of electricity in the production process. This is reflected in the participant`s answers to the survey and in literature. It is also important to note that geographical differences can have a big impact on electricity prices as well as the type of contract between the firm and the electricity provider.

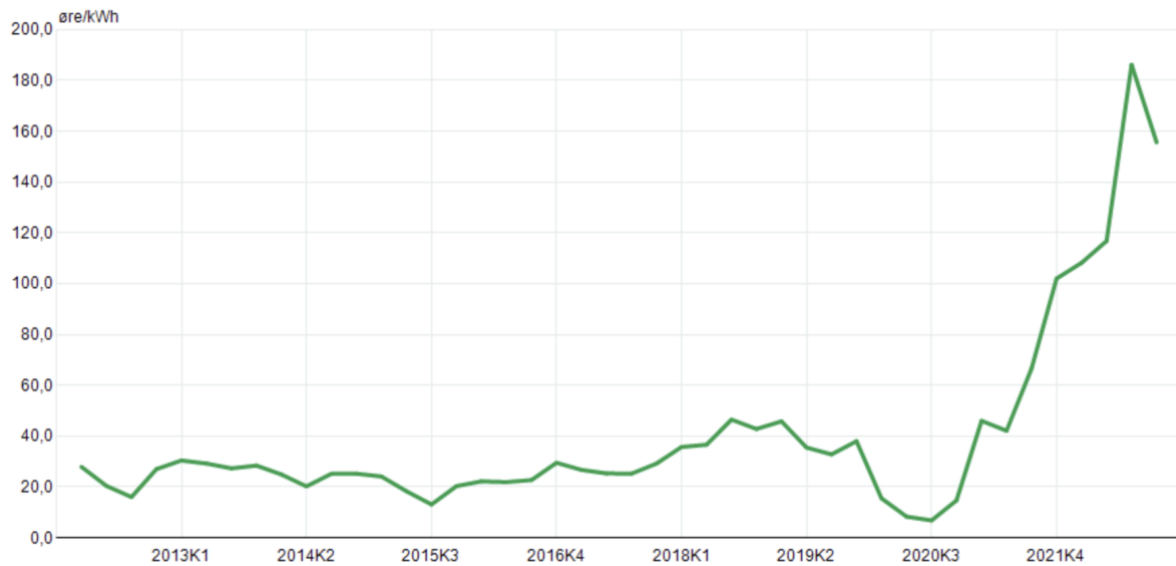


Figure 9. Quartile selling price of wholesale electricity in Norway 2012-2022. (Statistics Norway, n.d.-b)

Most businesses operate with forward contracts, such that short-term fluctuations in the electricity price shouldn't have a major impact on the day-to-day production cost. But if companies sign new forward contracts today, due to the soaring prices we have seen recently and the uncertainty about the future, the cost of energy will have a higher share of total costs. If the prices should continue to rise in the future, it will be hard for the manufacturers to not transfer the costs to the selling price. (Lund & Midtgaard, 2022)

## 5.5 Transportation costs

The cost of transportation was perceived as having a considerable effect on the prices of lumber, steel, and concrete with mean scores of 3.53, 3.59 and 3.53 respectively.

Transportation of cement is often expensive and logistically demanding, which influences the price of concrete. However, since Norway to a large extent is self-sufficient with input factors for concrete, fluctuations in the international market have limited effect on the Norwegian market (Norconsult, 2021). Outtake of raw materials for cement production is also done locally, which reduced transportation costs drastically (Norcem, 2021).

Ready-mixed concrete is mainly transported to construction sites by diesel trucks and is therefore subjected to price shocks in the oil and gas prices. In the first half of 2022, the price of oil and gas increased substantially, which can be seen in figure 10. As a consequence of

this one of Norway’s leading distributors of ready-mixed concrete *Unicon* added a surcharge for transportation (Barbøl, 2022). It is important to clarify that this didn’t increase the price of concrete in itself but increased the cost of attaining the concrete.

