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FX Risk Management & Shareholder Value

Evidence from the Nordic Stock Markets

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ABSTRACT:
Unexpected fluctuations in foreign exchange rates can cause considerable financial losses and unpredictability in firm's available capital. Measuring and managing the FX exposure is often described to be challenging as the risk can be faced through operational transactions, but also indirectly through customers, suppliers, and competitors. Foreign exchange rate hedging should allow firms to reduce the risk exposure and increase firm value by reducing the cash flow volatility.

This thesis examines if financial FX hedging with derivatives has any firm value impact in the smaller Nordic markets. The Nordic markets provide interesting sample as Finland, Norway, Denmark, and Sweden all have their distinctive features, such as national currencies, industry distributions due to geographical differences, and the presence of European Union. This thesis presents financial FX risk management as a valuable tool for nonfinancial firms to reduce their risk exposure and support firm value creation. Prior literature has often covered that the results regarding currency hedging and firm value are mixed. However, the more common conclusion has been that currency hedging has neutral or positive firm value impact.

To examine the relation between firm value and FX hedging, this thesis uses data collected for 205 nonfinancial Nordic firms over the years 2016-2019. Data for currency hedging activity is collected manually from firms' annual statements. To study the firm value impact of FX hedging, this thesis uses fixed-effect OLS regression for the estimations. Thesis uses firm-specific control variables, such as firm size, leverage, profitability, and export ratio. Additionally, data is categorized by country and industry sector.

This thesis shows that Nordic nonfinancial firms experience positive firm value premium from currency hedging activities. Firms hedging the currency risk are found to have 25% higher firm valuations in the markets when measured by Tobin's Q. However, The Nordic evidence on firm value premium is consistent with prior literature by providing somewhat mixed results between different countries and industry sectors. The evidence is still more consistently signaling that FX hedging increase firm value in the Nordic markets.

KEYWORDS: Hedging, risk management, currency risk, FX, firm value

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TIIVISTELMÄ:
Yllättävät heilahdukset valuuttakursseissa voivat aiheuttaa merkittäviä liiketappioita yrityksille. Lisäksi suuret heilahtelut voivat aiheuttaa vaikeuksia vapaan kassavirran arvioinnissa. Valuuttakurssiriski voi olla vaikeasti tunnistettavissa ja siltä suojautuminen on usein koettu hankalaksi. Valuuttakurssiriskiltä suojautuminen antaa yrityksille mahdollisuuden vähentää kohdattua kokonaisriskiä sekä kassavirran volatiliteettia.

Tämä tutkielma tutkii sitä, kuinka valuuttakurssisuojautuminen vaikuttaa yrityksen arvoon Pohjoismaissa. Pohjoismainen pörssimarkkina tarjoaa mielenkiintoisen tutkimuskohteen, sillä jokaisella maalla on omat erikoispiirteensä yhtenäisyyksien lisäksi. Muun muassa Euroopan Unionin läsnäolo sekä paikalliset valuutat ovat merkittäviä eroavaisuuksia kohdemaiden välillä. Kirjallisuus on aiemmin osoittanut, että tutkimustulokset riskienhallinnan ja yrityksen arvon yhteydestä ovat epäjohdonmukaisia. Tutkimustulokset ovat kuitenkin useammin viitanneet, että vaikutus yrityksen arvoon olisi neutraali tai hieman positiivinen. Tulokset ovat olleet kuitenkin laajalti riippuvaisia käytetystä aineistosta sekä tutkimusmenetelmistä.

Tämä tutkielma hyödyntää aineistoa, joka on kerätty 205 pohjoismaisesta yrityksestä vuosilta 2016–2019. Johdannaisintrumenttien käyttöön liittyvä aineisto on kerätty yritysten vuosikertomuksista. Tutkielmassa on myös hyödynnetty yrityskohtaisia muuttujia, kuten yrityksen kokoa, velkasuhdetta, kannattavuutta sekä vientisuhdetta. Aineisto on lisäksi jaettu myös yrityksen sijainnin sekä toimialan mukaan.

Tämän tutkielman tulokset osoittavat, että aktiivisesti valuuttakurssiriskiltä suojautuvat Pohjoismaiset yritykset on usein arvostettu korkeammalle. Yrityksen arvopreemio on jopa 25 % Pohjoismaissa. Myös tämän tutkielman tulokset osoittavat, että tulokset yrityksen arvon ja valuuttakurssin suhteesta eivät ole yksiselitteisiä, kuten aiempi kirjallisuus on usein maininnut. Ristiriitaisia tuloksia esiintyy erityisesti eri maiden sekä toimialojen välillä. Kattavimmat sekä luotettavimmat tulokset kuitenkin viittaavat siihen, että valuuttakurssisuojautuminen vaikuttaa useammin positiivisesti yrityksen arvoon.

AVAINSANAT: Suojaaminen, riskienhallinta, valuuttakurssiriski, yrityksen arvo, FX

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Abbreviations

FCD	Foreign Currency Derivative
FX	Foreign Exchange
OTC	Over-the-Counter
ROA	Return on Assets
R&D	Research and Development
US	the United States

1 Introduction

The rapid growth of international markets since 1990s has meant that firms around the world are using more managerial and financial resources in risk management than ever before (Hagelin, 2003). Meanwhile, risk management decisions and theories remain one of the most discussed matters in financial research (Geyer-Klingberg et al., 2019, Krause and Tse, 2016, & Froot et al., 1993). In financial literature, risk management incentives are well-established and applied into financial studies regarding the modern-day business environment. Managements are often aware of any business-related risks, and therefore firms are participating in risk management activities as it is seen important for the business. Multiple academics have concluded that nonfinancial firms are mainly using currency derivatives for increasing firm value and reducing the FX exposure (Hagelin, 2003, Allyannis et al, 2013, Arnold et al., 2014, and Bessler et al, 2019).

