Commodity exposures and risk management in the Swedish construction sector
A comparison between Skanska, NCC, Peab and JM

Sara Lyckeberg
Abstract

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Today’s construction industry consists of fierce competition and low margins, resulting in companies focusing on cost risk awareness. The aim of this thesis was to investigate how construction companies manage their market risks, with a special focus on commodity risks. In addition, the thesis purpose was also to explore the composition of commodity exposures within a few selected construction companies. A financial index of commodity exposures was generated out of Statistiska Centralbyråns’ totala faktorprisindex for multi-residence housing projects. Furthermore, a fictional case was combined to test the risk management effect of the financial index, using Sweden’s four largest construction companies’ commodity exposures. In summary, the construction companies were all aware of their commodity exposures although most of them did not actively manage them or know their exposures extent. Moreover, financial risk management of commodities is not easy or straightforward, resulting in difficulties in choosing the right management tool. Therefore, this thesis created and illustrated how a financial index could be used as a way to stabilize the profitability in construction projects.
Populärvetenskaplig beskrivning


Materialkostnader står för en stor del av varje byggprojekts budget men få av byggföretagen har kalkyler över hur mycket svängningar i materialpriserna faktiskt påverkar projektens lönsamhet i slutändan. Därför behöver byggföretagen förbättra sin kostnadstransparens när det kommer till hur materialkostnaden, både direkt och indirekt, påverkas av råvaruprisförändringar. I dagsläget används framförallt ramavtal till att reglera risken för prisförändringar under projektets livstid. I ett fåtal fall används finansiella säkringar.

Denna uppsats har undersökt hur råvaruexponeringarna ser ut i flerbostadshusprojekt hos de fyra olika företagen. Därefter har ett finansiellt index konstruerats utifrån Statistiska Centralbyråns officiella faktorprisindex för byggkostnader. Sluttiden skapades ett fiktivt case utifrån den information som framkommit av de fyra företagen. Indexet applikerades på caset för att illustrera hur det kan användas för att säkra lönsamheten i flerbostadshusprojekten.

Framtiden för byggbranschen fokuserar fortsatt på att försöka minimera och kontrollera kostnaderna i olika typer av projekt för att öka lönsamheten. I dagsläget har inget utav de fyra företagen en organisation som skulle kunna stötta en riskhantering av råvaruexponeringar i individuella projekt. Däremot skulle ett finansiellt index kunna användas som ett sätt att säkra ett företags generella råvaruexponeringar.
Preface

With the implementation of this essay, I have completed the examination of Master of Science in Sociotechnical systems engineering at Uppsala University. The thesis has been carried out in the autumn of 2012 at Skandinaviska Enskilda Banken(SEB) and corresponds to 30 högskolepoäng.

During the summer of 2012, my interest and curiosity in commodities and financial risk management evolved through an internship at SEB. As a result, I tried to find out which areas, where commodities and financial risk management merged, needed more insight. The result can be found in this thesis.

I would like to thank everyone who has helped out and contributed to this thesis. Several persons at the four construction companies have been very helpful as well as people at SEB and in my close surroundings. I especially want to thank Pär Melander, Fredrik Sundvall and Göran Lindström who has been my support throughout the thesis. Pär for his knowledge of commodities and his patience, Fredrik for his good advise and comments on my work and lastly, Göran for the continuous feedback and academic discussions on how a thesis should be carried out.

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1 Glossary

**Backwardation** - occurs when the future spot price is higher than the forward price of a commodity, resulting in a positive roll yield.

**Basis risk** – is the difference between the spot price and the futures price. Basis risk also occurs if there is a mismatch between a hedge and the underlying asset.

**Commodity risk** – the risk of movements of commodity prices affecting future material costs.

**Contango** - occurs when the future spot price is lower than the forward price of a commodity, resulting in a negative roll yield.

**Exchange rate risk** – the risk of movements of an exchange rate introduce the possibility of an indirect or direct loss in an organizations cash flow, assets and liabilities and/or net profit.

**Forward** - an agreement to sell or buy an asset at a specific time in the future for a certain price. Forward contracts are traded over-the-counter which means that they are specially tailored for every customer’s needs.

**Futures** - an agreement to sell or buy an asset at a specific time in the future for a certain price. The futures contract is traded on exchange. Unlike the forward contract, the futures contract exchange specifies standardized features in the contract.

**Hedging** is a financial tool that can be used to secure profitability.

**Index roll** - is the potential gain or loss from the replacement of an expiring contract with one further out on the futures curve.

**Interest rate risk** – the risk of movements of the interest rate affecting the opportunity for reinvestment and/or default of a company.

**Market risk** – Risks related to movements of the financial markets, for example interest rates and exchange rates.

**Options** - gives the holder the right but not the obligation to buy/sell an underlying asset by a specific date to a certain price.

**Risk** – is an uncertain event or condition that, if it occurs, has a positive or a negative effect on a project objective.

**Spot price** - is the quoted price to sell or buy an asset today.

**Swaps** - is a contractual agreement between two parties to exchange cash flows in the future. The exchange is performed because two parties want to take advantages of the other party’s benefits by swapping them.
2 Construction companies’ commodity exposures
Almost as old as time itself, is a common reference to construction work being one of the eldest craftsmanship in the history of mankind. What was once a one-man show has become a multibillion business in Sweden where a few strong companies dominate the market. Thus, competition is fierce and together with cost increases of production, many companies ask themselves where the costs are located and how they can be cut.

Construction projects, of all kinds and types, are to an extent dependent on the cost of materials such as steel and concrete in the foundation frames, wood in carpentries or diesel needed for machine work. According to SOU (2000:44), the material cost in a construction project represent 41% of the total construction cost which in turn denote 25% of the total production cost. The division of project costs is shown in figure 1.

![Project cost breakdown](image)

**Figure 1 Project cost breakdown (SOU 2000:44)**

Material costs can be divided into its commodity components where price changes can be tracked more efficiently. Price volatility in commodities hits both buyers and sellers profitability in a wide range of sectors. (UNDP, 2011, p. 58-62) Construction companies have a large commodity exposure due to their purchases of different commodities during a long project. A construction project can last from a few months up to several years in which time the commodity prices might have changed dramatically.

Another factor that makes these companies exposed is the lack of understanding for the magnitude of the commodity risks. Contractual frameworks with suppliers and partnering relationships with clients are some of the solutions in which construction companies minimize risks. However, the risks are not entirely eliminated.
2.1 Purpose
The starting point of this thesis is to map the construction companies’ commodity exposures in real estate projects. Within the companies, there is a lack of knowledge on the extent of the commodity exposures as well as on what the exposures consist of, resulting in indecision in risk management activities.

*The purpose of this thesis is to investigate the construction companies’ interest in hedging their commodity risk with a financial index and if so, suggest an example of the index composition.*

Thus, the main objectives of this report are: 1) to define commodity risks in multi-residence projects 2) to create a financial index that can reduce the commodity risk for construction companies by hedging. The thesis will result in a general index of the exposures in multi-residence projects, applied to a theoretical case study of a fictitious project and its commodity risks. The case study will show what an exposure may look like and how it can be managed. In order to be able to analyze and draw conclusions of the purpose, the thesis is divided in four different parts, each answering a question:

1. How are market risks managed at construction companies?
2. Are commodity risks managed by the construction companies and if so, how?
3. How would a theoretical index, tailor-made for constructing multi-residences, be composed?
4. What is the outcome of applying the theoretical index on a fictional project?

2.2 Limitations
Firstly, the selection of a real estate project is a deliberate choice to narrow down the parameters of the index. Almost every construction project is unique in some way, challenging the procedures and processes of identifying risks. Construction of multi-residence projects has a range of similarities that will be to an advantage of the index in drawing generalized conclusions about a projects commodity exposure.

Secondly, the thesis only analyzes projects geographically located in Sweden. Projects carried out abroad introduce other risk factors such as different policy’s and regulations, which will not be the focus of this report.

Thirdly, the choice of an index as a financial tool may neither be the only nor the best way to manage commodity risks. Different tools have not been evaluated before the index was chosen. However it was selected because of its ability to manage complex risk scenarios where many risk exposures could be combined into one solution rather than being managed individually.

Fourth, this thesis will only focus on financial market risks although there are other financial risks such as liquidity and credit risk. Market risks are the most similar set of financial risks compared to commodity risks because they occur due to price changes in the market.
3 The link between the construction sector and financial instruments

In a way, the relationship between construction projects and financial instruments may seem farfetched. However, a merge between the two sectors can result in synergy effects such as lower risk exposure.

3.1 Challenges within the construction sector

Although the Swedish construction market consists of a large number of players, the competition is not as rough as might be expected. In reality the market is fragmentized with four companies dominating as the lead contractors. Companies with fifty employees or less, often denoted as sub-contractors with specific competences, represent 99% of the companies in the sector according to Gabrielsson & Lutz (2008). Construction projects include both large contractors and several smaller sub-contractors to succeed. In a perfect market, the client would choose the contractor with the lowest cost at an acceptable quality. Nonetheless, this is not always the case. The costs in the construction sector are not transparent because of the participation of several companies in one project. (Gabrielsson & Lutz, 2008)

Today, the production of multi-residence houses has decreased in Sweden because of the difficulty of getting profitability due to high production costs of construction. (SOU, 2000) Gabrielsson & Lutz (2008) states that 40% of the contractor costs are related to material costs of production. This is in line with Statistiska centralbyråns (2012) analysis, which shows that for a long time period, production costs have increased rather constantly. Figure 2 shows that especially material, transportation and electricity costs has increased rapidly over the past decades.

![Figure 2 Cost development of multi-residence housing, 1975-2012 (SCB, 2012)](image)

Thus, material cost has come to play an essential role in present day construction projects, indicating a need for risk management. Still, the annual review of the four largest construction companies shows an awareness of the risk of price changes in materials; however, none of the companies has a pro-active policy plan of commodity

Furthermore, material exposures are difficult to manage because of variations in the extent of the risk exposure throughout the construction projects lifetime. Construction projects time span varies from a year up to fifteen or twenty years depending on size, complexity and available resources. A projects steel exposure is therefore not constant during a project, thus it varies depending on the phase of the project.

3.2 Introducing the four major players

Sweden has a long tradition of boosting new construction companies. The four largest players in the Swedish construction market all originate from Sweden. Sveriges Byggindustrier (2011) ranks Skanska, NCC, Peab and JM as the four largest construction companies due to annual turnover and the number of employees. However there are thousands of smaller more specialized sub-contractors that are essential in order for the projects to be carried out. Thus, the larger companies are responsible for the total project while the smaller sub-contractors are responsible for their specific competence area. Consequently, the larger companies are in the end responsible for all the risks in a project including the commodity risk, which is why they are the most interesting participants for this thesis.

In the choice of participants for this thesis two factors of the companies were especially noteworthy. First, the choice of project type for the index should represent the companies largest revenue units in order for the index economically interesting. Secondly, also in relation to the revenue of the companies, a large part of it should correspond to a common market, in this case it was the Swedish market. In the next section the two factors are described for each company.

Three of the four companies, namely Skanska, NCC and Peab, all have different business units such as construction, infrastructure and so on. However, in each of these three companies, the construction unit is the largest source of revenue in the Swedish market. JM focuses specifically on construction projects (with a few exceptions), which is why most of their revenue in Sweden corresponds to construction projects. Table 1 describes the size of each companies construction unit in relation to the revenue of each company in the Swedish market.

<table>
<thead>
<tr>
<th>Company</th>
<th>The construction units part of total revenue in Sweden (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skanska</td>
<td>89%</td>
</tr>
<tr>
<td>NCC</td>
<td>40%</td>
</tr>
<tr>
<td>Peab</td>
<td>56%</td>
</tr>
<tr>
<td>JM</td>
<td>~ 80%</td>
</tr>
</tbody>
</table>

When it comes to graphical patterns, the companies differ quite a lot. Today, Skanska is a world-leading project development and construction company with business units all over the world, although most of their focus is in USA and Sweden.
Skanska, 2012, p.6) NCC on the other hand, is active in the Nordic countries, Germany, Estonia and S:t Petersburg, even though Sweden is still the largest market in relation to revenues. (NCC, 2008) Moreover, Peab are more nationally focused although they to have business units abroad. Peab has offices on 130 different locations in Sweden, Norway and Finland, while spread out over six different business units in Sweden, Norway, Finland, Denmark and Belgium (Peab, 2011, p.1-5) (JM, 2011, p.1)

3.3 Commodities way out of the shadows
Commodities are one of the oldest tradable products and it has been traded for more than 2000 years. (Gorton & Rouwenhorst, 2006) It started out as a supply and demand market where farmers, refiners and wholesalers' traded over the counter (OTC) on individually tailored spot or forward contract with physical delivery. Commodities such as metals, energy, grains, soy and livestock were commonly traded. Nowadays, commodities can be traded with derivatives on different exchanges. Maslakovic (2011) describes an exchange as a centrally regulated market where a large number of buyers and sellers come together to trade different commodities on standardized contracts. While farmers, refiners and wholesalers use exchanges to trade excess supply or demand as an insurance of revenue, there are also other types of players such as speculators that mainly trade on exchanges to earn profits. (Maslakovic, 2011)

Back in the beginning, the asset class of commodities was for a long time shunned by investors because of its low return compared to other financial instruments in combination with illiquid contracts and high trading costs due to storage and distribution expenses. (Stoll & Whaley, 2009, p. 5) When the dot-com bubble burst in the year of 2000, activity in the commodity markets increased at a rapid pace together with the proliferation of investment options. In addition, Gorton & Rouwenhorst (2005, p. 14-17) and Tang & Xiong (2011, p. 1-2) argue that returns from commodity investments are not correlated with the returns from more traditional assets. This means that an investment in commodities reduces the risk in investment portfolios by diversifying it.