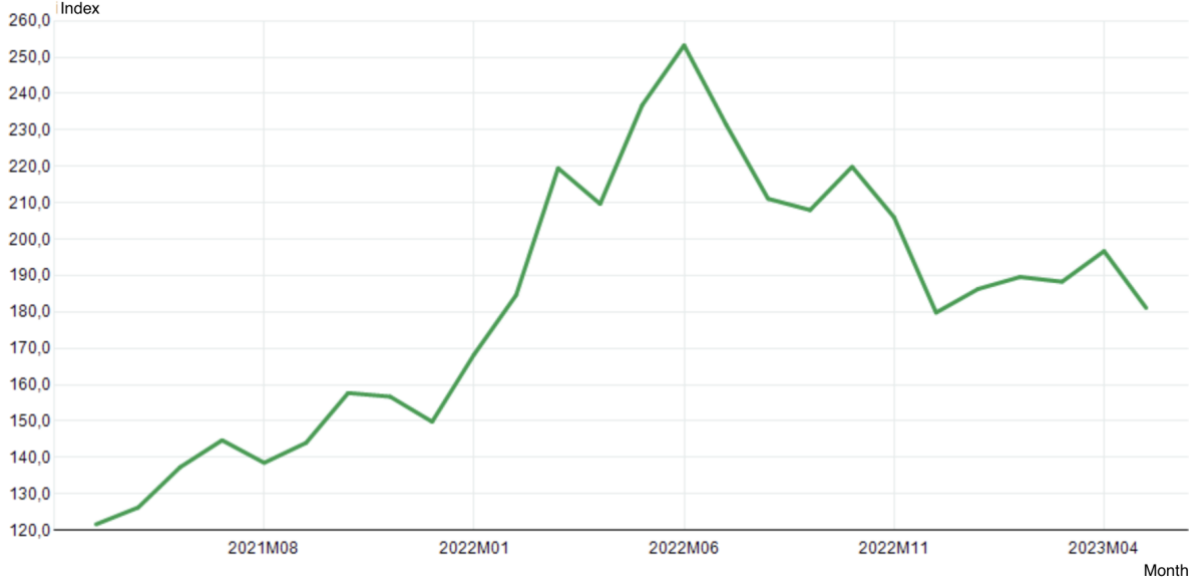


Figure 10. Producer price index oil and gas 2021-2023 (Statistics Norway, n.d.-c)

Since materials of steel and wood also need to be transported to the building site, usually by trucks, they too will be affected by the cost of transportation. If this is substantial enough to where the economic benefit of the construction industry is reduced, it may affect the demand for building materials as a whole and therefore result in lower material prices.

Transportation costs also play a significant role in determining the final price of imported goods. When goods are produced in one country and transported to another, various transportation expenses are incurred, which are ultimately passed on to the customer. Naturally, this will affect the price of goods that is heavily imported, like steel. In 2021 the price of container shipping from China reached new heights due to a shift in demand from services to goods. This led to major logistical problems in the shipping industry and a shortage of containers, which ultimately affected the price of steel (Norconsult, 2021).

## **5.6 Inflation rate**

Inflation received a mean score of 3.18, 3.41 and 3.12 for lumber, steel, and concrete respectively. Indicating a moderate effect on the price of lumber and concrete and a considerable effect on the price of steel.

When inflation rises, the general buying power of most people weakens leading to less demand for home improvement. The Norwegian bank has a goal to keep inflation low and adjusts the policy rate after how the economy is doing. To reduce high inflation, they increase the policy rate, which makes it more expensive to loan money (Aursand, 2022). The real income of the population reduces. As a result, the price growth of the housing market falls, thus reducing construction activity (Norconsult, 2021). Consequently, demand for building materials goes down which can potentially result in lower prices for building materials. This is especially the case for lumber for which home improvements and housing are strong drivers of the demand (Moelven, 2023).

The expectation of future inflation levels also plays a role in the pricing of goods and may therefore affect the price of certain building materials. According to the Bank of Norway, expectations of higher inflation contribute to increased prices. Conversely, expectations of low inflation levels lead to lower prices (Norges Bank, 2019).

As shown in section 2.7 the consumer price index displays a continuous upwards trend, which is also the case for the price index of concrete shown in section 1.1. Strongly indicating that higher inflation does not result in reduced concrete prices, but rather that the concrete price follows the consumer price index.

## **5.7 Price of crude oil**

The survey results show that the price of crude oil is perceived as having a moderate effect on the price of steel and concrete with mean ratings of 3.18 and 3.06 respectively. For lumber it was perceived as the least influential determinant of the selected factors, receiving a mean score of 2.53.