However, consensus regarding the firm value impact of hedging practices remains unreached as the results are largely mixed even after extensive research on the topic of risk management. Financial literature suggests few possible value-enhancing qualities of hedging practices. Capital market imperfections such as reduced costs of financial distress, reduced cost of taxes, and managing underinvestment risk when considering the cost of external financing options are often listed as the main hedging incentives in prior literature (Hagelin, 2003). Also, managerial issues, and firm-specific factors are often suggested to imply hedging positive attitudes within firms, especially in more recent studies.

Foreign exchange rate exposure arises through direct and indirect risk sources. Hence, foreign exchange rate, or in fact any of the market risks, are challenging to measure and quantify properly for risk management purposes. For market risks, the perfect hedge does not exist in practice as risk source can be faced through direct transactions, customers, suppliers, or even industry competition. For financial FX hedging, recognizing the time horizon and source of the risk can be more crucial when making the hedging decisions (Gezcy et al.,1997).

Most theoretical suggestions on why currency hedging should impact positively on firm value are based on the view that firm's cash flow volatility is reduced, or major losses created by fluctuations of foreign exchange rates are avoided. Multiple papers argue that the global and extensive use of currency derivatives should indicate that there could be firm value benefit from hedging the FX risk. Even if the hedging arrangement is not extremely successful, it should not destroy firm value significantly (Blomvall & Ekblom, 2018, Bartram, 2000, and Allayannis & Ofek, 2009).

This thesis concentrates on the Nordic markets where risk management impacts are not that broadly studied as in the larger markets of United States and Europe. This thesis attempts to find if FX hedging creates firm value in Nordic nonfinancial firms during the years 2016-2019. A study by Brunzell et al. (2011) suggests that hedging incentive dominates also in the Nordic markets and currency derivatives are widely used, which is also supported by the data sample of this thesis. In total, 78% of firms in the sample have declared of using currency derivatives. Prior studies have also found weak but supportive results in regards of positive firm value impact from hedging in the Nordics. Especially Sweden has been associated with positive hedging premiums.

The importance of financial hedging studies is highlighted by the steady growth of derivatives markets and currency derivative users in the markets. Geyer-Klingeberg et al. (2021) demonstrate in their study that derivative trading volumes have grown over 400% between the years of 1995 and 2016. Geyer-Klingeberg et al. also analyze multiple studies from around the world and find that more than 50% of firms hedge the FX risk. Furthermore, currency hedging is stated to be the most important reason for hedging policies in 84% of US firms in the study by Aretz & Bartram (2010). This shows that foreign exchange rate risk management is considered important topic and worth the used resources in most firms. When also observing the sample of this thesis, it can be concluded that the excessive attention towards currency hedging is a global phenomenon.

1.1 Purpose of the study

The purpose of this thesis is to provide evidence on the firm value impact of financial FX risk management in the Nordic markets of Finland, Norway, Denmark, and Sweden. Hedging incentives and firm value impact are well-studied in prior literature, but the research is mostly concentrated on larger markets. Results are also often found to be mixed. The Nordic market environment offers interesting basis for risk management study as all countries are similar by characteristics and legislations, but still have distinctive differences such as the domestic currencies and respective industry distributions. This thesis also attempts to provide evidence on any distinctive differences in value impact of FX hedging between different industry sectors and countries.

1.2 Structure of the study

This thesis is organized as follows. In the following chapter the paper provides insight to the theoretical background of foreign exchange rate risk management and financial risk management practices. The following chapter presents the review of prior literature regarding FX hedging and firm value. Literature review gives throughout idea on why firms might be hedging the FX risk, how firms are hedging the FX risk currently, and essentially if FX hedging does have any firm value effect according to the prior literature. Data and methodologies are presented before the empirical part of the thesis.

2 Theoretical background

This chapter of the thesis covers the theoretical background for foreign exchange rate risk and financial risk management. This chapter should provide a supportive background of foreign exchange rate exposure and corporate risk management practices to understand how foreign exchange rate risk hedging could affect firm value.

2.1 Foreign exchange rate risk

The foreign exchange risk is integral part of the international finance as it is one of the elements of systematic risk. Significant and unforeseen fluctuations in exchange rates, interest rates, or commodity prices may result in substantial changes in firm profitability and firm value (Bessler et al., 2019). These risk elements are often referred to as market risks or undiversifiable risks. These definitions are suitable for these risks as these factors cannot be completely avoided in the markets by extensive diversification. All market members are exposed to the market risks directly or indirectly as market risk exposure can also be encountered indirectly. Indirect exposure can be triggered through customers, suppliers, or external financing, which makes the risk management practices even more crucial for corporations around the globe. Recognizing the impact of market risks is an important aspect of any firm's operational decisions and investment portfolios.

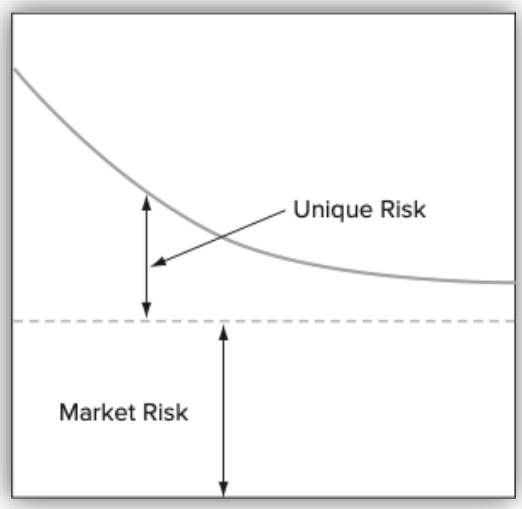

Figure 1. Firm-specific risk and market risk (Bodie et al., 2018).