The last decade since the dot-com bubble burst has resulted in a five-folded increase in exchanged-traded commodity futures and options. (Stoll & Whaley, 2009, p. 6) Drivers such as rising demand from China, India and Russia and increased frequency of natural disasters such as draughts, have led to continuous supply and/or demand deficits in selected commodities. As an example, oil and iron ore prices increased with 40%-150% between the years 2008-2010. (Maslakovic, 2011) The volatility of the commodity market has affected both buyers and sellers significantly in profitability.
4 Methodology
This chapter describes how the thesis purpose was fulfilled through different processes and methodical choices. The work is described in chronological order and methodological choices are motivated.

4.1 Going from A to Z
This report and master thesis was written in collaboration with Skandinaviska Enskilda Banken (SEB). The purpose of the thesis was derived and developed by the author and SEB representatives with the supervision of a mentor from Uppsala University. By defining the purpose early, a lot of other possible end results that would stem from other methodological choices were ignored. Benchmarking the use of financial indices between sectors or industries could for example have provided a guideline to why the construction industry should be a potential user. However, the choice was made by careful consideration to what SEB and the construction companies deemed most interesting and challenging. It was also made to focus the information gathering somewhat since it is a quite unknown subject.

Roughly, the thesis can be divided into four different phases. Initially, a pre-study was performed in order for the author to learn more about the industry. At the same time, construction companies responded to a questioning of the interest of participating in the study. Next, the study went deeper within the collaboration with the construction companies and data was gathered from several. The first phase was the most time consuming of them as it focused on creating a connection to the participating companies and objectively identifying their commodity exposure.

Phase number two was the development and construction of an index tailored to reflect a specific type of construction project’s commodity exposure. Thereafter, phase three resulted in the creation and composition of a fictional case study. Empirical data was used in both phase two and three together with follow-up interviews with representatives from the construction companies.

Finally, the author performed an analysis of the result from using the index on the fictional case. The analysis result was discussed and recommendations for the case study made, which will be a hint on what the construction companies can do to manage their commodity exposures.

4.2 Pre-study and information gathering
The choice of methodology to fulfill the purpose of a master thesis depends according to Noor (2008) on the nature of the research. In this report, the author is not familiar with the research area from before, resulting in a need of basic knowledge at the beginning of the thesis. Lekvall & Wahlbin (2001, p. 186) suggests that in the case of the author not being familiar with the research area at hand or if the author is not sure of what research questions to ask, one should use an explorative methodology. An explorative methodology focuses on gaining a fundamental knowledge and understanding of the problem at hand. (Noor, 2008)
With this in mind, the first phases focused on gathering data through a literature study and initial contacts with the construction companies.
As knowledge of the construction industry and financial risk management increased, potential respondents at the different companies were identified and contacted for interviews. Before the interviews, questions built on the thesis purpose, the research questions and theoretical concepts were created to steer the semi-structured interviews. All questions can be found in appendix 11.2-11.4. Over twenty interviews were conducted and the results were documented and compiled to use in the next phases.

### 4.3 Development of an index

In addition to the identification of companies to include in the study, the author also had to narrow down the scope to consist of one type of construction project in order to realistically be able to provide any substantial conclusions after the duration of the master thesis. Multi-residence housing projects were chosen because of its reliance on several different commodities such as steel, copper, aluminum, lumber, compared to road projects, which are mostly exposed to bitumen.¹ Thus, the index should represent the commodity exposure in a multi-residence housing project.

Statistiska centralbyrån (SCB) has since 1974 gathered price information regarding the construction of multi-residence houses. Incoming data from suppliers, subcontractors and wholesalers paints a picture of the price development over the recent decades through an index called *Totala faktorprisindexet*. The index is divided into cost sections such as built-in material, transportation, commissioner and payroll costs. Each section has a predefined set of factors affecting costs. Cost affecting factors have been determined twice since the index was first introduced to represent a multi-residence housing project in modern times. (SCB, 2012) Furthermore, the cost factors are divided into percentages of the total cost of every section.

The multi-residence index of this thesis was based on the cost percentages of built-in materials in the *totala faktorprisindexet*. Every cost percentage was divided into exposures towards tradable commodity futures with the help of two of SEB’s commodity experts. Appendix X shows the liquidity of the chosen commodity contracts. Some of the factors of in-built material in the *totala faktorprisindexet* could not be represented by a futures contract, which meant exclusion from the multi-residence index. Exclusions were only made when there were no tradable futures contracts or the fundamental commodity exposure cost was too small. Concrete for example, was excluded because its fundamental parts are water and sand, which cannot be traded on a commodity exchange.

Furthermore, the multi-residence index is based on spot prices to better represent the movements that affect commodities in today’s market.² Unfortunately some of the futures contract only dates back a few years, giving the multi-residence a history of four years in total, which is far from a sufficient sample to draw any general conclusions from. However, for this thesis it is deemed fit as an illustration of what it could look like.

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¹ Interview sessions with Pär Melander, 2012-08-01 to 2012-12-31.
² Ibid.
4.4 Construction of a fictional case

Data specifically regarding commodity exposures in multi-residence housing projects was gathered from the four different construction companies. Disappointingly, most of the data consisted of bits and pieces from different projects, not detailed data from several whole projects. Hence, the information is only enough to be combined into one case study. Yin (2009, p.8) recommends case studies as a research method when trying to answer questions such as how and why something happens. The case study methodology therefore suits the purpose and research questions of this thesis since the focus is to investigate how a financial index can decrease commodity risks and why the recommendations in this report should be of interest to the construction companies. Furthermore, case studies are also suitable when researching a present day phenomenon that is not well known, much like the area of interest of this report. (Yin, 2009, p.8)

Case studies are a qualitative approach in which interviews are of great importance according to Yin (2009, p.106). If a quantitative approach had been chosen instead, then the data would have lacked the necessary depth to be able to fulfill the reports purpose. A quantitative approach would have focused on gathering as much data as possible about the construction companies’ attitudes towards hedging or not hedging commodity risks, disregarding the reasoning behind the answer. It is therefore not a suitable method for this thesis. A similar qualitative method is the use of experiments instead of case studies. Experiments also answers the questions of how and why something happens although they need strict control in addition to possibilities of changing input variables and initial conditions. (Yin, 2009, p.8-9) Hence, it is impossible to control or change the input variable and conditions in a construction project lasting for years, for a student thesis.

Due to confidentiality agreements, the collected data has been complied into one fictional case. As in the construction of the multi-residence index, the commodity exposures in the fictive case were estimated with the help of SEB’s commodity experts. The result was plotted in an index to see how well it correlated with the multi-residence index. In regard to that correlation, a basket of commodities following the multi-residence index was created to illustrate how a hedge could look like and how effective it would be.

4.5 Selection of respondents

A qualitative study has been carried out to examine how construction companies commodity exposure look like. The study was performed partly by interviews of representatives from the construction sector and representatives from financial risk management with focus on commodity hedging. Combining the two different sectors of construction and finance is of fundamental value of this thesis.

4.5.1 Construction companies

The choice of construction companies to include in the study was based on which of the companies in the Swedish construction market, who most often has the full responsibility of delivering the project to the client, i.e. those companies will have the largest commodity exposures since they have a final budget to match against material costs no matter where in the project they occur. Thus, the four largest construction companies in Sweden were chosen due to their annual turnover and
number of employees. The resulting companies were contacted and all agreed to be included in this study, therefore the group of construction companies consist of Skanska, NCC, Peab and JM.

Since the topic of the thesis is commodity exposures in the construction industry, it is only natural to assume the need of interviews from the construction sector. However, the responsibility of commodity exposures is not as straightforward as the division of responsibilities of financial risk management at the construction companies. Therefore, several persons at different positions such as, financial treasury, purchasers and site managers, had to be interviewed at each company to map the knowledge and experience of commodities as well as risk management of market risks. The purpose of interviewing a wide spectrum of representatives was to come up with a diversified picture of financial risk management with focus on commodity risk management in the construction sector. Together, the respondents represent an extensive knowledge of the construction industry’s prerequisites and challenges.

4.5.2 Experts in commodities
Performing the thesis in collaboration with a bank provided the author with the opportunity to collaborate with specialists in financial risk management and interview experts within commodity trading and hedging. The collective data enabled the author to illustrate how commodity risks can be managed in a sufficient manner. In addition to the subjective representatives at the bank, an expert in commodity risk management was interviewed. The expert is working with different companies in a wide range of sectors to provided risk management advising regarding commodity exposure. Using a combination of experts has laid the foundation of what can be done within financial risk management.

4.6 Data collection
Primary data consisted of interviews of experts in commodity risk management in addition to several respondents on different positions in the four different construction companies. The interviews ranged between half an hour to one hour. If possible, the interview was performed in person, however, lack of time from the respondents resulted in most of the interviews carried out over the phone. Kvale & Brinkmann (2009, p.98) suggest that the quality of the interview result is dependent on the interviewers knowledge of the subject area, which in essence means the level of ability in asking relevant follow-up questions. Moreover, the interviews were semi-structured allowing for follow-up questions on new angles but also allowing the respondent to associate freely. (Trost, 2005, p.34) In addition to the primary data, secondary data has been gathered through research publications, books and webpages references to build a solid background regarding commodities in general and the construction industry as a whole, for the author as well as to provide a theoretical foundation for the thesis.

4.6.1 Choice of interview method
The goal of the qualitative approach was to gain a deeper understanding of the construction industry, construction projects, commodity exposures and how hedging can be used as a risk management tool. Different standpoints developed from the secondary data was tested and evaluated in the interviews.

Commodity exposures in the construction sector are not a well-researched area.
Thus, there was limited access to relevant literature such as research publications, books or internet references. Therefore, the thesis conclusions are based on an extensive qualitative study including over twenty interviews. Qualitative studies aim to understand complex questions on a deeper theoretical and practical level. Holme & Bernt (2006) identifies the advantage of qualitative interviews as the interview respondent controlling the outcome to a larger extent than the researcher himself. This method provides the possibility of investigating several cases with the opportunity to ask follow-up questions for clarification. In this thesis, semi-structured interviews were chosen as the preferred method to avoid missing out on important information due to too narrow questions. The set-up of the interview consisted of a set of open-answer questions as guidelines, enabling the respondent to elaborate on deeper knowledge or other insights. (Mariampolski, 2001, p.284)
5 The fundamentals of financial risk management
In order to identify and manage risks, one must be familiar with the definitions: risk, exposure and risk management. The following section lays the foundation of theoretical risk management.

5.1 Different approaches to the risk concept
Risk is always a factor in economic activity. (Liekweg and Weber, 2000, p.277) The risk aspect relates to the degree of uncertainty in everyday decisions being made in an organization. Napp (2011, p. 4) states that decisions with known boundaries have a probable outcome and therefore a low risk while decisions being made although factors such as lack of information exist, have a high risk of uncertain outcomes. The abundance of market imperfections often result in lack of knowledge of decision outcomes, which constantly introduces risk exposure to organizations.

Several types of risks exist in an organization and always have, although the globalization has increased the focus on financial risks. The constant access to information anywhere and at any time has lead to a sensitive and rapid market that continuously adapts and adjusts itself to new knowledge. (Horcher, 2005, p.1) An organization will be exposed to at least one but most often several business risks and systematic risks although this thesis will only focus on market risks. Market risks include interest rate risk, exchange rate risk, and commodity risk. All of these risks will be described in detail in the following sections.

There is an important distinction between risk and exposure that need to be emphasized. Horcher (2005, p.1) describes a risk as the probability of a loss and an exposure as the possibility of a loss. Adler and Dumas (1984) point out that an exposure in an organization is equal to what the organization has at risk, this might be revenue in a foreign currency, need to purchase commodities in a contango market or funding new projects in a recession. Hence, a risk outcome is not always negative, it can also be positive. Therefore, an organization might not always want to eliminate all the risks but they should want to identify, understand and manage them.

5.2 Definition and purpose of risk management
It is the volatility of the market that generates opportunities and risks. In order to be a successful organization in business, one must therefore take on significant risk in order to thrive economically. (Triantis, 2000, p. 594) Major risks can be taken but still managed in a controlled way by risk management in an organization. Triantis (2000, p.595) describes the opportunity to lower the probability for bankruptcy as well as increase debt capacity and maximum value of the organization, as other risks that could and should be managed by the organization.

Risk management is a formal and structured process that anticipates and plan for potential problems and opportunities in order to better control the outcome of an event. (Molenaar, 2011)
The process of risk management consists of five steps according to Molenaar (2011):
1) Identification of risks
2) Assessment and analysis of risks
3) Mitigation and planning of risks
4) Allocation of risks
5) Monitor and control of risks.