The most obvious impact the oil price has on the price of building materials is the cost of transportation. This is briefly described in the chapter analyzing the influence of transportation costs on the price of the building materials studied. Crude oil is one of the main

costs of shipping (Chou et al., 2011). As we have discovered, the supply of steel to Norway is highly dependent on shipping, therefore higher crude oil prices can impact the price of steel through higher transportation costs.

According to Norsk stål, high oil and gas prices affect the steel mill prices both directly and indirectly (Norsk Stål, 2022). A study done by Chou, Yang and Chang in 2011 revealed that there is an indirect relationship between the crude oil price index and the steel price index. Their study found that the price of steel is affected by the price volatility of crude oil (Chou et al., 2011).

There was found no supporting evidence that the price of crude oil affects the price of lumber in Norway. Figure 11 shows the yearly energy costs in the Norwegian lumber industry from 2005 to 2022. The graph also shows that the cost of petroleum products in lumber production has been low and stable for the last 17 years. Additionally, the survey participants perceived the price of crude oil to have little effect on the price of lumber. The graph also shows that the cost of electricity is far greater than the cost of petroleum. Consequently, the price of electricity has a bigger effect on the price of lumber than the price of crude oil.

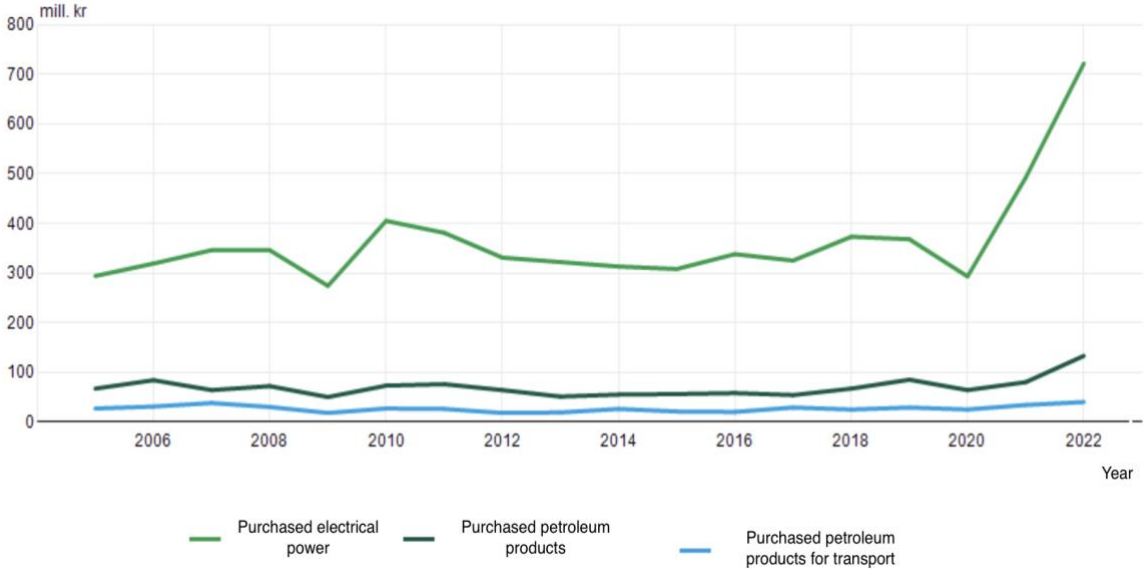


Figure 11. Cost of energy in the lumber industry 2005-2022. (Statistics Norway, n.d.-a)

As discovered in section 5.5 the price of crude oil increases the transportation costs of ready-mixed concrete. Figure 12 shows the use of fuel in the production of cement in Brevik. As

one can see from the figure the rate of fossil fuel used in cement manufacturing has been halved from 70 584 tons in 2010 to 35 726 tons in 2021. The majority of fuel used comes from burning waste and the rest comes from coal (Multiconsult, 2019). Together with the survey results, there are no indications that the price of crude oil is a major determinant of the price of concrete in Norway.