In general, firms are exposed to foreign exchange rates in all their business activities as exchange rates fluctuate continuously. This is especially true in today's global market where most firms are genuinely involved in international trading and are considered multinational. Firms are exposed to FX risk when their cash flows and market value are influenced by any abnormal fluctuations in foreign exchange rates between different currencies. This applies also to other market risks, interest rate and commodity price risks. (Bodie et al., 2018 and Hagelin & Pramborg, 2005)

In short, the exchange rate is a ratio between two currencies which is used in trading conducted in the specified currencies. Fluctuations in foreign exchange rates are rarely linked directly with any macroeconomic factors, which are on the contrary often linked with fluctuations in interest rates. The volatility of foreign exchange rates can be extremely high and difficult to analyze based on economic fundamentals. Many analysis tools are also regarded to be relatively weak in predicting foreign exchange rate movements and any related firm-specific exposures. Hence, interest towards risk management of FX exposure is especially high for investment purposes as most firms investing expansively are eager to lock in any unpredictable financial exposures in their investment projects. (Marroni & Perdomo, 2014)

According to Bartram (2007), most of the US companies are considerably exposed to at least one currency and the risk that this currency imposes. For US firms, exposures to Canadian Dollar, Euro, and Japanese Yen are the most common currencies causing the exposure. For European firms, currency exposure is mostly caused by the US Dollar or Euro, if the firm is operating in a country with a national currency, such as Norway, Denmark, and Sweden studied in this thesis. According to O'Brien (2017), large research in more than 55 different countries has found that 76% of total firms are exposed to FX risk in some way. Bartram (2000) finds similar results that 96% of firms are hedging the FX risk. Even firms operating in domestic markets are found to be generally exposed to foreign exchange rate risk.

2.1.1 FX risk exposure

As mentioned, foreign exchange risk is one of the most fundamental market factors affecting firms globally. As the exposure is not always easily monitored and measured, forward-looking and proactive risk management measures are often required. Geyer-Klingeberg et al. (2019) argue that managing market risks can often be labelled as taking speculative stands on future market signs. As market risks have a market-wide influence that cannot be fully avoided in the markets, firm-specific characteristics such as industry and location cause conditions where changes in foreign exchange rates affect firms differently depending on the type and extent of FX exposure firms are facing. Hence, FX risk exposures rising from the different sources must be considered and measured sufficiently for effective risk management treatment. The FX risk can be considered a challenging risk to manage and recognize due to the varying types of exposures. Foreign exchange rate exposures can be classified into three types of risks which are regularly referred to as translation risk, transaction risk, and economic risk (Hagelin, 2003 & O'Brien, 2017).

According to Hagelin & Pramborg (2005), the primary sources of FX exposure are FX rate changes in contractual transactions or uncertain cash flows generated by the firm's income from producing assets. This is often referred to as transaction risk. *Transaction exposure* is described to be faced in potential changes in the value of future cash flows which are caused by unanticipated changes in exchange rates. Transaction exposure is mostly caused by the firm's operational transactions meaning that firms are buying raw materials or services in foreign currency to fulfill their operational commitments. This means that firms have agreed to receive or make payments in foreign currencies where the transaction is exposed to changes in foreign exchange rates. Transaction exposure caused by foreign currency-denominated transactions is usually a short-term risk element on a firm's cash flows as most single or short-term contractual transactions are usually known, and exposure can be more precisely measured and anticipated (Martin & Mauer, 2003). Hence, financial hedging with derivative instruments can be a relatively effective method to mitigate the FX risk faced by transactional exposure.

Hedging transaction exposure can increase firm value by smoothening the unexpected changes in the firm's cash flows and by reducing excess costs related to financial distress and underinvestment. The importance of currency risk hedging for cash flow smoothing and profit stabilization was also mentioned in many annual reviews used for collecting the data for the empirical part of the thesis (A.P. Moller-Maersk A/S, 2019 and KONE Oyj, 2019).

The second type of FX exposure, translation exposure elevates from financial accounting practices of financial statements where foreign subsidiaries statements are translated into the currency of the parent company. Translation exposure is commonly disregarded in financial literature as there are no manageable methods to counter this exposure according to Hagelin (2003). Translation exposures are most commonly unrealized in financial statements and have almost no effect on future or anticipated cash flows. According to Hagelin, these unrealized exchange rate gains or losses are also bad estimators of the real value, and hence inefficient in exposure risk management. This is the reason why most of the firms utilizing currency hedging in the markets are pursuing to hedge only against the transaction exposure of the FX risk. Thus, corporate hedging views translation exposure purely as an accounting exposure rather than something truly affecting firm values significantly (Moffett & Karlsen, 1994).

According to Hagelin & Pramborg (2004), exposure to foreign exchange rates can also be derived from also from external competition. Unfavorable fluctuations can create situations where a firm's products or services are less competitive or more expensive in foreign markets. This FX risk factor is often referred to as *economic exposure* or *competitive exposure* to the FX risk. Competitive exposure is often faced through lagged and more long-term effects when compared to transaction and translation exposures. Hence, most firms are making proactive operational choices to mitigate the impact of economic exposure on firm value. The long-term nature of economic risk exposure makes it also more complex to avoid and hedge against, as the effect is generally

continuous and indirect in a firm's operations. For longer-term exposure, operational hedging practices should be more effective than hedging with derivatives as the exposure cannot be measured that effectively.

Economic exposure is a combination of a firm's structural function, and the competitive operating environment firm is engaged (Moffett & Karlsen, 1994). Martin and Mauer (2003) describe that this indirect economic exposure can arise from market changes in sales prices, sales volumes, and the costs of inputs of the firm and its competition due to the changes in FX rates. Unanticipated changes in foreign exchange rates then affect the cash flows and profitability of the firm in the long-term which is challenging to estimate accurately due to the lagged effects. This could for example mean that for firms operating largely in a country where the local currency is strengthening, importing goods and material for production and sales is a lot cheaper than for the firms operating in other currencies. Consequently, the firm in the stronger currency markets can hold their product prices or even reduce them to gain more customers, while other firms might even need to increase their prices or cut their sales margins to survive in the competitive industry. Hence even domestic firms are facing foreign exchange rate risk as the competitive environment of substitute products can change due to market risks applicable to all firms regardless of their operative strategy (Marston, 1996). The general growth of globalization has led to the situation where domestic firms face increased competition cross-borders, especially in Europe.

As economic exposure hedging is more difficult to recognize and measure, this thesis concentrates mostly on financial hedging of transaction risk which is commonly reported by firms on an annual basis. However, Moffett and Karlsen (1994) estimated that approximately 30% of European multinationals were actively hedging the competitive FX exposure already in the early 1990s so it can be mentioned that economic exposure should not be disregarded completely.