In the 1960’s, risk management only concerned systematic risks. This approach was based on Mogdigliani and Millers theory that states: “In a perfect market, financial decisions will not influence the firm value and therefore there is no need to manage unsystematic risks” (Oosterhof, 2001, p.2). Mogdigliani and Miller (1958, p.265) claimed that the market only priced systematic risks but this approach was based on investor's ability to constantly diversify their portfolio according to their risk preference. Oosterhof (2001, p.2) on the other hand, had a contrarious view. According to him, the market consists of imperfections resulting in obstacles for investors, which means that all investors might not have the opportunity to diversify their portfolio in an efficient and satisfactory way. Furthermore, in a perfect market, transactions costs and taxes are ignored together with costs of defaulting, bankruptcy or other types of financial distress. (Triantis, 2005, p. 560) Oosterhof view is widely accepted today where both systematic and unsystematic risks are taken into account in the risk management process.

5.3 Risk management in theory
The following section will go through the steps of risk management theory.

5.3.1 The process
The definition of risk management and its steps might differ depending on the author of choice, but the content is the same. (Herman, 1996, p.40) However, before the process of risk management can be started a few things need to be sorted out. Firstly, in order to be able to structure and implement a risk management plan, one must know the organization's goal and expectations with the process. (Liekweg and Weber, 2000, p.280) Secondly, the level of risk taking of the organization needs to be defined. Is the organization risk-taking, risk adverse or somewhere in-between? (Liekweg and Weber, 2000, p.283) The organization must decompose its risk exposures in order to be able to identify all the individual risks. (Triantis, 2000, p.605) Lastly, Wesel (2010, p. 292) emphasizes the importance of classifying different types of risk. What level of risk is classified as an essential risk compared to a risk that is only problematic? Furthermore, the organization must decide how it will address the different risks: financially, contractual agreements or in an alternative way. In figure 3, the process of risk management is shown. Next, the different steps in the risk management process will be defined.
5.3.2 Risk identification
The first step in the theory of risk management is the identification of risks. Risk identification is the identification, categorization and documentation of a comprehensive, non-overlapping set of risks. (Molenaar, 2011) Herman (1996, p.41) states that the identification step is of great importance and all risks that an organization can be exposed to must be documented. Wesel (2010, p.288) focuses on the risks that have a negative impact on an organization's balance sheet, income statement or the cash flow.

Herman (1996, p. 41) identifies two approaches to identification of risks: the progressive and the regressive approach. The progressive approach is based on identification of specific risk factors such as market changes, legal and financial factors. Every factor is scrutinized for exposures and different type of risks. The regressive approach on the other hand, emanates from the goals of the organization and what risks can lead to unfulfilled goals.

It is essential that all the list of risks is comprehensive because the future steps of the risk management process will only assess and analyze the documented risks.

5.3.3 Risk assessment and analysis
It can be difficult to separate the identification, assessment and analysis of risks, however, the latter two focuses on defining the risk and its consequences. (Herman, 1996, p.42) Molenaar (2011) describes risk assessment as the process of adequately describing and assessing the severity of the risks in terms of their probability of occurrence and magnitude of impact. Liekweg and Weber (2000, p.285) define this step as the phase where the probability and impact of a risk on an organization is assessed. In order to proceed however, a categorization of risk must be made to prevent risks from overlapping with each other.

The analysis part of this step is often very difficult. It demands a quantification of every risk identified in the previous step. Quantitative measures such as statistical programs and computer simulations give calculations and a prognosis on the probability and impact of a risk. This approach demands a volume of data, which
might not always be available or even possible for gathering. Qualitative measures are more subjective; it involves expert's statements regarding probability of a risk or impact. Many risks cannot be measured statistically and therefore, one must frequently rely on both quantitative and qualitative estimations in the analysis results. (Liekweg and Weber, 2000, p.286) Lastly, the impact of a single risk is compared to the tolerated risk level that was decided before the risk management process began. If the impact of the risk exceeds the preferred risk level, the risk will continue into the next step of the risk management process. (Wesel, 2010, p.295)

5.3.4 Risk mitigation and planning
Depending on how the organization’s risk-taking strategy looks like, there are different plans of action. There are five different strategies for risk-taking; risk avoidance, risk prevention, risk reduction, transfer of risk and acceptance of risk. (Herman, 1996, p.45)

Risk avoidance is seldom a strategy that can be used on its own. It states that any risk should be avoidable if possible; this means that the organization cannot take any decisions where the outcome is uncertain leading to a strangled business situation. (Liekweg and Weber, 2000, p.506-507) Prevention of risk is one of the main focuses in risk management strategy. By identifying risks at an early stage, they can be properly mitigated and classified as low risks instead. Sometimes, however, it is not possible to mitigate the whole risk impact, only to reduce it. The reduction can be measured in different ways, for example as a minimization of a financial impact. (Liekweg and Weber, 2000, p.506-507) A common strategy nowadays, especially in complex projects with many under-entrepreneurs, is to transfer the risk to a third party that can handle the risk in a better way. According to Triantis (2000, p.597), the risk should be transferred to the party that has the best way to control it, even if that party is less able to bear the risk. Large infrastructure projects are an example of transfer of risks. Technical risk and cost overruns are transferred to the construction companies since they are the most appropriate risk controllers. The risk is transferred by contractual agreements or insurance agreements. (Liekweg and Weber, 2000, p.285) Lastly, risk acceptance is used when the probability of the risk and the impact of the risk are not of great concern or where there are no resources for risk management. Many organizations are also forced to accept some of the risks since it is seldom possible to mitigate all of the risks in a project. In addition, organizations want to be exposed to some risks. (Henschel, 2010, p.267)

Usually, organizations’ choose a risk strategy with a mixture of the different positions. Furthermore, joint ventures is another way of handling risks and costs, that has become more common during the last decade, especially in large projects with substantial technical risks. A joint venture implies shared risks and investments between parties. (Triantis, 2000, p.599) The most common aim on risk-taking is for an organization to be able to keep the opportunities and minimize the potential losses. (Herman, 1996, p. 45)

5.3.5 Risk allocation
The responsibility of the risks are decided and distributed in this step of the risk management process. Some organizations have a financial treasury that manages all the market risks while other organizations handle risks on each business unit/department/project and so on. (Liekweg and Weber, 2000, p.506-507) (Molenaar, 2011)
5.3.6 Risk monitor and control
The final step of the risk management process is risk monitoring and control. Herman (1996, p.48) describes this step as the point where all the earlier steps are evaluated as either successful or not. Liekweg and Weber (2000, p.507) describe it as the analysis of actual changes between chance, risk and earning. The risk situation is compared to the risk strategy and aberrations are documented. If a potential or actual risk deviates from its position in the financial policy, it can be caught at an early stage, leading to new measures evaluations. The appearance of a new risk leads to a new risk management process. The process is therefore iterative. (Herman, 1996, p.48)

5.4 Risk categories
Depending on what type of sector an organization belongs to, different types of risks are emphasized. Financial organizations often focus on the financial risks although they also have operational risks as well. Non-financial organizations are more likely to disregard the financial risks since there might not be sufficient knowledge about them. (Napp, 2011, p.4) In the next section financial risks will be described.

5.4.1 Market risks
In order to understand what potential risks an organization may be exposed to, it is essential to identify which factors that have an impact on financial rates and prices.

The following risks relates to changes in the financial market.

- Interest rate risk affects most organizations in some way.
- Exchange rate risk affects organizations that have an exposure of some sort abroad, for example via imports or exports or subsidiaries.
- Commodity risk affect organizations dependent on some sort of materials. The risk can be direct or indirect.

5.4.1.1 Interest rates
The interest rate is often used as an economic indicator of the general macroeconomic condition since it is an essential factor in many market prices. It reflects the market situation for funding and credit risk. Futures prices of the USD/EUR for example, are determined by the spot price combined with the difference between the future interest rates in Europe and USA. Horcher (2005, p.8) describes that the interest rate is determined by a real rate paired with a component for expected inflation. Inflation is a key component since the longer time to maturity, the greater uncertainty of the inflation level and thereby the purchasing power of the lender’s assets. (Horcher, 2005, p.8)

5.4.1.2 Reinvestment risk
Mismatches between assets and liabilities paired with unexpected changes in the interest market, result in an interest rate risk. (Söderlind, 2001) (Triantis, 2000, p.594) Saunders and Cornett (2011) define interest rate risk as an organizations failure to match maturities of assets to their liabilities. The mismatch can lead to a reinvestment risk of an organizations profit if the maturities of its assets exceed the maturity of the liabilities. (Saunders and Cornett, 2011)
The interest rates movements are of great importance for companies and organizations when they finance new projects and expansions through debt. Longer debt financing always exposes the lender to reinvestment risk.

5.4.1.3 Yield curve risk
Yield curve risk is related to the expectations of the future interest rate level that can be graphically viewed in the shape of the yield curve and how it changes. The yield curve consists of the interest rate level and the time to maturity. In figure 4, the short-term interest rate is lower than the long-term interest rate resulting in a positive slope, which means that lenders will demand a higher interest rate for long-term borrowing. positive yield curve is considered as the "normal" yield curve.

![Positive yield curve](image)

Figure 4 Positive yield curve

Default risk and uncertainty of future interest rate pushes the interest rate higher in the long-term lending. Sometimes the short-term interest rate is higher than the long-term interest rate resulting in a downward-sloping curve. This situation indicates a future expectation decreasing or stable interest rates. If the short-term interest rate is equal to the long-term interest rate, the slope will be flat. (Horcher, 2005, p.9-10)

5.4.1.4 Basis risk
As the futures contract draws closer to its maturity date, Hull (2006, p. 26) argues that in a normal market the futures price will converge towards the spot price of the underlying asset. It is the difference between the spot price and the futures price that is called the basis. Basis risk also occurs if there is a mismatch between a hedge and the underlying asset. If the hedge does not follow the movements of the underlying asset than it will expose the hedger to a risk of loss from market movements. (Horcher, 2005, p.29) In every transaction there will be a basis risk which means that we do not know if the spot price and the futures price will converge. If they do not converge we have a situation where anybody could profit with an easy arbitrage.

5.4.1.5 Exchange rate risk
Exchange rate risk occurs in a company that has cash in- and outflows in different currencies. Changes in the exchange rate can lead to uncertainties in the organization’s amount of payable and receivables. Therefore, movements of an
exchange rate introduce the possibility of an indirect or direct loss in an organizations cash flow, assets and liabilities and/or net profit. (Papaioannou, 2006, p.4)

5.4.1.5.1 Transaction exposure
Transaction exposure arises from the commercial flows of daily trading activities in organizations or from foreign currency dealing. Papaioannou (2006, p.4) describes the transaction risk as the cash flow risk that result from exchange rate fluctuations. When the exchange rate moves up or down on a transactional account, it creates an exposure related to receivables, payables or repatriation of dividends. In short, the transaction exposure affects organizations profitability through the income statement. (Horcher, 2005, p.29)

5.4.1.5.2 Translation exposure
Translation exposure stems from the organizations asset and liability infrastructure, both on- and off-balance sheet. (Bank of Jamaica, 2005) The translation risk emerges when the asset, liabilities and/or profits is converted from the operating currency to the reporting currency. Foreign currency debt can be especially costly according to Horcher (2005, p.30), if an organization borrows in a foreign currency but has no offsetting currency assets or cash flows in that currency. Translation exposure also relates to the exchange rate risk that results from translating a foreign subsidiary’s value to its parent company’s balance sheet. Exchange rate moves changes the valuation of the foreign subsidiary. This in turn will have an effect on an organizations balance sheet. (Papaioannou, 2006, p.4)

5.4.1.5.3 Strategic exposure
Depending on where the organizations competitors are located and what type of activities they preform, the organization might have or not have a competitive disadvantage. A strong Swedish krona (SEK) might be devastating for a Swedish organization whose revenue largely depends on exported goods and services. The strong SEK makes their products more expensive to their customers compared to their competitor’s prices, if the competitors are located in a country with a weaker currency. It might also be a competitive advantage if the situation is reversed with a weak SEK. (Horcher, 2005, p.33)

One major threshold for constructions companies is that hedging might not be the norm of the whole sector. If companies within the same sector have different approaches to hedging then the profit margins will be affected according to Hull (2006, p. 50-51). Hedging strategies aim to stabilize the profit margin of a company but if some companies in the sector let the profit margin fluctuate then the implementation of a new hedging strategy might result in a negative profit margin compared to the competitors.