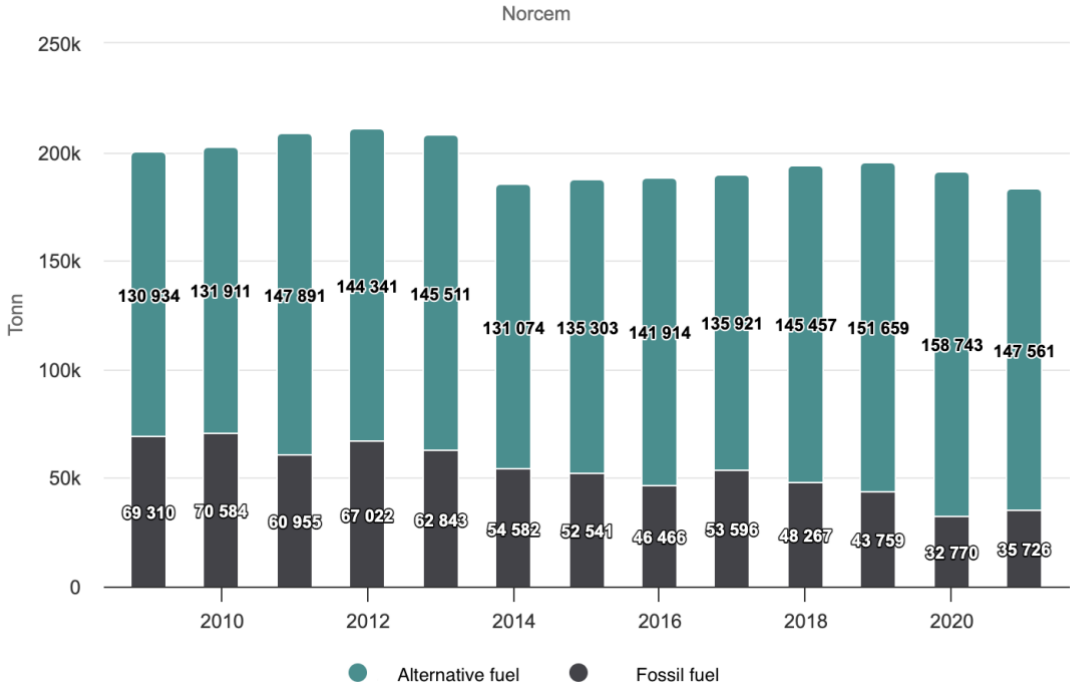


Figure 12. Fuel usage in cement production in Brevik. (Heidelberg Materials, n.d.-b)

### 5.8 National macro policy

The national macro policy was perceived as having little effect on the price of the materials by the participants of the survey. It received the lowest mean score for steel and concrete with scores of 2.71 and 2.82 respectively. For lumber, it was perceived as having the second lowest influence on the price by the participants with a mean score of 2.59.

According to the CEO of *Betong Norge*, John Erik Reiersen, the sales of concrete will be considerably affected by the government fiscal policy. If the government reduces its investments in infrastructure and public construction projects, it will be challenging for the concrete industry (Reiersen, 2023).

Monetary policy can indirectly impact the demand for building materials through the policy rate as described in section 5.6. Additionally, if the Bank of Norway decides to increase the policy rate, while other central banks choose to keep their policy rate unchanged, the demand for the Norwegian kroner increases. This can lead to a stronger Norwegian krone which would reduce the price of imported goods (Norges Bank, 2019).

## **6. Concluding remarks**

### **6.1 Summary and discussion of the findings**

The literature suggests that supply and demand, and therefore prices, of steel and lumber are more affected by the international market compared to concrete. China was identified as a major driver of the supply and demand of steel in the global economy. Increased demand in China leads to a tightening of supply which results in higher steel prices in the rest of the world. It was found indications that the price of lumber is highly affected by the international market, mainly due to suppliers using higher lumber prices abroad as a leverage to increase their price in Norway.

Additionally, the price of lumber was found to be highly affected by the demand for detached houses and the renovation market in Norway. The supply and demand of concrete were discovered to be most affected by local circumstances. Predominantly explained by local production. Common for all of the materials is that the level of construction directly affects their demand. However, the less fluctuating price of concrete might suggest that the supply and demand conditions are more stable for concrete than steel and lumber. One explanation for this can be that there exist more substitutes for lumber and steel than concrete.

The increasing price of cement was identified as the major driver behind the rising price of concrete. Mostly caused by soaring electricity prices and higher CO<sub>2</sub> fees. Rising electricity prices in addition to fluctuating prices of iron ore and scrap metal were found to greatly impact the cost of producing steel. Furthermore, it was found that the exchange rate and cost of transportation greatly impact the price of steel in Norway as Norway's dependency on imports of steel products is very high.