2.1.2 Measuring FX exposure

Bartram and Bodnar (2007) explain that foreign exchange rate exposure is principally connected with a firm's international operations, firm size, firm liquidity, and industry. This is the reason why these specific control variables are also used in this thesis. The paper also demonstrates that there is real evidence of a significant FX exposure effect in firm value in multiple prior research, which is also supported by the connection between the volatility of exchange rates and stock prices. According to the authors, FX exposure is often found to be significant for most firms. However, according to their results, the FX exposure is not as significant for as many firms as is suggested by the prior literature, even though the exposure is certainly evident in the earlier results. Their results show that only 25% of firms have significant FX exposures which is largely lower than what is often measured in prior studies. However, especially industry-related factors, such as competition and product types can generally make a significant difference in the magnitude of the faced FX exposure (Bartram, 2007).

As mentioned, a firm's foreign exchange rate exposure is affected by the firm's international activities, industry, firm size, and country of origin. Surprisingly, European firms operating mainly domestically appear to be more exposed to unexpected and sizeable exchange rate fluctuations (Hagelin & Pramborg, 2004, and Parlapiano et al., 2017). It can be expected that domestically operating firms are smaller than multinational firms. Firm size is also linked with reduced foreign exchange rate exposure, meaning that smaller firms would have larger exposures than large firms. This could be an indication of economies of scale where larger firms are more often participating in financial hedging than smaller firms. Also, larger firms are more likely able to implement effective operational measures to tackle the economic FX exposures. As larger firms are often multinational, they can have production and sales in many locations and currencies enabling natural hedges against foreign exchange rates as transactions and contracts can be prepared in local currencies in the foreign subsidiaries. In conclusion, it can be said that foreign exchange rate exposure increases when the amount of foreign currency

revenues and costs increase, but the total exposure also declines when firm size increases.

Measuring a firm's FX exposure can be difficult and measures can also vary depending on the type of exposure faced. As mentioned, measuring the short-term transaction risk on cash flows can be rather straightforward due to contractual factors and business forecasts prepared within firms. Translation risk can also be estimated on a somewhat accurate basis by modelling the accounting difference caused by uncertain foreign exchange rate fluctuations. Longer-term economic exposure is more complex to measure and hedge as described earlier as it can only be based on speculation or historical data while making operational decisions.

This thesis uses the one-sided measure of FX exposure in the empirical part due to its simplicity and indicative feature. The export ratio uses only the percentage of foreign sales of the total sales. This indicates the international weight of a firm's sales and contractual exposures and hence it is used by many prior papers according to Hagelin & Pramborg (2004). Measure of net exposure includes both import and export activities in foreign currencies which should give more accurate results on the total FX exposure from an accounting perspective. However, Hagelin & Pramborg argue that this measure fails in reaching significant results in empirical analysis due to many firms having insignificant FX betas. Cash flow-based FX exposure models would be effective in mitigating the transaction and economic exposure to foreign exchange rates. However, modelling these measurements is described to be challenging due to the data restrictions and limitations when considering global corporations. This is why most academic research on FX exposure tends to rely on accounting or equity return data rather than cash flows (O'Brien, 2017 and Krapl & O'Brien, 2014).

2.2 FX risk management

Importance of financial hedging cannot be overlooked in global firms which are extremely common in the modern-day markets. Currency risk is a major element of modern financial markets, and managing the FX risk can often be considered difficult. That is not surprising as currency derivatives can easily be complicated by structure and firm's total exposure can be difficult to estimate accurately. (Pirie, 2017)

2.2.1 Risk management incentives

Determinants of currency hedging, and overall risk management are well-studied in the financial literature. Risk management theories and empirical studies on shareholder value maximization present expectations that capital market imperfections are the main reason why nonfinancial firms should be able to create firm value from risk management. Hence, there should be meaningful hedging incentives (Bartram, 2008, Froot et al., 1993, Bartram et al., 2009, Hagelin & Pramborg, 2005, Arnold et al., 2014, and Geyer-Klingberg et al., 2019). According to the financial theory, firm-level risk management is needed as capital market imperfections ensure that individual shareholders cannot reproduce the relevant risk hedging on their own. Capital market imperfection related determinants might be relevant for optimal hedging strategy, but the theoretical background rarely represents the realistic and current business environment companies are operating.

First of the main imperfect capital market hedging incentives is the *cost of financial distress* (Gezcy et al, 1997, Fok et al., 1997, Bartram et al., 2009, Geyer-Klingberg et al., 2019, Froot et al., 1993 and Bartram, 2007). Financial theory suggests that by reducing financial distress costs, firms can reduce cash flow volatility and create firm value. The cost of financial distress is explained in the studies to consist of indirect elements such as losing valuable customer and vendor partnerships, and increased pricing for external financing. Financial distress costs are constant across all companies as the expected costs of financial distress are consistently higher for firms with lower coverage ratios (Gezcy et al., 1997 and Froot et al., 1993).

An increase in financial distress probability is caused by increasing volatility in firm value and the firm's future cash flow. Fok et al. (1997) recognize that the larger the firm's debt relative to the firm value, the higher the probability of bankruptcy. Hedging is said to decrease the probability of financial distress by ensuring sufficient liquidity, and hence less money is required to ensure a stronger financial position for the firm to meet all its financial obligations. Hedging should hence allow firms to increase their debt capacity (Froot et al., 1993). According to Arnold et al. (2014), hedging also allows firms to reduce the costs of financial distress without sacrificing the tax benefits of debt financing available in many countries.