5.4.1.6 Commodity risk
The majority of the commodities traded on the market are priced in US dollars (USD). The result is that all the commodity traders that do not have USD as their domestic currency are exposed to exchange rate risk. Commodities can be priced in other currencies as well which will in turn also create an exchange rate risk. (Horcher, 2005, p.31)

In many ways, commodity risk differs from the other market risks. For starters, commodities can be traded both by players in need of a commodity and from a speculation point of view, where the player bets on a price increase/decrease. The
physical traders need the commodity for production while the speculator never want that actual delivery, he just want to sell the commodity when demand is high and therefore that prices and profit is too. (Horcher, 2005, p.39)

5.4.1.6.1 Commodity prices
Commodity prices are very volatile which mean that fluctuations of over 30% are not uncommon. (Akey, 2005, p.4-5) The commodity market is in essence a demand and supply market where prices adjust thereafter. If a draught destroys part of America’s corn harvest for that year, prices will rise quickly. The price impact will affect the whole supply chain of the commodity, from the producer to the end-customer. (Horcher, 2005, p.35)

5.4.1.6.2 Contango and Backwardation
The commodity market of every commodity is in either contango or backwardation. In order to understand what contango and backwardations is, one must understand the importance of the futures curve for hedgers and speculators. Prices in a futures contract are settled depending on factors such as demand and supply expectations of the market, geographical storage facilities, delivery methods and state of production techniques and machinery.

In the contango market the commodity has a higher price in the future contract than the spot price of today, indicating that it will most likely be more expensive to buy in the future. For example, if the price of gold is expected to increase in the future then the spot price will be lower than the futures price. Contrary, a market in backwardation has a lower price of the commodity in the future compared to today’s spot price. The commodity will therefore be cheaper to buy in the future. (Dow Jones, UBS, 2012, p. 8) Figure 5 illustrates both contango and backwardation curves.

![Contango and Backwardation](image)

Figure 5 Contango and Backwardation in Commodities

Being able to identify that type of market is of great importance for an organization that is depending on a delivery of a commodity in the future. (Horcher, 2005, p.39) Some commodities such as gold are in an almost constant contango market while other commodities are in constant backwardation. The important note for the investor is to never forget that the market can switch from contango to backwardation at any time and vice versa. Thus, imposing a cost of rolling a futures contract forward if the market is in contango and a profit if the market is in backwardation. (Guyer, 2012)
5.4.2 The derivative approach
There are several different ways of using derivative instruments to minimize, also called hedge, financial risks. Hull (2006, p. 1) defines a derivative instrument as a financial instrument whose value depends on the value of a more fundamental underlying asset.

5.4.2.1 Hedging
Hedging present companies with an opportunity to create insurance for future in- and outflows. (Gorton & Rouwnhorst, 2006) Many companies have a main focus in another sector than the financial one. In fact, according to Hull (2006, p. 50), a lot of companies have little knowledge, skill or expertise in predicting variables such as interest rates, commodity price volatility and so on. Therefore companies should manage risks by hedging as soon as they arise.

Moreover, Hull (2006, p.8-15) differentiates between three different types of traders: hedgers, speculators and arbitrageurs. Hedgers reduce a company’s risks by locking an asset to a specific price through forward contracts and options. Speculators, unlike hedgers want to take advantage of adverse movements in the price of an asset by taking a position in the market. The last type of trader is arbitrageur. This type of trader tries to lock in a riskless profit by entering into several transactions at the same time. (Hull, 2006, p.8-15)

Additionally, there are three types of hedging costs; spreads, contango/backwardation and cash collateral costs. Costs related to the spread are depending on the spreads of the specific asset. If the asset has a high liquidity then the spread will be small. However, if the asset has a low liquidity then the spread can vary a lot causing larger costs of hedging. When it comes to hedging commodities, there will always be a cost or profit depending on whether the futures are rolled into a contango or backwardation market. The cost/profit is included in the price of the hedge. Cash collateral is the third cost of a hedge and it represents an opportunity cost of investing in a hedge instead of investing in something that would be more profitable.3

Usually the exposure is much larger than the cost of the actual hedge. Hence, one can hedge 0-100% of the exposed amount. Depending on the company and project, generally exposures are hedged between 70-90%. 4

5.4.2.1.1 Forwards
The contractual agreement in a forward contract gives the buyer/seller the right to buy/sell an asset at a certain time in the future for a beforehand decided price. It is a tailor-made financial contract otherwise called over-the-counter contract that infers no cost of entry. Hull (2006, p. 3-4)

5.4.2.1.2 Futures
Another simple derivative is the futures contract. This type of contract is the most commonly known since it is printed daily newspapers. Similarly to the forward contract, the futures contract binds the buyer/seller to at a certain time in the future sell/buy an asset at a specific date and to a certain price. The difference between

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3 Interview sessions with Pär Melander, 2012-08-01 to 2012-12-31.
4 Ibid.
forward and futures contracts is that futures contracts are standardized, which means that they cannot be tailored after the buyer or sellers needs. Hull (2006, p. 6)

5.4.2.1.3 Options
Options are a slightly more complex derivative. It can be traded over the counter or on exchanges. The derivative provides the buyer or seller the opportunity to buy or sell an asset at a future date, to a certain price. There are two fundamental types of options: a call option and a put option. The call option gives the holder the right to buy the underlying asset at a certain date to a specified price while the put option gives the owner the right to sell an underlying asset at a certain date to a specified price. Unlike the forward and the futures contract, the transaction does not have to be preformed. The buyer/seller can choose to not exercise his/her right. However, the forward and futures contracts are free of charge for entering while options incur a premium. (Hull, 2006, p. 6-7)

5.4.2.1.4 Swaps
Swaps are a similar derivative to the futures and forwards contracts. Hull (2006, p. 149) describes it as a contractual agreement between two parties two exchange cash flows in the future. The exchange is preformed because two parties want to take advantages of the other party’s benefits by swapping them. Benefits could for example be a swap from a fixed interest rate to a floating or vice versa. The contract specifies the terms such as date and how the cash flows should be calculated. Calculations of the cash flows are often based on a future value of a market variable such as an exchange rate or interest rate. (Hull, 2006, p. 149)

5.5 Minimizing price fluctuations with a financial commodity index
Stronger demand for specific commodity exposures has lead to an expansion of indices to invest in. The advantage of using indices is the possibility to individually tailor a mixture of exposures or provide a more general exposure to the commodity market. One often-used strategy today is investing in a basket of commodities following a specific commodity index. Futures are made on the selected commodities in the basket according to the weighting in the chosen index. The more similar the exposure is to the index, the better proxy hedge can be created. In addition, by investing in a basket of commodities that follows an index with the same or very similar exposure as the company itself, the financial risk of price changes can be eliminated. Theoretically, the index balances out the exposures within the company. For example, a construction company is exposed to a lot of different commodities due to material purchases, resulting in sensitivity towards price changes in every individual commodity. If a commodities price increases, the company loses profitability and vice versa. In order to eliminate the financial risk of price changes, the company can invest in a basket of commodities that follows an index specifically tailored to the exposures in a specific construction project. Thus, if one commodity’s price increases, costs will incur in the project budget within the company while the value of the index increases with the same value as the cost. In essence, it is a zero-sum game.

Interview sessions with Pär Melander, 2012-08-01 to 2012-12-31.
Tang & Xiong (2011) recognize that indices differ in terms of composition, selection criteria of commodity futures, assigned weights, roll mechanism and rebalancing strategy. Most indices track commodity spot or futures prices in order to perform futures on the index. Nearby contracts are chosen for the futures, with a time to maturity longer than a month to avoid physical delivery. (Tan & Xiong, 2011) If the exposure lasts for a longer time, futures needs to be rolled forward to maintain the companies exposure when the original contract is due. Replacing futures contracts of commodities with new ones with a maturity date further away, impose a financial risk of rolling into a market that has switched from backwardation to contango or vice versa. Thus, the result can be a cost or a profit of switching contracts.

5.5.1 Managing a group of projects

Commodities are the main focus of this thesis, which implies a risk management focus on one asset class. Therefore it is of great importance to understand how diversification can spread risks and thereby minimize risks within one asset by diversification, or by not:

“…putting all your eggs in one basket”

Managing an asset introduces the risk of unwanted correlations between the different components of the portfolio. A well-diversified portfolio does not consist of high correlations between the components because of the effect that external factors such as supply and demand of certain commodities could have on the portfolios value. Thus, a low correlation factor between the different components in the portfolio will minimize the effect of them. (Strukturinvest, 2012) Covariance on the other hand, illustrates how much two variables are related to each other in their movement patterns. (Freund E. J & Perles M. B, 2009) Statistically speaking, risks are often a synonym to volatility and its return, which can be measured through variance or standard deviation.

Portfolio risks cannot simply be denoted to the weighted average of the individual risks of each component. Instead, all risks must be assessed and any relationships between the different components must be identified and analyzed. A useful tool is the covariance matrix which computed, describes the risk attributes of the portfolio over a chosen time period. (Ceverin & Daboczi, 2011) Depending on which input data that is used, different results will occur. Therefore, the total portfolio risk can be calculated and minimized by using variations of the three input data that is needed for a creating a covariance matrix:

1. Expected return
2. Variances
3. Covariance’s

Most often it is not only one project but several project’s risks that should be managed. An alternative way of managing commodity exposures can therefore be to manage several actively running projects side by side in a portfolio. Thus, the overall commodity exposure can be managed. Figure 6 illustrates a hedging example where a rolling hedge structure of all projects included in the portfolio are of similar composition regarding their commodity exposure towards steel, aluminum, lumber, plastic and bitumen.

6 Bodie et al 2005
Figure 6 Rolling hedge structure - assuming a portfolio of 18m running projects, evenly spread

At every point in time, the portfolios commodity exposure will be similar to the exposures to the Steel/Aluminum, Lumber and Plastic/Bitumen/Steel intensive periods in each project. All projects have the same duration although their start and end period differ. In this case, where the projects are of the same duration and composition, the overall commodity exposure will remain the same for the duration of the portfolio. Hence, the exposure could be hedged using a tailor-made index.

In example two, figure 7, the portfolio has a number of projects running side by side of different duration with different start and end periods. This situation is more complex, even though the projects are similar in composition, the overall commodity exposure will not remain the same for the duration of the project portfolio as the timing of the projects becomes very important. Consequently, an index hedge may be used as a base exposure hedge of approximately 50%, although further fine-tuning is required with futures or single commodity swaps. For each point in time, the portfolios commodity exposure will be different.

Figure 7 Rolling hedge structure - assuming a portfolio of 18m different length projects, unevenly spread
Addition of an extra project will incur additional exposure somewhere in the project portfolio, thus increasing the marginal commodity exposure at that point for the entire portfolio. By adding an extra unit of hedge, most of the risk will be offset but not totally eliminated. As new projects are added, the drawbacks of the hedge approximation diminish.

5.6 An illustration of how to minimize price fluctuations with a financial commodity index

Figure 8 illustrates how a construction company provides each individual project with a budget and thereafter receives a profit or a loss (+/- $) when the project is finished.

Figure 8 Managing several projects budgets

If the project is going well and no unexpected costs arise, then it will result in a profit according to the budget. However, every projects budget consist of different costs, some of them are illustrated in figure 9. Any cost increases, such as an increase of the steel price during the projects time horizon, in the material cost budget can result in loss of profitability in the total project.
Figure 9 Affecting one project’s budget

If the company invests in a financial index, then every time the material prices go up, the index value will increase while the material cost will increase creating a gap in the budget. Figure 10 describes how the index increases in value when commodity prices go up.

Figure 10 Index value increases with commodity prices

It is the balancing effect of the budget versus the index that maintains the profitability of the project with regard to material costs.
6 Four companies’ exposures and management directives

It is very difficult to keep track of the effects of financial risks and especially commodity exposures in the construction sector due to complex organizations and the diversity of projects. Most often, there is no comprehensive list of commodity exposures that exist in every construction project. However, there could be a common foundation of commodity exposures for a certain type of construction projects. Therefore, it should be possible to identify the largest commodity exposures that material purchases in construction projects give rise to. The process of identifying material exposures in a specific type of construction project, namely a multi-residence housing project, at each of the four construction companies, together with gathered data on risk management of financial risks has resulted in the information described in the next sections.

6.1 Risk management responsibilities

Division of risk management responsibilities seems to be quite similar in most of the four dominating construction companies. Figure 11 illustrate the hierarchical chain of command.

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7 Interview with Peter Hamilton, 2012-10-22.
8 Interview sessions with Pär Melander, 2012-08-01 to 2012-12-31.
directors. Skanska, NCC and Peab are all to a large extent decentralized organizations. However, the centralization of the treasury department enables a control of the organizations financial risk exposures resulting in higher cost-effectiveness, economies of scale and capacity building. JM on the other hand, is a somewhat more centralized organization where all decisions regarding financial risks are taken at headquarters.\(^9\) The treasury department manages market risks by hedging according to the financial policy. Treasury is also responsible for evaluating other financial risks such as credit risk, cash flows, customers and joint ventures partners. Moreover, at Skanska (2011, p.18) the department is also involved in the continuous re-evaluation of risks in every long-term project that Skanska has taken on.

The responsibility of hedging market exposures is strongly decentralized to the individual projects at Skanska, NCC and Peab.\(^10\)\(^11\)\(^12\) At JM, it is up to the treasury department to hedge market risks, although these risks are often managed by other means than derivatives.\(^13\)

Moreover, there is a centralized purchasing department in figure 9, which is responsible for larger purchases and development of standardized contract frameworks. At JM, this department is described as the decision point of all material costs. Because of JM's standardized projects, all economic decisions regarding individual projects are taken at purchasing or treasury department.\(^14\)

Furthermore, in figure 9, the different business units are shown with individual purchasers and site managers for each project beneath them. Neither site managers nor purchasers are responsible for detecting commodity risks in individual projects at Peab.\(^15\)\(^16\) At NCC it is the site manager's responsibility to identify commodity risks in the projects. However, the process of identification and knowledge of commodity risks is far from sufficient.\(^17\)\(^18\)

As a result, market risks are generally taken care of at the treasury department while commodity risk identification and management is related to a more vague responsibility division. The treasury department is the only department that has the necessary tools and authority to manage commodity risks but today's situation in the companies testifies of knowledge gaps regarding commodity risk identification in decentralized organizations.