The literature indicates that higher inflation leads to less activity in the housing market, which can reduce the price of building materials, especially lumber.

Conversely, there was found evidence in the literature that the expectation of higher inflation can increase the price of building materials, which may appear contradicting to the previous statement. However, when people expect higher prices, they tend to demand higher wages, as a result, the producers respond by increasing prices, causing inflation to rise (Floyd, 2023). As inflation rises, demand for non-necessary goods decreases ultimately leading to reduced prices.

Furthermore, the findings indicate that crude oil prices affect the price of steel considerably. Both due to increased shipping costs and impact on the production cost. It also emerged from the study that higher crude oil prices increased the cost of ready-mix concrete due to higher transportation costs.

It was also shown that the price of the building materials can be influenced by macro policy indirectly through the adjustment of the policy rate, and the government's investment in infrastructure and construction projects. However, there was found no evidence that macro policy directly affects the price of the building materials in reality. Together with the low rating received from the participants of the survey, the actual effect of macro policy on the prices of steel, lumber and concrete is assumed to be low.

It should also be mentioned that the price determinants used in the survey were on average scored higher for steel than concrete and lumber (tables 2-4), which can suggest that they are more correlated with steel than lumber and concrete. Factors that were not studied in the thesis like wage rate and seasonality among others can also be potentially important price determinants of the materials.

## **6.2 How can the risk associated with fluctuating prices of building materials be reduced?**

In times of fluctuating building material prices, it can be hard to estimate the actual cost of a project. In a fixed-price contract, the contractor bears the risk associated with rising prices of

building materials. To reduce this risk the contractor should try to achieve binding prices with the material suppliers. If the suppliers won't agree to fixed prices, the contractor should demand index adjustment of the prices with the client. This way the contractor doesn't bear all of the risk associated with rising building material prices. Additionally, the client may experience reduced costs if the prices fall.

### **6.3 Limitations of the thesis**

The main limitation of the thesis has been the availability of scientific papers. Most of the analysis/discussion part builds on grey literature, due to the lack of relevant scientific research on the topic. Since much of the literature used in the analysis can be considered anecdotal evidence, it is difficult to conclude the findings of the thesis with absolute certainty. However, only statements and reports from established companies in the construction industry were used which reduces the uncertainty of the findings in the thesis. Therefore, it is believed that the thesis gives a good indication of what influences the prices of lumber, steel, and concrete in Norway.

### **6.4 Conclusion**

This thesis studied the underlying factors influencing the prices of steel, lumber, and concrete in Norway. The main goal of the thesis was to identify the major price determinants of these materials and study the relationship between the determinants and the prices. It was also a goal to discover risk-reducing measures that can be taken against fluctuating material prices in a construction project.

To identify the major determinants of the materials, a survey approach was taken. The participants of the survey were gathered from the Norwegian construction industry which identified several major factors influencing the prices of the materials. These factors were further analyzed through market reports, research articles, price indices and statements from industry-specific people.

It can be concluded that the participants of the survey were overall well-informed about the factors influencing the prices of steel, lumber, and concrete in Norway.

The study found rising cement prices due to higher electricity prices and CO2 fees to be the main driver behind the increasing price of Concrete. International supply and demand conditions were found to be the major determinants of the price of steel, especially the supply and demand of steel in China. The price of Lumber was also found to be greatly affected by international demand and supply conditions, as well as the demand for detached houses and renovation in Norway.

It is important to note that the impact the identified determinants have on the prices changes over time. The major determinants might therefore differ in the future. Therefore, stakeholders in the construction industry need to follow the market closely. However, predicting the prices of steel, lumber and concrete is difficult due to the multitude of factors that influence them. The study also shows that the prices can be highly fluctuating in periods. In times when prices are highly volatile, it is important to take risk-reducing measures. As we have seen, this can be done by negotiating fixed prices with material suppliers or incorporating index adjustment of the prices with the client.

## **6.5 Suggestion for further research**

As this thesis mainly focused on studying the price determinants of steel, lumber, and concrete. Further research should be directed towards the consequence of increasing prices of building materials as well as control measures for increasing prices of building materials in Norway.

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