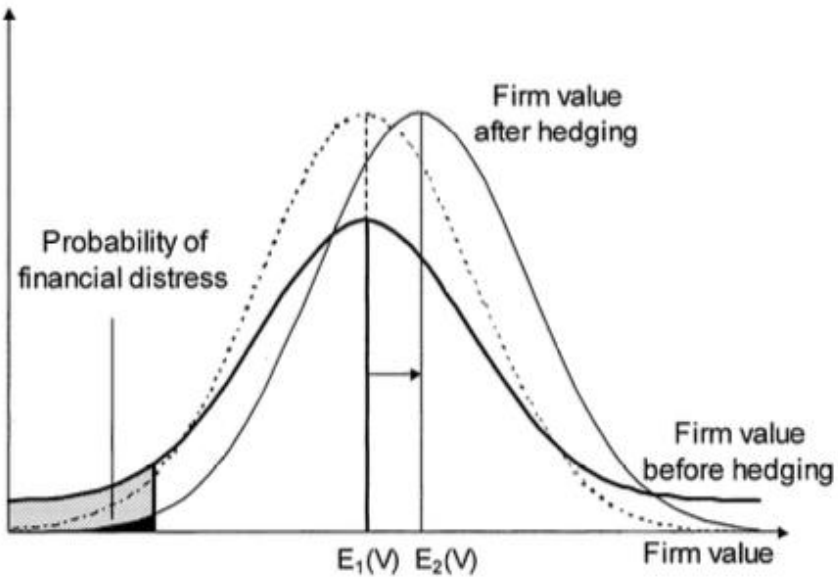

Figure 2. Impact of hedging on the cost of financial distress (Bartram, 2000).

The second imperfect capital market aspect is often considered to be *taxation* (Cezcy et al., 1997, Bartram, 2007 and Geyer-Klingeberg et al., 2019). According to the theoretical predictions, hedging should reduce the unexpected variances in the firm's cash flow which would increase predictability in the firm's earnings. This increased predictability is reflected in taxable income calculations, which could be then utilized better in a firm's tax function planning for tax refunds and other tax benefits. Thus, hedging should create more constant earning streams lowering the average yearly tax liability. Gezcy et al.

consider that cost stability in taxation should be positively linked with firm value. However, according to Arnold et al. (2014), this hedging incentive applies only if the operating country is applying a convex marginal tax program, where the tax rate increases according to the firm's earnings.

The theoretical prediction of financial distress cost and taxation as a hedging determinant indicates that companies with higher leverage, shorter debt maturity, and lower coverage ratios are increasingly likely to hedge their foreign currency exposures by using financial derivatives. On the other hand, firms with greater profitability, high dividend yields, and higher percentages of tangible assets should be less likely to hedge currency risks as their cash flows are in most scenarios more secure, and the probability of extreme financial distress is lower. (Bartram et al., 2009 & Froot et al., 1993)

The third hedging incentive in financial theory is *agency conflicts and risk aversion*. In short, reducing the risks related to a firm's value, hedging reduces the appeal of riskier assets for the shareholders of the company (Bessler et al, 2019, Gezcy et al., 1997, Froot et al., 1993, and Hagelin, 2003). When risk-aware manager own shares of the company, their wealth can be significantly affected by the performance of the company due to undiversified positions. Therefore, their personal wealth is substantially dependent on the firm's value, which in theory should create internal conflicts due to the biased managerial self-interests in risk management (Arnold et al., 2014). This means that risk-averse managers would direct the hedging strategy so that it is less costly to share price than if managers would alternatively hedge the risks on their accounts. Risk-aware managers demand increased compensation for carrying the additional wealth risk or otherwise managers might follow their own self-interests in the decision making. This explains why companies having the considerable managerial option or stock ownership programs should be more actively participating in the financial derivative markets (Gezcy et al, 1997 & Bessler et al., 2019).

Fok et al. (1997) add one additional dimension to the managerial agency conflict theory. They expect that institutional ownership should reduce the opportunistic attitudes of the managers, as institutional owners are scrutinizing the managers more extensively than private shareholders. In consequence, managers are more likely to engage only in value-creating projects, such as hedging.

Finally, the fourth generally discussed hedging incentive is *growth opportunities* or *underinvestment cost*. Firms use financial hedging to decrease the volatility in their cash flows and earnings (Gezcy et al, 1997). This reduction gives firms stability and predictability which enables firms to take increased risk by investing more into valuable growth opportunities. Less predictable cash flow could otherwise make the investment decision riskier and therefore more difficult, which could alternate the final investment decision compared to the situation where the company had managed the foreign currency exposure (Lau, 2016, Fok et al., 1997, and Hagelin & Pramborg, 2005). Firms having many valuable growth opportunities should have strong incentives to hedge if hedging reduces the cost of debt.

The cost of financial distress and valuable investment opportunities are often linked with underinvestment problems in financial literature (Gezcy et al., 1997 & Arnold et al., 2014). Prior risk management theories have described that without appropriate hedging strategy, firms are likely to launch investment projects which are not optimal for growth and firm value or are partially less optimal than projects which could instead be enabled by successful risk management (Bartram et al., 2009 and Gezcy et al., 1997). Financial theory also predicts that an underinvestment problem can occur if shareholders and debtholders have differing interests. As hedging can aid firms by reducing the probability of financial distress, hedging should reduce the probability of underinvestment issues as the lowered volatility in cash flows allows more external and internal financing to be concentrated on investment projects. The underinvestment issue is more prominent in firms with higher leverage ratios, which are actively aiming for significant growth and are completing more investment projects (Bartram, 2009).

Finally, geographic differences and culture can also significantly affect the risk management determinants in firms. Economic, regulatory, and financial environment aspects can have important effects on the decision-making in all firms (Geyer-Klingberg et al., 2019 & Bartram et al., 2009). In recent years, political risk has also increased as legislation has been reviewed more actively. Especially climate change and sustainability-linked themes have been highlighted in many regions which can have significant effects on many industries globally (Geyer-Klingberg et al., 2019).

2.2.2 Financial FX hedging

Bartram (2000) explains that in equilibrium there should not be any reason for hedging as any negative effects are instantly replaced by offsetting developments in another risk or economic factor. Related theories such as the International Fisher Effect and Purchasing Power Parity are holding in equilibrium, but empirical research has proven that this does not hold in practice. These theories can hold in long-term observation horizons, but especially short-term movements can still be significant and impactful if not hedged.