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\(^9\) Interview with Sören Bergström, 2012-08-03.
\(^10\) Interview with Olle Strandsäter, 2012-11-02.
\(^11\) Interview with Anneli Bedman, 2012-08-13.
\(^12\) Interview with Mikael Johansson, 2012-08-01.
\(^13\) Interview with Marcus Lund, 2012-08-24.
\(^14\) Ibid.
\(^15\) Interview with Klas Ulen, 2012-10-31.
\(^16\) Interview with Hans Svedman, 2012-09-13.
\(^17\) Interview with Tomas Mejbert, 2012-10-08.
\(^18\) Interview with Mattias Söderberg, 2012-10-30.
6.2 Market risk

6.2.1 Skanska
The annual report states that Skanska is exposed to a variety of risks, wherein market risks are represented as interest rate and exchange rate risks. The financial risks originate from the company’s documented financial instruments; cash flows, interest-bearing receivables, accounts receivables, accounts payable, interest bearing debts costs and derivatives. (Skanska, 2011, p.121)

6.2.1.1 Interest rate
Skanska has introduced an upper limit to the interest rate exposure of 100 MSEK wherein the interest-bearing assets and liquidities and derivatives are included. According to Skanska’s (2011, p. 18) annual report, current interest-bearing assets exceed the interest-bearing liabilities, which imply that Skanska would be negatively affected by a lowering of the interest rate level. In summary, a one-percentage increase in the interest rate level of financial receivables, payables and derivatives would result in a change of 44 MSEK. (Skanska, 2011, p. 122) Table 2 illustrates Skanska’s interest rate exposures.

Table 2 Skanska interest rate exposures excluding the pension debt

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Average fixed interest rate maturity</th>
<th>Fixed interest rate</th>
<th>Percentage fixed interest rate</th>
<th>Percentage floating interest rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest-bearing assets</td>
<td>13.5 billion kronor</td>
<td>0.3 years</td>
<td>1.22%</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>Interest-bearing liabilities</td>
<td>6.8 billion kronor</td>
<td>0.5 years</td>
<td>3.02%</td>
<td>34%</td>
<td>66%</td>
</tr>
</tbody>
</table>

As a result, the company has decided to divide the current interest-bearing asset and liabilities into a mixture of fixed and floating interest rates. Taking advantage of increases in the interest rates as well has decreasing the cost of a decreasing interest rates. In addition, the financial policy defines guidelines concerning the time to maturity of fixed interest rates to benefit from the market movements in a risk appropriate manner. (Skanska, 2012, p.122)

6.2.1.2 Exchange rate
The annual report includes sensitivity analyses of the effect of a change in SEK against other currencies as well as the effect of a change in USD against SEK. Table 3 illustrates the sensitivity analysis.
Table 3 Sensitivity analysis of a change in SEK against other currencies and a change of USD against SEK (Skanska, 2011, p.18)

<table>
<thead>
<tr>
<th>Billions (SEK)</th>
<th>Percentage USD +/- 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td>+/- 9.1</td>
</tr>
<tr>
<td>Operating result</td>
<td>+/- 0.2</td>
</tr>
<tr>
<td>Equity</td>
<td>+/- 1.4</td>
</tr>
</tbody>
</table>

As can be seen in table 3, Skanska’s revenue is sensitive towards exchange rates, especially SEK towards other currencies than USD. Therefore, the financial policy includes a maximum exchange rate exposure that is 50 MSEK. According to the annual report, the current exposure is 16 MSEK. (Skanska, 2011, p.122)

Skanska divides the exchange rate exposure into transaction exposure and translation exposure. Transaction costs are limited at Skanska because the company has a global presence and is therefore able to match revenues and losses in a project in the same currency. If this is not the case, then it is up to the relevant business unit to hedge the exposure using futures contracts. Skanska uses hedge accounting in their polish organization. The hedge accounting is focused on countries whose currency is mainly euro but other currencies are also hedged. Projects of a commercial or infrastructure nature are always fully hedged because the finished assets will be sold over the projects lifetime. In addition all budgeted financial flows are fully hedged to minimize the risk of losses denoted to transaction exposures. (Skanska, 2011, p. 123)

Skanska’s global presence can be viewed in table 4, which illustrates the company’s translation exposure.

Table 4 Skanska’s hedged net investments in foreign countries

<table>
<thead>
<tr>
<th>Currency</th>
<th>2011 Net investment</th>
<th>Hedge value</th>
<th>Hedged percentage</th>
<th>2010 Net investment</th>
<th>Hedge value</th>
<th>Hedged percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>USD</td>
<td>4945</td>
<td>1407</td>
<td>28%</td>
<td>4434</td>
<td>1369</td>
<td>31%</td>
</tr>
<tr>
<td>EUR</td>
<td>4102</td>
<td>1757</td>
<td>43%</td>
<td>3996</td>
<td>1477</td>
<td>37%</td>
</tr>
<tr>
<td>CZK</td>
<td>2884</td>
<td>840</td>
<td>29%</td>
<td>3101</td>
<td>788</td>
<td>25%</td>
</tr>
<tr>
<td>NOK</td>
<td>3352</td>
<td>870</td>
<td>26%</td>
<td>3483</td>
<td>1111</td>
<td>32%</td>
</tr>
<tr>
<td>PLN</td>
<td>2170</td>
<td>479</td>
<td>22%</td>
<td>2024</td>
<td>430</td>
<td>21%</td>
</tr>
<tr>
<td>CLP</td>
<td>193</td>
<td>155</td>
<td>80%</td>
<td>1359</td>
<td>1067</td>
<td>79%</td>
</tr>
<tr>
<td>BRL</td>
<td>554</td>
<td>0</td>
<td>0</td>
<td>578</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>GBP</td>
<td>175</td>
<td>74</td>
<td>42%</td>
<td>628</td>
<td>71</td>
<td>11%</td>
</tr>
<tr>
<td>Other</td>
<td>890</td>
<td>0</td>
<td>0</td>
<td>984</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sum</td>
<td>19365</td>
<td>5582</td>
<td>29%</td>
<td>20587</td>
<td>6313</td>
<td>31%</td>
</tr>
</tbody>
</table>

Table 4 shows that Skanska’s currency exposures that arise through translation of the organizations subsidiaries budgets, are only partially hedged. (Skanska, 2011, p. 18)
6.2.1.3 Commodity

Skanska’s exposure of material costs in construction projects can be estimated to 80% of the total cost.\(^{19}\) However, the estimation includes sub-contractors. Its essentially lumber, steel, reinforcement and concrete products whose price changes can potentially reduce profitability in a project. In addition, the total steel cost in a multi-residence housing project can be estimated to be 2-3 % of the total cost depending on the type of frame etc.\(^{20}\)

“Commodity exposures at Skanska’s projects are extensive which is why the company tries to overlay the risk towards their suppliers, using indices to regulate cost variations during the projects lifespan. Skanska’s customers and clients are often very price sensitive preventing a risk-overlay on them.”\(^{21}\)

Hedges have been made on bitumen and some oil products.\(^{22}\) However, the volume of hedges is still small and they are performed on individual projects, thus not in a centralized manner. The site manager of every project needs to first identify a commodity exposure, and then request assistance from the treasury department in order for them to analyze and manage the commodity exposure.

At Skanska there is an awareness of commodity exposures. However, the extent of the exposures is not defined today.\(^{23}\) In addition, the financial policy does not comprehend the commodity risk, which results in no distinct risk management method. A reorganization of the company with a centralized purchasing function would be necessary to be able to support a commodity risk policy and this scenario is not likely to happen today or in the near future.

Instead of using financial risk management tools, Skanska uses standardized framework contracts and indices with their suppliers to minimize losses due to commodity price volatility. There is also an emphasis on the importance of purchases early on in a project, preferably as soon as the deal is done, to ensure that the budgeted cost and the actual cost of a material product is consistent.\(^{24}\) However, one opinion of one site manager is that commodity risk does not provide any significant cost impact except in time of crisis or in large projects such as Karolinska Institutet in Stockholm. Nevertheless, Skanska acknowledges the risk of price changes in materials during the time a bid was handed over to a client to the time where the project is fully defined and initial purchases can be made.\(^{25,26}\)

Moreover, Skanska has a large centralized purchasing department called Nordiska Inköpsorganisationen, which purchases volumes of commodities to fulfill projects needs. Unfortunately, these commodity volumes are not hedged today. Although the Nordiska Inköpsorganisationen is a collaborative purchasing department between the Nordic countries, most purchasing departments are national. There is a belief at the

\(^{19}\) Interview with Olle Strandsäter, 2012-11-02.
\(^{20}\) Interview with Bently Björnheden, 2012-10-10.
\(^{21}\) Interview with Pär Lageryd, 2012-08-08.
\(^{22}\) Interview with Per Heinrup, 2012-08-13.
\(^{23}\) Interview with Pär Lageryd, 2012-08-08.
\(^{24}\) Interview with Olle Strandsäter, 2012-11-02.
\(^{25}\) Ibid.
\(^{26}\) Interview with Pär Lageryd, 2012-08-08.
treasury department that the opportunities for commodity hedges will increase the more centralized the purchasing departments get.27

6.2.2 NCC
At NCC, market risks consist of the company’s interest rate and exchange rate risks, which are incorporated into the financial policy. (NCC, 2011, p. 86)

6.2.2.1 Interest rate
NCC’s assets consist of equity, cash flow from operations and borrowing whereas the last one is exposed to interest rate risk. As can be seen in table 5, the interest-bearing liabilities exceed the interest-bearing assets resulting in an exposure to fluctuations in the interest rate level.

Table 5 Overview of NCC’s interest-bearing assets and liabilities

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Average fixed interest rate maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest-bearing assets</td>
<td>1044 MSEK</td>
<td>0,5 years</td>
</tr>
<tr>
<td>Interest-bearing liabilities</td>
<td>5442 MSEK</td>
<td>0,58 years</td>
</tr>
</tbody>
</table>

Thus, an upward change of the interest rate level would consequently lead to a negative impact on the interest-bearing liabilities. The financial policy states that to manage risks associated with interest-bearing assets, the weighted average of the remaining fixed interest rate of the debt portfolio minus the fixed interest rate of cash should be twelve months with a deviation of plus minus six months. In addition, the debt portfolio’s interest rate structure should be spread out over time. When the available type of loan does not fulfill the debt portfolio’s structure, interest rate swaps should be used to adapt the available structure to the preferred one. (NCC, 2011, p. 87)

6.2.2.2 Exchange rate
The financial policy states that transaction exposures should be hedged as soon as they arise, usually with currency funds. (NCC, 2011, p. 87) Table 6 describes NCC’s transaction risks.

Table 6 Overview of NCC’s transaction exposures

<table>
<thead>
<tr>
<th>Currency</th>
<th>2011</th>
<th>2010</th>
<th>2011</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Net investment</td>
<td>Hedge value</td>
<td>Hedged percentage</td>
<td>Net investment</td>
</tr>
<tr>
<td>EUR</td>
<td>649</td>
<td>537</td>
<td>83%</td>
<td>452</td>
</tr>
<tr>
<td>Others</td>
<td>130</td>
<td>118</td>
<td>91%</td>
<td>55</td>
</tr>
<tr>
<td>Sum</td>
<td>779</td>
<td>655</td>
<td>84%</td>
<td>507</td>
</tr>
</tbody>
</table>

27 Interview with Pär Lageryd, 2012-08-08.
Both contractual and forecasted flows are hedged, contractual flows to hundred percent while projected flows are hedged successively over time. Thus, the quarter closest in time is hedged to a greater degree than quarters further away. Hedges can consist of currency funds or currency swaps as well as loans in the local currency.

Translation risk is not hedged according to NCC’s financial policy. Exceptions are made for development operations such as NCC Property Development and NCC Housing where the hedges are at maximum 90% of the total value. Borrowing between the business units or subsidiaries goes through the treasury department and is transferred as internal loans. Moreover, the loan financing currency is in SEK or EUR while the lending currency is in the preferred local currency, which implies that there exists an exchange rate risk. Usually, this risk is managed by currency swaps. (NCC, 2011, p.77)

6.2.2.3 Commodity
Commodity exposure is not mentioned in the financial policy, even though purchases of material and services represent 65% of the organizations total costs according to the annual report, sub-contractors included. At NCC the total material costs in a project is estimated to 60-70 % wherein only pure material costs are approximately 20-25 %. In an average project at NCC Construction the large cost groups are related to concrete and woods. Other cost groups are kitchen, doors, glass batches, timber and wooden panels. Most of these material costs, 90 %, are pre-negotiated in framework agreements by the centralized purchasing department.