Froot et al. (1993) summarize the basic logic behind risk management of foreign exchange rate risk by explaining the expected impact of hedging on a firm's cash flow. If a firm does not hedge the risk, they can expect variability in the cash flows by the assets already controlled. Froot et al explain that internal cash flow variability can either arise from changes in the availability of externally raised money or changes in the availability of valuable investment opportunities. Constant and unpredictable variability in cash flows disturbs negatively both investment projects and financing decisions. Hence, Froot et al. summarize that FX risk management should reduce the variability of a firm's cash flows and increase firm value.

According to Allayannis et al. (2012), financial derivatives can be used for hedging, managers' self-interests, or speculative purposes. However, multiple papers have presented that firms are primarily using financial derivatives for hedging the concrete

foreign exchange risk rather than using the instruments for speculative purposes (Bartram, 2000 and Allayannis & Ofek, 2009). Papers also agree that most multinational corporations are primarily hedging the transaction risk with financial instruments.

Financial hedging strategies are in principle not designed to anticipate the financial markets. The idea of financial hedging is to reduce or eliminate the risk connected with market fluctuations which cannot be predicted completely based on historical data (Horcher, 2011). Even some technical tools for estimating the FX exposure and FX fluctuations are considered to be weak in accuracy (Marroni & Pedromo, 2014). Predicting foreign exchange rate movements is rather difficult even if the FX exposure could be well estimated in firms. Financial hedging allows firms to estimate their cash flow impact of foreign exchange rate risk by locking the exchange rates for any future transactions. For example, receivable future cash flow denominated in foreign currency can be hedged by selling a forward contract in foreign currency (Pirie, 2017). This transaction locks the exchange rate to the one desired in the forward contract. Even if the foreign exchange rate contracts can hedge large portions of the FX exposure, in practice financial hedges are never able to create complete elimination of the risks. In simple terms, a perfect hedge does not exist (Bartram, 2000, Chod et al., 2010 and Geyer-Klingeberg et al., 2019).

Perfect or optimal financial hedging is difficult to achieve in practice. When attempting to model a perfect financial hedge, a firm enters the financial markets to acquire financial instruments which would generate positive cash flow for the firm during unstable and low-demand markets. Usually, this financial instrument is bought to offset any potential negative cash flows that could occur if markets move in an unfavorable direction or there is transactional uncertainty. This is the reason why financial hedges are usually imperfect (Chod et al., 2010). It is also important to note that hedging contracts often come with a cost that is associated with either buying the contract or the transaction itself. This cost or hedging premium should be considered as the maximum loss in any optimal hedging scenario. Thus, the maximum loss that a firm can face should

be the cost of acquiring the hedging contract. On the contrary, if the market moves unfavorably for the underlying asset of the initial exposure, a firm should receive the maximum payoff that should offset any losses made from the market movements as argued by the paper by Chod et al. (2010). This general idea of the relationship between payoff and optimal hedge can be observed in Figure 3.

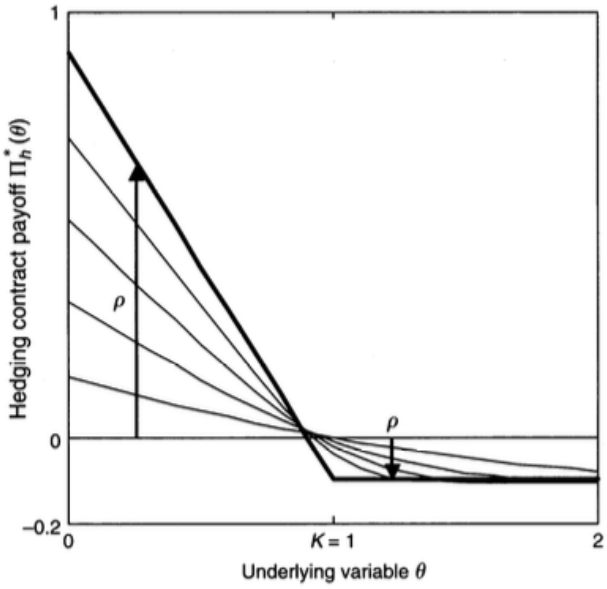

Figure 3. Payoff of the optimal hedging contract (Chod et al.,2010).

The indicative findings that a high percentage of multinational firms are using FX hedging instruments globally, should signal that there is potential for FX hedging to create firm value. At worst, hedging should not be significantly destroying firm value as firms and shareholders are willing to practice financial hedging so actively. As mentioned, it is argued that capital market imperfections are the main reason why hedging should be value value-creating tool in the field of risk management (Blomvall & Ekblom, 2018 and Bartram, 2000). In general, firm value can be increased by lowering the discount rate of net present value-creating projects or by increasing the firm's cash flows. In most cases, firms decide to use financial hedging for streamlining their cash flows which reduces the volatility in both cash flows and firm value. In addition to polishing the cash flow volatility, hedging the FX risk reduces the probability of low firm value in comparison to firms not

using hedging strategies. Similarly, the number of firms with higher firm value should increase. This is well-presented also in figure 4. (Bartram, 2000)

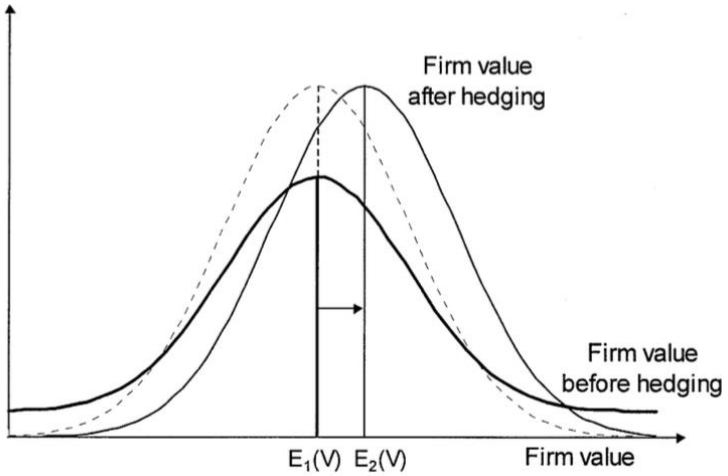

Figure 4. The effect of hedging on firm value (Bartram, 2000).

According to Pirie (2017), for financial hedging to be efficient for risk management purposes, there must also be speculators in the financial markets who are willing to accept the risk carried by the firms. Speculators are generally hedge funds and other professional investors who are willing to make riskier investments to make higher profits. Speculating for extra profits is linked with an increase in firm risk (Brunzell et al., 2011). From nonfinancial firms, almost 50% have declared to take speculative derivative positions to some extent (Bartram, 2019). However, this behavior is more often linked to taking speculative positions on the direction and volatility of the foreign exchange rates rather than taking speculative positions to make large profits. Some academics have called this betting on the market movements (Pirie, 2017 and Bartram, 2019).

2.2.3 FX hedging instruments

As previously mentioned, using financial instruments for hedging in multinational corporations has become the standard practice (Bartram, 2000). Effectively, using financial derivatives to manage FX risks exchanges the faced FX exposure to risk exposure against the counterparty of the deal. Thus, the firm is no longer facing FX risk but instead faces counterparty risk which can and should also be managed to some extent in

corporations. In short, counterparty risk refers to the possibility that the other party is not able to hold their side of the obligation which could lead to a situation where some future cash flow payments will not materialize.

Research by Hagelin (2003) states that it is evident that larger firms are using more financial derivatives to hedge their foreign currency risk which could indicate that fixed costs are creating hedging barriers for smaller firms when examining potential risk management opportunities. Economies of scale have also influenced this as larger firms are able to create more efficient and centralized hedging organizations to manage their financial risks. Hedging with derivatives usually reduces the foreign exchange rate risk in the short-term horizon only. This is the reason why most firms use financial hedging against transaction exposures (Bartram, 2000 and Bartram & Bodnar, 2007). Approximately an average firm in Europe hedges 90% of the transaction risk with financial instruments (Hagelin & Pramborg, 2004).

Forwards are the most used derivative instruments to hedge foreign exchange rate exposures alongside currency swap contracts (Horcher, 2011). In principle, forward contracts are customizable agreements between two different parties where the other party agrees to buy the underlying asset at the time of maturity of the contract at a certain price. In currency forwards, an agreement is made to exchange one currency for another on a future date at the previously agreed exchange rate (Pirie, 2017). Currency forwards are especially used to hedge against unexpected exchange rate fluctuations in certain transactions the firm is participating. This means that currency forwards are a great tool to hedge the transaction exposure of FX risk, as the short-term fluctuations in exchange rates of deals are protected in advance. This gives firms assurance that the agreed contract price holds at the time of completing the trade. Hence, forwards can create stability and predictability in a firm's cash flows.

Even if the currency forwards create stable income and cost streams in advance, it still does not eliminate the total currency exposure. The payoff of currency forward is

determined by the difference between the agreed delivery FX rate and the spot FX rate in the markets at maturity (Horcher, 2011). If the foreign exchange rate moves in an unfavorable direction in comparison to the agreed delivery price, the firm has a loss position from the forward contract and vice versa. Hence, forwards are not as flexible for firms which are aiming to take part in speculative trading with their derivative transactions. Also, as non-standardized contracts which can be traded in OTC markets, forwards often carry the additional risk that the counterparty is not able to fulfil their obligation.

C*urrency swaps* are also often used as financial instruments in financial foreign exchange rate hedging. The general function of currency swaps is to allow firms to trade their financial obligations in foreign currency. Firms can use currency swaps to exchange their debt payment done in foreign currency for liability paid in their domestic currency which eliminates the extensive currency exposure from their original contract (Horcher, 2011). Currency swaps might be more beneficial for larger obligations agreed in foreign currency such as financing debt or investment due to the fact that firms need to find corresponding periodic payments from their counterparty. Hence, currency swaps are frequently considered to be a more long-term hedging tool for currency exposures (Clark & Judge, 2009).

In a currency swap, the foreign currency payment swap happens at the beginning of the contract. Over the period of the swap, each party makes regular periodic payments in the desired or domestic currency and receives one periodic payment in the other currency. At the maturity of the currency swap, payments are exchanged back to the initial holders. Effectively currency swaps allow firms to borrow and invest in the locations where they have the greatest benefit and then use currency swaps to exchange the underlying currency of the payment. The gain and loss of the currency swap are determined by the currency forward rates at the time of closing the swap contract. (Horcher, 2011)

Finally, *options* are also used to hedge against the unanticipated foreign exchange rate exposures in the markets. Options are financial instruments where the obligation to buy or sell the underlying asset can be cancelled if the spot value of the asset is not worth exercising at the time of closing the option term. The distinctive difference between options and others previously introduced is that options can expire without obligation to buy or sell any assets. This possibility comes with a cost which is often called option premium. *Option premium* is determined by the type of option contract in addition to other affecting variables and it is effectively the maximum loss that a trading party can face from making the option contract. An *American* option can be exercised at any point before the maturity of the contract while a European option is exercisable only at the time of maturity. When generalized, American options are usually more expensive as conditions for exercising the option are more likely during the contract period. (Horcher, 2011)

In general, gain and loss positions from option contracts are determined by the agreed delivery rate and the spot rate at the markets. When delivery or strike price is below the agreed delivery price or *out-of-money*, the option contract will expire effectively worthless, and the paid option premium will be the maximum loss that can occur. If the delivery rate and strike rates are practically equal, or *at-the-money*, a firm can choose whether it wants to exercise the option contract and receive the underlying assets. When the strike rate is higher, or in-the-money, a firm can make gains by exercising the option contract as the exchange rate movements have been favorable in comparison to the position they have taken. The cost of option premium must still be formulated into the gain calculations as it has already occurred at the beginning of the contract in most markets. (Horcher, 2011 and Pirie, 2017)

Options as a hedging instrument are also more flexible for taking speculative opinion into the hedging strategy of the firm, even if somewhat restrictive in nature. This strategic flexibility is achieved as option contracts do not expose firms to extreme losses

from foreign exchange rate fluctuations while still holding the ability to take advantage of beneficial FX rate movements.