“At NCC, there is great uncertainty in the size and extent of the commodity exposure as well as a preferred manner of mapping the exposure.”

Projects within NCC Roads are especially exposed to the price of materials, the commodity costs represent a third of the total costs in a road project. (NCC, 2011, p.46) Interestingly, hedging bitumen is common practice at NCC Roads, due to its large exposure in their projects. Diesel is also hedged on ad hoc-basis. In addition, NCC Roads collaborate with NCC Construction in order to continuously hedge their combined electricity exposure. In general, commodity risks are managed if identified as a direct cost, for example electricity. However, not many analyzes of commodity exposures are being made to identify common commodity risks.

Moreover, NCC has discussed a solution to hedge the steel exposure in their projects. The suggestion is that a selected region should purchase all the needed steel in NCC Constructions projects and hedge those before they are distributed to the different projects. Hedge accounting will not be possible in this case and therefore the hedging actions might be seen as speculative, which is not a welcomed approach by investors and other stakeholders. According to a person at the treasury department, this is a solution for the future since hedging is mostly done on imported

28 Interview with Anneli Bedman, 2012-08-13.
29 Interview with Tomas Mejbert, 2012-10-08.
30 Ibid.
31 Interview with Maria Nyberg, 2012-08-22.
32 Interview with Anneli Bedman, 2012-08-13.
materials today and the exposure towards different commodities are not fully analyzed and understood in the organization.\textsuperscript{33}

With twenty years knowledge of the construction business and the price volatility it endures, a site manager expresses the complexity of management of material price changes.\textsuperscript{34} Price fluctuations in especially steel can be felt in projects depending on the lifetime of the project.

"The problem is that when a construction project needs steel for beams, it requires delivery on a certain date and times no matter if the price of steel increases by 10
during last month."\textsuperscript{35}

Therefore, the local project purchasers opt for material purchases as soon as the bid is accepted although the delivery must be negotiated to fit with the construction schedule.\textsuperscript{36} In addition, instant delivery would not be realistic because of the construction sites limited storage capacities. The same goes for other commodities. Demand and supply for construction projects are not steered by micro changes in commodity prices but the present investing environment. A site manager also articulates the difficulty in determining the indirect costs that commodity price fluctuations have on a project from his current position.\textsuperscript{37}

6.2.3 Peab
Peab has identified market risks as the risk of fluctuations in the annual statement and cash flow due to changes in exchange rates and interest rates.

6.2.3.1 Interest rate
Peab’s annual statement identifies the most concerning factor of the interest rate level as the choice of time to maturity. (Peab, 2011, p.78) The financial policy states that the average time to maturity of the borrowing capacity is maximum 24 months (2 years). Table 7 illustrate that Peab’s interest-bearing assets exceed the company’s interest-bearing liabilities.

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest-bearing assets</td>
<td>1494 MSEK</td>
</tr>
<tr>
<td>Interest-bearing liabilities</td>
<td>9147 MSEK</td>
</tr>
</tbody>
</table>

Moreover, 4929 MSEK of the corporates net debt, including derivatives, have a time to maturity of less than a year. This implies that an upward change in the interest rate level will affect the interest-bearing debts in a negative way. Since the majority of the financial debt has a time to maturity of less than a year, a change in interest level will

\textsuperscript{33} Interview with Anneli Bedman, 2012-08-13.  
\textsuperscript{34} Interview with Tomas Mejbert, 2012-10-08.  
\textsuperscript{35} Ibid.  
\textsuperscript{36} Interview with Mattias Söderberg, 2012-10-30.  
\textsuperscript{37} Interview with Tomas Mejbert, 2012-10-08.
mostly affect the cash flow. (Peab, 2011, p.78) Peab uses interest rate swap to manage the interest rate level of asset and liabilities. As of 31\textsuperscript{st} December 2011, there are interest swaps to a value of 2550 MSEK with a time to maturity ranging from three to seven years with the average interest rate of 2.6 %. (Peab, 2011, p.78)

6.2.3.2 Exchange rate
Peab is exposed to both transaction and translation risk from exchange rates. Borrowing is mainly done in the local currency to minimize the transaction risk fluctuations. Peab manages transaction risk with currency swaps with an average time to maturity of three months. (Peab, 2011, p.78)

Furthermore, the annual report states that translation exposure that arises due to investments in foreign net assets should be partially to fully hedged using futures or by loans in the foreign currency. Table 8 shows Peab's hedging of foreign assets.

Table 8 Foreign net assets (Peab, 2011, p.79)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NOK</td>
<td>874</td>
<td>233</td>
<td>27%</td>
<td>643</td>
<td>166</td>
<td>26%</td>
</tr>
<tr>
<td>EUR</td>
<td>87</td>
<td>16</td>
<td>18%</td>
<td>77</td>
<td>16</td>
<td>21%</td>
</tr>
<tr>
<td>PLN</td>
<td>5</td>
<td>0</td>
<td>0%</td>
<td>4</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>LVL</td>
<td>1</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Sum</td>
<td>967</td>
<td>249</td>
<td>26%</td>
<td>724</td>
<td>182</td>
<td>25%</td>
</tr>
</tbody>
</table>

A sensitivity analysis shows that a ten-percentage increase of the non-hedged assets in EUR would lead to a positive change of equity of 63 MSEK. Likewise would a ten-percentage change in the NOK lead to a positive effect on equity by 74 MSEK. However, the effects of exchange rate changes are limited on the annual income statement. (Peab, 2011, p.79)

It should be mentioned that Peab’s purchases and sales of products and services in foreign currency are limited today. However, because of Peab’s expansion and the competitive environment of purchasing, this could and most likely will change in the future. Today, hedges are used to secure known currency flows. (Peab, 2011, p.79)

6.2.3.3 Commodity
Peab do not recognize any commodity exposure in the company’s annual statement, which in essence means that it is not included in the financial risk policy. Interviews at the company indicate that commodity exposures are rather unacknowledged at Peab.\footnote{38 Interview with Mikael Johansson, 2012-08-01.} \footnote{39 Interview with Niclas Hesselgren, 2012-09-03.} However as an exception, Peab Roads perform some bitumen hedges in their projects.\footnote{40 Interview with Mikael Johansson, 2012-08-01.} Additional questioning reveals that even in large projects such as \textit{Stockholm Waterfront} and \textit{Mall of Scandinavia}, commodity exposures are not evaluated even though just the cost of steel in the frame is 6.7\% of the total cost of
the project. On the other hand, two purchasers argues that most material cost volatility can be managed through standardized frameworks or indices with the suppliers and sub-contractors.

6.2.4 JM
Market risks are managed according to JM’s financial risk policy, which defines the risks as the interest rate and exchange rate risk of a project. (JM, 2011, p.76)

6.2.4.1 Interest rate
JM’s annual report identifies the time to maturity of an interest rate as one of the most important interest rate risks. A one-percentage change in the interest rate level would have an effect of 7 MSEK on the loan portfolio of 2012. (JM, 2011, p.77) Hence, the board of directors has imposed a set of guidelines for interest rate bindings and tenor. There is also a set of regulations related to construction loans. (JM, 2011, p.29) The choice of time to maturity is built upon the on-going projects capital bindings and cash flows, the available volume of long-term borrowing and the market prognosis of the yield curve. (JM, 2011, p.76) JM uses interest rate swaps to adjust and lower the interest rate risk according to the risk policy. JM has no outstanding interest rate derivatives according to the annual report. The long-term borrowing capacity of the company is rather limited which therefore result in short-term bindings of the interest rate. The average time to maturity is 0.2 years.

6.2.4.2 Exchange rate
Being a domestically focused company leads to limited exchange rate exposure. (JM, 2011, p.29) However, JM do have operations in other countries, for example Norway which implies that the exchange rate risk is limited but not eliminated. During 2011, the company has provided its Norwegian subsidiary with a loan that was fully hedged. Aside from that exposure, neither transaction nor translation exchange rate risks are hedged. (JM, 2011, p.77)

6.2.4.3 Commodity
JM has preformed sensitivity analysis on commodity exposures and has from the result drawn the conclusion that the company does not need to hedge its commodity exposures. However, they do make exceptions to the rule when it comes to hedging electricity. Other commodity prices such as the price of steel products are secured through framework agreements with index adjustments. Fuel deliveries related to projects are also managed through framework agreements.

6.2.5 Market risk comparison summary between companies
First, the interest rate exposures in the different companies are summarized in table 9. Both Skanska and NCC have guidelines in the financial policy that states a credit risk limit to control the interest rate exposure.

---

41 Interview with Klas Ulen, 2012-10-31.
42 Interview with Hans Svedman, 2012-09-13.
43 Interview with Nils Yttergård, 2012-10-04.
44 Interview with Marcus Lund, 2012-08-24.
45 Ibid.
46 Interview with Sören Bergström, 2012-08-03.
Table 9 Comparison of interest rate risk

<table>
<thead>
<tr>
<th>Interest rate risk</th>
<th>Skanska</th>
<th>NCC</th>
<th>Peab</th>
<th>JM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit risk limit</td>
<td>100 MSEK</td>
<td>Yes, but not official</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>A 1% increase in the interest rate level</td>
<td>Positive impact (+44 MSEK)</td>
<td>Negative impact</td>
<td>Negative impact</td>
<td>Unknown impact</td>
</tr>
</tbody>
</table>

Second, table 10 describes the different policies towards exchange rate exposures. Here, Skanska is the most experienced and positive company towards managing transaction and translation exposures while JM on the other side, only manages the exposures as exceptions.

Table 10 Comparison of exchange rate risk

<table>
<thead>
<tr>
<th>Exchange rate risk</th>
<th>Skanska</th>
<th>NCC</th>
<th>Peab</th>
<th>JM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange rate exposure limit</td>
<td>Yes, 50 MSEK (Currently 16 MSEK)</td>
<td>No, all known exposure should be hedged</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Transaction risk</td>
<td>Yes, all known and budgeted financial flows are fully hedged</td>
<td>Yes, as soon as they arise</td>
<td>Yes, partially or fully hedged</td>
<td>No, only done as an exception</td>
</tr>
<tr>
<td>Translation risk</td>
<td>Yes, partially hedged</td>
<td>No but exceptions are made for development operations</td>
<td>Yes, partially or fully hedged</td>
<td>No, only done as an exception</td>
</tr>
</tbody>
</table>

In table 11, the identification and management of commodity risks in all four companies are described. The extent of identification deviates, with JM confident at its general exposures, NCC’s estimations regarding bitumen specifically, while Skanska and Peab are unaware of the extent of their exposures.

Table 11 Comparison of commodity risk

<table>
<thead>
<tr>
<th>Commodity risk</th>
<th>Skanska</th>
<th>NCC</th>
<th>Peab</th>
<th>JM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identified commodity risk exposure in individual projects or in general in the organization</td>
<td>No</td>
<td>1/3 of total cost in NCC Roads projects</td>
<td>No</td>
<td>Yes, some products commodity exposure have been estimated</td>
</tr>
<tr>
<td>Managed risks</td>
<td>Selective hedges in electricity, bitumen and steel billets</td>
<td>Bitumen, electricity, some steel hedges</td>
<td>Selective hedges of bitumen</td>
<td>Electricity hedges</td>
</tr>
</tbody>
</table>
In summary, the four companies have to a certain extent the same methods for risk management of market risks. However, as the tables above shows, there are some differences as well.
7 Risk management; present and future strategies

The following chapter analyzes the presented material in relation to the theoretical framework that has been provided. Assessment of the effect of using a financial index on a fictional construction case, will serve to illustrate if commodity exposures could be sufficiently managed in this manner. Throughout the section challenges and opportunities are discussed and evaluated.

7.1 Risk management and market risks

Structures and procedures of financial risk management are in theory a reasonably straightforward approach. Looking at each of the individual companies risk management processes, a range of similarities can be found, especially at Skanska, NCC and Peab. Notably, JM’s differ from the other three companies in both its limited diversity of projects, most are standardized, too well established centralized financial decision-making. Standardized projects provide an opportunity to control costs in a more efficient manner. Therefore, it was non-surprising to find out that JM had performed sensitivity analysis of material costs and exchange rate risk effects on their profitability. Companies with larger projects and business units such as Skanska, NCC and Peab tend to need more decision making on site, which consequently leads to a decentralized organization. A decentralized organization might result in a lack of comprehension of some risks. Centralized financial risk management is therefore of great importance.

Companies have to take some risks to thrive in businesses, however risks can be taken in a calculated manner. The financial policy of the individual companies shows risk awareness at the same time as it defines the chosen risk level of each individual company. Furthermore, the financial policy also describes the risk management processes of identification, assessment, allocation and mitigation. Interest rate and exchange rate risks are identified, assessed and managed by the treasury department. Upper limits to interest rate and exchange rate exposures have been enforced at Skanska and Peab to keep the risk level on in a preferable state. Moreover, the time to maturity was identified of Peab, NCC and JM as an important factor in regulating the interest rate risk. A short time to maturity on debts will result in a negative effect on the company’s finances if the interest rate moves upwards. Furthermore, the companies are well aware that the relationship between their interest-bearing assets and interest-bearing liabilities affect their exposure towards the interest rate and the yield curve. Many of the interest rate risks are managed by swaps, although the diversity in time to maturity and amount of fixed and floating interest rates also represent risk management actions.

When it comes to exchange rate risk, the risk management approach differs between the companies. JM recognizes transaction risks but do not hedge them on a regular basis. In addition, the company does not hedge its translation exposure. Peab does not have a lot of business in other countries, minimizing both transaction and translation risks. However, in the future they aim to increase their business activity abroad, conversely raising their exposure. NCC acknowledges their transaction risks but only on occasion their translation risks. Lastly, Skanska recognizes their transactional and translational risks. However, because Skanska is a global company, some of the transactional risk exposure is balanced out between the
countries. Skanska, NCC and Peab hedge all known and budgeted exposures fully or partially by currency swaps. In addition, Skanska also has enforced an upper exchange rate exposure limit.

All four companies show financial risk awareness when it comes to market risks such as interest rate risk and exchange rate risk. However, financial commodity risk management is not included in the financial policy of any of the companies even though all of them infer that the risk exists. One reason for this might be the lack of identification of direct but most importantly indirect commodity exposures. The largest volume of commodity risk in material costs is an indirect affect from refined products. Indirect risks are hard to estimate and therefore even harder to measure. Nevertheless, if the risk was identified it is still unclear how the allocation of the risk should turn out. Today, most commodity risks are managed on-site by site managers or in the purchasing department using standardized framework contracts. Decentralization is obviously a concerning factor when it comes to identification and management of commodity risks. Even if the site managers had sufficient knowledge on how to estimate commodity risks, they need to contact the treasury department to have the risks eliminated financially. Knowledge of how to identify commodity risks and whom it should be allocated to is of great concern if a company aims to decrease its commodity exposure.

There have been a few commodity hedges at each company, mostly in bitumen and electricity consumption. Interestingly, even JM has performed a few hedges although the company has taken a stand against hedges of commodity risks and most exchange rate risks. The strategic exposure in the construction industry is hard to evaluate. It is not the norm to hedge commodity risks as of now, which indicates that a too rapid change in risk management strategy might decrease profitability instead of stabilizing it through hedging. In essence, commodity risk management in the constructions industry is in its infancy even though most of the companies express an interest in managing commodity risks financially. Deciding factors such as the price of the hedge and complexity of using financial tools, are of great importance for future development of commodity practices.

7.2 Multi-residence index composition and application
The methodology of gathering data for the index has been described earlier in the thesis whereas the actual composition and any complications are illustrated in the following section.

7.2.1 Exposures and composition
From the description of SCB’s totala faktorprisindex it can be shown that the material cost is just a part of the total cost of a construction project. In table 12, the total cost percentages of a construction project are illustrated and sorted into the final tradable material amount that can be managed by financial risk management.
Data inputs in the multi-residence index are based on the cost items in SCB’s *totala faktorprisindex*, more specifically in the sections *Inbyggt material* and *Transport, drivmedel och elkraft*. Appendix 10.6 illustrates all cost items in a multi-residence housing project. All cost items did not represent material costs and were therefore not taken within consideration for the multi-residence index. In addition, some of the material cost items cannot be hedged due to reasons such as a commodity not being introduced on the stock market yet. Consequently they are of no use in an index that should be use for hedging exposures. Originally in SCB’s index, the different inputs were denoted as its cost percentage of the total cost picture of the project. In the multi-residence index, all inputs represent their volume percentage of the total building volume. All cost items in SCB’s *totala faktorprisindex* sections *Inbyggt material* and *Transport, drivmedel och elkraft*, were researched for their fundamental commodity parts. Thereafter, the fundamental commodity volume percentages of every cost item were estimated together with two commodity experts at SEB. Lastly, the individual commodities total exposures were summarized to represent the multi-residence index. Table 13 illustrates the multi-residence index composition of commodity exposures.

### Table 12 Cost percentages in the project

<table>
<thead>
<tr>
<th>Cost</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total project cost</td>
<td>100%</td>
</tr>
<tr>
<td>Pure material cost</td>
<td>40%</td>
</tr>
<tr>
<td>Material costs that can be hedged</td>
<td>10%</td>
</tr>
</tbody>
</table>

### Table 13 Commodity exposures in the multi-residence index

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Percentage exposure (volume)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>4.27%</td>
</tr>
<tr>
<td>Black sea billets</td>
<td>13.26%</td>
</tr>
<tr>
<td>Basmetall index LME</td>
<td>15.48%</td>
</tr>
<tr>
<td>CME Lumber</td>
<td>10.08%</td>
</tr>
<tr>
<td>Copper</td>
<td>12.90%</td>
</tr>
<tr>
<td>Fuel oil 3.5%</td>
<td>0.79%</td>
</tr>
<tr>
<td>Hot roiled coil (HRC)</td>
<td>9.72%</td>
</tr>
<tr>
<td>Iron ore</td>
<td>0.30%</td>
</tr>
<tr>
<td>LDPE Plastic</td>
<td>1.84%</td>
</tr>
<tr>
<td>Molybdenium</td>
<td>0.01%</td>
</tr>
<tr>
<td>Nickel</td>
<td>11.75%</td>
</tr>
<tr>
<td>Nord pool</td>
<td>9.23%</td>
</tr>
<tr>
<td>Pulp</td>
<td>6.19%</td>
</tr>
<tr>
<td>ULSD 10 PPM</td>
<td>3.17%</td>
</tr>
<tr>
<td>Zinc</td>
<td>1.01%</td>
</tr>
</tbody>
</table>

The multi-residence index was composed of commodities traded in USD and EUR (all but one contract was denoted in USD). However, the identified construction projects costs, were denoted in SEK in addition to the country specific limitations of...
this thesis, subsequently the index was converted into SEK. Figure 12 describes the price volatility of the commodities used in a multi-residence construction project over a four-year period.

![Index vs. Time](image)

**Figure 12** Historical volatility of the multi-residence index

In general, four years is not a sufficiently long time to draw any general conclusions about the volatility of the index. Nonetheless, the existence of some of the commodity contracts only dates back four years, narrowing down the history span of the total index.

### 7.2.2 Factors of concern

Basically, for the multi-residence index to be useful in reducing commodity risks, it has to be validated against official data. The following section will investigate correlations between the composed index and official statistical data.

#### 7.2.2.1 Price volatility of the selected commodities

Commodity markets are especially volatile because of the relation to an actual physical supply and demand market. To understand the impact of price volatility on projects profitability, figure 13 illustrates the individual commodities price volatility in the multi-residence index.
Figure 13 Price history of the selected commodities in the multi-residence index
7.2.2.2 Exchange rate effect
As mentioned before, the original commodity contracts are denoted in USD and EUR. Conversion of the currencies into SEK can result in an exchange rate risk, which essentially means that the conversion might impact the volatility in the index. Hence, it is possible that changes in the index are due to strengthening of USD against SEK or vice versa. However, figure 14 illustrates the historical volatility of the multi-residence index denoted in USD and in SEK.

![Figure 14 Correlation between the multi-residence indexes in SEK vs. USD](image)

From figure 14, it is deductible that exchange rate risk due to conversion of USD/SEK is limited. In addition, the correlation factor between the indices is as strong as 0.951, indicating a relationship beyond the different currency pair’s volatility. Still, even though the correlation is strong, it is not certain that it stays the same over a longer time period. In order to be able to draw more general conclusions on the correlation, the time period has to be elongated.

7.2.2.3 Correlation with totala faktorprisindex of material and transportation
A worthy comparison to the multi-residence index is the totala faktorprisindexet from SCB. In fact, since the material and transportation units of the totala faktorprisindexet, is the basis of the multi-residence index, they should correlate in some essence. Yet, the totala faktorprisindexet does not specify exposures towards specific commodity contracts, which means that the selection of commodity contracts could play a major role in the multi-residence index composition. Figure 15, does show some correlation between the two indices, although most of the correlation can be derived from static noise due to the low correlation factor of 0.495.
An interesting observation can be noted when comparing figure 15 and figure 16. The two figures differ in the choice of currency of the multi-residence index. The correlation factor between the multi-residence index in USD and the totala faktorprisindexet of material and transportation is notably higher than the correlation factor of the multi-residence index in SEK and the totala faktorprisindexet of material and transportation, 0.638 compared to 0.495.

Most commodities denoted in USD have a correlation towards the currency itself. For example, if the USD is strengthened then the oil price will increase while the price of gold will decrease. Thus, a change in the value of SEK has minimal impact on commodities expressed in USD or EUR, resulting in a lower correlation towards totala faktorprisindexets of material and transportation costs of products dependent on commodities.
7.3 Fictional case of a construction project
The fictional case is based on material costs provided from the four individual companies. Together they form an illustration of how an exposure can look.

7.3.1 Description
A decision has been made to start a construction project to build an apartment block in the region of Stockholm. The project consists of two main buildings, one with ten floors and one with twelve floors. Both buildings will house business activities on the ground floor. In addition, the project also includes underground parking for residents only.

All negotiations have been finished and it is time to start up the project. Budgeted costs are 135 million SEK in total for payrolls, material, and sub-contractors. An exception is made for the land costs. Moreover, the project is estimated to proceed for 23 months and one company is responsible for the delivery towards the customer. Total material costs are approximately 93 MSEK (70 % of the total cost) including the sub-contractor cost. Out of the total sub-contractor costs, 50% represents pure material costs.

A description of the material and subcontractors included in the project can be found in appendix 11.6. The cost percentage represents the cost of each individual factor in relation to the total material cost. All identified material costs cannot be hedged because there need to exist a tradable contract for the exposed commodity. All costs are summarized in table 14 and the percentage is referring to the total cost of the project.

Table 14 Cost percentages in the project

<table>
<thead>
<tr>
<th>Cost</th>
<th>Percentage</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total project cost</td>
<td>100%</td>
<td>135 MSEK</td>
</tr>
<tr>
<td>Total material cost</td>
<td>69%</td>
<td>93 MSEK</td>
</tr>
<tr>
<td>Pure material cost</td>
<td>34.5%</td>
<td>46.6 MSEK</td>
</tr>
<tr>
<td>Material costs that can be hedged</td>
<td>29%</td>
<td>39.3 MSEK</td>
</tr>
</tbody>
</table>

7.3.2 Commodity exposures
Thus, approximately 30% of the total costs are exposed to price volatilities from tradable commodities. Unlike when the multi-residence index was composed, there was no strict cost items list to start identifying the different commodity exposures from. Instead, all four companies had provided bits and pieces from their commodity exposures in multi-residence construction projects. Together they form a holistic picture of how the commodity exposure can look like in a multi-residence housing project. All input data was sorted into material costs versus other costs. Thereafter, once again with the help of SEB’s commodity experts, the different individual commodity exposures in the different material items were estimated and summarized into a total exposure. Unfortunately, the individual data cannot be shown in this thesis due to confidentiality agreements. However, table 15 reveals the individual commodity exposures in the fictional project consisting of all companies input data.
Table 15 Commodity exposures in the fictional case index

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Percentage exposure (volume)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>7.81%</td>
</tr>
<tr>
<td>Black sea billets</td>
<td>13.28%</td>
</tr>
<tr>
<td>Basmetall index LME</td>
<td>9.63%</td>
</tr>
<tr>
<td>CME Lumber</td>
<td>15.70%</td>
</tr>
<tr>
<td>Copper</td>
<td>2.57%</td>
</tr>
<tr>
<td>Fuel oil 3.5%</td>
<td>4.26%</td>
</tr>
<tr>
<td>Hot rolled coil (HRC)</td>
<td>6.07%</td>
</tr>
<tr>
<td>Iron ore</td>
<td>1.17%</td>
</tr>
<tr>
<td>LDPE Plastic</td>
<td>9.47%</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>1.11%</td>
</tr>
<tr>
<td>Nickel</td>
<td>1.11%</td>
</tr>
<tr>
<td>Nord pool</td>
<td>9.47%</td>
</tr>
<tr>
<td>Pulp</td>
<td>11.95%</td>
</tr>
<tr>
<td>ULSD 10 PPM</td>
<td>6.40%</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

In comparison to the multi-residence index, the fictional index has no exposure towards zinc. However, in figure 17, both indices are illustrated to show the relation between their historical movements. A correlation factor of 0.965 shows a very strong resemblance between the indices.

![Figure 17 Correlation between the fictional case index and the multi-residence index](image)

Both indices were created using commodity expert’s opinions of commodity exposures in the identified materials. Because of a limited time frame and minimal resources, the exact commodity exposures were not identified. The strong correlation could therefore, partly be due to a similar approximation approach towards the predetermined commodities in the multi-residence index. It is of great importance that both the multi-residence index and potential real construction cases’ exposures are determined comprehensively otherwise the risk of commodity price volatilities will not be fully eliminated.
7.3.3 Applying the multi-residence index

First, the fictional case’s exposures must be matched against the multi-residence index to evaluate if the basis risk is within tolerable limits. If not, then the fictional case’s exposures cannot be hedged against the multi-residence index. Therefore, an index of the fictional case exposures is created to compare the exposures over a longer time period. Do note that this index is not tradable, it is just used as an illustration of the exposures in the project. In figure 15, the close similarity between the exposures history of the two indices are illustrated.

The result is in line with the correlation factor of 0.965, indicating a strong correlation with a small basis risk. Hence, the fictional case can be hedged against the multi-residence index.

Now, the company in charge of the fictional project now has the opportunity to limit the effect of the commodity exposure of 39.3 MSEK on the projects profitability. In this example, three alternatives are suggested: performing a swap with three, six or twelve months to maturity. Depending on the length of the project and/or when the commodities can be purchased, different length of the time to maturity of the swap is suitable. Figure 18 shows the index values of the multi-residence index, denoted in USD and in SEK, for the three options.

![Graph: Multi-residence index values](image)

**Figure 18 Multi-residence index values**

At the start of the multi-residence index in the year of 2008, the index value was set to 100. Throughout the years the index value have changed. In this case, the multi-residence index in both SEK and USD has increased in value.

Depending on the choice of time to maturity on the swap, different costs of hedging occur. Table 6 provides the actual costs of hedging the projects exposures with a swap. The numbers are derived from the cost of buying the different percentages of each commodity in the multi-residence index. Notably, the cost of hedging increases with the time to maturity because of an increased uncertainty of the future value of the index.
Table 6 Actual cost of hedging

<table>
<thead>
<tr>
<th>Actual cost of hedging</th>
<th>Spot</th>
<th>3m</th>
<th>6m</th>
<th>12m</th>
</tr>
</thead>
<tbody>
<tr>
<td>USD</td>
<td>3680.3</td>
<td>3696.9</td>
<td>3697.8</td>
<td>3728.0</td>
</tr>
<tr>
<td>SEK</td>
<td>24584.5</td>
<td>24755.4</td>
<td>24808.4</td>
<td>25101.7</td>
</tr>
</tbody>
</table>

Until now, there has been no evaluation on what would happen if the price of a commodity increased or decreased. Let's say that the price of steel increases with 30% in a six month period, that would lead to a higher cost of buying steel in six months compared with today's price. In figure 19, the fictional projects company can choose to either hedge 70%, 80%, 90% or not hedge at all. If the company chooses to hedge 70% of their exposure, 30% will be not be hedged, resulting in a loss when commodity prices increase.

![Figure 19: Effect on hedge if the price of steel billets increased with 30% in 6M](image)

<table>
<thead>
<tr>
<th>Hedge ratio</th>
<th>0%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of unhedged exposure</td>
<td>-1563536</td>
<td>-469061</td>
<td>-312707</td>
<td>-156354</td>
</tr>
<tr>
<td>Profit of hedged exposure</td>
<td>0</td>
<td>1094475</td>
<td>1250829</td>
<td>1407183</td>
</tr>
<tr>
<td>Total profit/loss</td>
<td>-1563536</td>
<td>625414</td>
<td>938122</td>
<td>1250829</td>
</tr>
</tbody>
</table>

Figure 19 illustrates the incurred loss when the exposure is not hedged at all. It also demonstrates the profit made from investing in the index paired with the loss incurred of the unhedged exposure. Consequently, hedging the commodity exposure is highly recommended under the assumption that the exposure correlated well towards the multi-residence index. On the other hand, the steel prices could decrease leading to the opposite situation of the hedge strategy. Figure 20 demonstrates a decrease in the steel price.
Figure 20 Effect on hedge if the price of steel billets decreased with 30% in 6M

When figure 20 is compared to the example where the steel prices increased, the result indicates that a hedge results in a higher profit if prices increase and a smaller loss if prices go down. However, the loss when prices decrease is singlehandedly due to the hedge.

In addition, if a hedge is made on a 6M swap while the exposure continues over three years, then there will also be a risk of rolling into a contango or backwardation market of any of the commodities in the multi-residence index.

7.3.4 A final note
On a mere high-level basis, this multi-residence index provides the construction companies with an interesting tailor-made opportunity to minimize their exposures. The construction industry is a difficult sector to identify and manage commodity risks in. However, managing a group of construction projects as a portfolio at the same time with an index can be the solution to a few of the problems. Construction projects start at different times as well as lasts over different sets of time periods. These conditions make it very time inefficient to manage every single projects commodity exposure. Gathering a group of projects into a portfolio enables the company to maintain a transparent view on their total commodity exposure by identifying all exposures and opportunities of neutralizing them against other projects exposures.

In summary, both profit and losses can be made in a construction project due to the volatility of commodity prices. Hedging is a solution that secures the profitability of the project, not a mean to gain revenue on price speculations. If a company wants to decrease their commodity risk, they could hedge their exposures, preferably against a financial index.
8 Conclusion
Both interest rate risk and exchange rate risk are included in the companies’ definition of market risks. Every company has a financial policy with guidelines on division of responsibility for risk management and how to manage each specific risk. Interest rate risk is often managed by interest swaps and a combination of fixed and floating interest rates, while exchange rate risk is managed by currency swaps and in some cases and upper limit for the total exposure in the company. In both cases, the treasury department manages the risks although another business unit such as the purchasing department can detect risks.

Commodity risk, which should be categorized as a market risk, is not as purposefully managed as the other market risks. For example, financial risk management of commodities is not defined in the financial policy of any of the four participating companies. Instead, most commodity exposures are today managed through purchasing agreements such as standardized framework contracts or trough index adjustments. In fact today, the majority of the four companies do not have an organization structure that could support the increased work tasks that the addition of a commodity risk management policy would cause.

Moreover, this thesis has contributed an example of how the commodity risk exposures in multi-residence housing projects could be managed financially to sustain the profitability of the construction project. The multi-residence index composition of different commodities is derived from actual construction projects and should therefore be a reflection of the projects exposures.

In conclusion, the weight of the commodity exposures in multi-residence housing projects have, to a certain detail level, been defined and/or estimated. Before a construction of a real multi-residence index can be made, further analysis of the commodity exposures relationships between one another must be performed in order for the index to match the projects exposures better. From the result of this thesis, the use of a financial index seem promising as a tool for decreasing commodity risks in construction projects.
9 Discussion

We have not heard the last thing about commodity exposures in the construction industry. Tight margins and fierce competition will drive the companies to want to manage all the risks of increased costs, especially including material costs. However, the organization in three out of the four participating companies in this thesis, are not ready to enforce a risk management policy of commodities. The structure and risk division between units and positions are complex and need clarification together with education regarding how to identify and manage commodity risks.

From the construction companies' point of view, I would like to emphasize the need for a calculated awareness of the comprehensive commodity exposures within projects but also within the company. Risk management is most successful if all risks are fully defined and managed. One way to proceed would be to analyze all the standardized framework contracts in the company to determine the commodity exposure in those. The reason for this is that purchases made through a standardized framework contracts are easily measured in the four different companies. Consequently, the general exposure could be measured and in turn managed.

Moreover, a bank has the opportunity to provide the construction industry with financial risk management tools to decrease financial risk exposures. Future ambitions should be to find a suitable tool, such as a tailor-made index, to simplify risk management of complex exposures, for example commodity risks, at a reasonable cost. Relationships between the bank and the construction companies will be of great importance because in order to advise the construction companies on commodity risks, the bank need to dig deep into the construction sector and in how the individual companies' projects work and where the exposures arise.

This thesis has resulted in an introduction to how commodity exposures are managed today at construction companies and how they could be managed in the future. One interesting approach for further research would be to investigate how indirect commodity exposures affect the material costs in a project. It is essential to define how refined a product can be to still be classified as a commodity risk. Moreover, the study could also be extended to include the sub-contractors exposures towards some of the selected commodities. A VVS-installer would probably not be exposed to everything in the multi-residence index but their exposure would add detail to the exposure of the total project.

Finally, it would also be interesting to analyze how changes in the number of commodity contracts would affect the multi-residence index correlation towards multi-residence housing projects. In addition, how would the actual price of the hedge increase/decrease with a different number and composition of the multi-residence index and how that would affect the hedge ratio.
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Melander Pär; Head of Corporate Sales, Commodities, SEB, 2012. Interview sessions between 2012-08-01 to 2012-12-31.


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11 Appendix
11.1 Liquidity of futures contracts

The liquidity of a commodity contract implies the trading volume of the particular commodity. A low spread as can be seen in aluminum in table 11, indicates a highly traded contract, while black sea billets denotes a less traded contract. In general, the contracts were selected if they had liquidity below 1. Black sea billets and HRC are exceptions to the selection criteria because of their short history. In a few years their liquidity will hopefully have increased.

Table 13 Liquidity of contracts measured in the price spread

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Spread %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>0.025</td>
</tr>
<tr>
<td>Black sea billets</td>
<td>2</td>
</tr>
<tr>
<td>Basmetall index</td>
<td>0.03</td>
</tr>
<tr>
<td>HRC</td>
<td>1</td>
</tr>
<tr>
<td>Iron ore</td>
<td>0.4</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.7</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.05</td>
</tr>
<tr>
<td>Nord Pool</td>
<td>0.1</td>
</tr>
<tr>
<td>ULSD</td>
<td>0.05</td>
</tr>
<tr>
<td>Zink</td>
<td>0.035</td>
</tr>
<tr>
<td>Copper</td>
<td>0.03</td>
</tr>
<tr>
<td>Fuel oil 3.5%</td>
<td>0.05</td>
</tr>
<tr>
<td>CME Lumber</td>
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<td>PE LDPE GP Film</td>
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11.2 Interview questions for a site manager

- **Bakgrund**
  1. Berätta lite om din bakgrund
  2. Hur länge har du arbetat som projektchef? På företaget?
  3. Vilken typ av ekonomiskt ansvar har du haft?

- **Råvaruexponeringar**
  1. Har du någon gång i ditt arbete märkt att materialpriserna svänger kraftigt?
  2. Om detta är fallet, har du dragit någon parallell till råvarupriserna?
  3. Vilka materielgrupper alternativt produkter är det som påverkar kostnaderna mest när råvarupriserna förändras?
  4. Hur stora är dessa kostnader i förhållande till den totala materialkostnaden i projektet?
  5. Hur stor är materialkostnaden gentemot ett projekts totala kostnad? (Inkluderas underentreprenader i denna kostnad?)

- **Riskhantering**
  1. Hur arbetar ni för att hantera råvarurisken ute på bygget?
  2. Känner du att denna hantering är tillräcklig?
  3. Anser du att denna risk bör hanteras någon annanstans i organisationen? Om så, var i så fall?
  4. Hanterar ni någon annan typ av risiker ute på bygget (ex. operationella risker)?
  5. Hur hanteras dessa?(Finns det någon policy osv)
11.3 Interview questions for a purchaser

• **Bakgrund**
  1. Berätta lite om din bakgrund
  2. Hur länge har du arbetat som inköpare? På företaget?
  3. Beskriv dina och centrala inköpsavdelningens uppgifter

• **Råvaruexponeringar**
  1. Har du någon gång i ditt arbete märkt att materialpriserna svänger kraftigt?
  2. Om detta är fallet, har du dragit någon parallell till råvarupriserna?
  3. Vilka materielgrupper alternativt produkter är det som påverkar kostnaderna mest när råvarupriserna förändras?
  4. Hur stora är dessa kostnader i förhållande till den totala materialkostnaden i projektet?

• **Riskhantering**
  1. Om ni köper in material från andra länder, hur går processen för valutasäkring till? Kontaktar inköp treasury eller vad händer?
  2. Hur arbetar ni för att hantera råvarurisken i inköpsprocessen?
  3. Känner du att denna hantering är tillräcklig?
  4. Ansåd du att denna risk bör hanteras någon annanstans i organisationen? Om så, var isf?
  5. Hur hanteras dessa?(Finns det någon policy osv)
11.4 Interview questions for a treasury position

• Bakgrund
  1. Berätta lite om din bakgrund
  2. Hur länge har du arbetat på treasury-avdelningen? På företaget?

• Råvaruexponeringar
  1. Har du någon gång i ditt arbete märkt att materialpriserna svänger kraftigt?
  2. Om detta är fallet, har du dragit någon parallell till råvarupriserna?
  3. Vilka råvarors priser har ni mest kändedom om?
  4. Hur stora är dessa kostnader i förhållande till den totala materialkostnaden i projektet?
  5. Hur stor är materialkostnaden gentemot ett projekts totala kostnad? (Inkluderas underentreprenader i denna kostnad?)
  6. Har du någon uppfattning om hur stora råvaruexponeringarna är i hela företaget alternativt i någon av affärsenheterna?
  7. Om möjligt, uppskatta hur stora råvaruriskerna är gentemot ränta- och valutarisker

• Riskhantering
  1. Hur arbetar ni för att hantera råvarurisken på treasury-avdelningen?
  2. Är ni delaktiga i råvaruriskhanteringens ute på projekten på något annat sätt?
  3. Känner du att denna hantering är tillräcklig?
  4. Anser du att denna risk bör hanteras någon annanstans i organisationen? Om så, var i så fall?
11.5 Specification of materials in the fictional case

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11.6 Components in Statistiska centralbyråns faktorprisindex

All the material products that were included in the multi-residence index were based on the different products and weights from the faktorprisindex. However, some of the products are not useful or even possible to hedge. Therefore, only products in Inbyggt material and Transporter, drivmedel och elkraft were considered.

Vikterna i faktorprisindex för flerbostadshus

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**5. Omkostnader**
### 6. Byggherreknader

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