2.2.4 Operational hedging

Due to the measurement difficulties associated with operational hedges, this thesis concentrates primarily on financial hedging in the empirical part of the thesis. It is still important to recognize the complementary FX hedging strategies which are widely used in the firms even if the concrete impacts are often difficult to observe or analyze without being associated with the specific firm. Clark and Judge (2009) argue that operational hedging has previously been associated with increased firm value only when it has been implemented with a strategy involving the use of currency derivatives. According to Bartram and Bodnar (2007), operational hedging should be able to reduce the long-term impacts of foreign exchange rate fluctuations on firm value either by effective pricing practices or by pre-assigned operational flexibility. However, the overall results on value creation and total FX exposure reduction with operational hedging are mixed in prior academic literature. Most studies still agree that financial hedging and operational hedging are complements rather than substitutes meaning that a firm's risk management is at its most effective level when these practices are combined (Chod et al., 2010, Bartram & Bodnar, 2007 and Kuzmina & Kuznetsova, 2018). This element should be particularly important when considering the value-maximation impact of FX hedging.

The first concrete operational hedging strategy against FX exposure is the firm's geographical diversification in operations. A firm that has extensively positioned operations globally can reduce its FX exposure by structuring offsetting exposures to foreign currencies (Pantzalis et al, 2000). When operations are structured in multiple countries, the firm can make sale contracts, financing decisions, and investments in the local currency. This eliminates the long-term exposure to the FX risk included in these financial obligations as payments are done in the same currency and foreign exchange fluctuations are eliminated in the subsidiaries. According to Allayannis et al. (2001),

operational hedging by relocating operations cannot reduce the overall foreign exchange rate exposure as a single hedging tool. Financial hedging would be needed to reduce the exposure. This supports the view that financial hedging and operational hedging practices are complements.

Operational hedging practices also include selective behavior in suppliers and customers alongside the natural hedges of relocating operations. This means that firms should have operational flexibility to emphasize their operations to suppliers and locations where operating is more cost-efficient for the firm's long-term cash flows. This factor can be considered more difficult to implement as long-term partnerships and operations are not quickly changed. This also includes active and intentional choosing based on market views which can also be an expensive practice.

However, relocating operations purely for financial hedging purposes can be considered risky and expensive as the hedging strategy is difficult to implement and abandon in the future (Pantzalis et al., 2000 and Hagelin & Pramborg, 2004). Relocating decisions should in most cases be based on operational and business factors rather than financial hedging purposes to be more natural and effective. Relocating large and important regional businesses also exposes firms to additional business risks which are not necessarily even measurable depending on the operating industry, such as reputation damage or cultural changes.

Lastly, another factor in operational hedging is the contract clauses that a firm can use in its agreements where payments are done in foreign currencies. By agreeing to conduct deals in foreign currencies with greater value, firms can avoid unfavorable currencies or any unexpected and extreme exchange rate fluctuations.

3 Literature review & hypotheses of the study

Nonfinancial firms are heavily involved in risk management in today's market, and it has been one of the most important targets for firms (Froot et al., 1993). According to Bessler et al. (2019), approximately 50% of firms are participating in risk management activities in some capacity. This percentage of firms is constantly increasing in the markets, and the growing demand for risk management is well-demonstrated by the prompt growth of derivative trading volumes in the markets. According to a study by Aretz and Bartram (2010), hedging against foreign exchange rate risk is one of the main reasons for risk management programs for 84% of US companies. Moreover, hedging against interest rates is also an important objective for 75% of the firms which highlights the demand for risk management tools. Most firms hedge to reduce risk, but hedging should also affect firm value positively (Fok et al., 1997). In that scenario, corporate hedging should be a valuable activity to be actively implemented.

The topic of corporate hedging is extremely challenging to model and research. The field is made rather complicated by its multivariate interrelations. For example, the tax hypothesis of hedging incentives can be influenced in multiple ways in any data, such as tax payments, volatility of earnings, and convexity of tax functions. Because of the challenging characteristics and interconnected variables, it has been difficult to create consistent and reliable models across the academic field. Results are often affected by data selection process and methodology used to gather the results. Hence, many academically published papers have addressed the mixed results regarding corporate hedging and firm value. (Geyer-Klingeberg et al., 2017)

3.1 FX hedging determinants

Recently, more evidence has been found that hedging has value effects through the hedging determinants widely studied previously in the financial literature. However, financial literature is not able to provide single and widely accepted consensus on the hedging determinants as many variables appear to affect any hedging decisions made.

As mentioned in previous chapters, capital market imperfections are widely associated as the only value creation-allowing aspect for hedging. However, recent literature is mixed regarding the importance of these imperfection concepts but there are many papers which are still supportive of these hedging incentives. In the paper by Arnold et al. (2014), they discuss that their research model gives a significant proxy for a firm's leverage ratio and current ratio as hedging determinants. This finding they argue to confirm the view of financial theory that hedging is a more important feature in firms which are facing a higher risk of financial distress or bankruptcy. This finding is also supported by multiple papers as it is found that hedging helps firms reduce the associated firm risk (Campello et al., 2011 and Geyer-Klingeberg et al., 2017). This means that hedging would be more important for firms experiencing increased risk of financial distress or bankruptcy. Additionally, Fok et al. (1997) confirm that firms do hedge to reduce financial distress costs and agency costs of debt. This finding is also supported by Allyannis and Weston (2001). In addition, Lin and Smith (2011) find that the use of derivatives reduces the cost of equity which is consistent with the incentive of reducing financial distress costs.

Geyer-Klingberg et al. (2017) find supporting evidence to bankruptcy and financial distress cost hypotheses. According to the paper, positive relation with dividend yield, negative relation to financial liquidity, and positive relation with firm size are firm characteristics strongly connected with hedging decisions and are found to support the theory of financial distress costs.

Taxation related benefits are also linked to value creation from hedging. Decreased probability of financial distress and lower volatility in cash flow should also be recognizable in the expected value of tax liabilities according to the concept of Jensen's inequality (Geyer-Klingeberg et al., 2017, Bartram et al., 2009 & Fok et al, 1997). However, there is no strong evidence that hedging decisions are related to tax benefits or the overall tax function. Fok et al. (1997) did not find any evidence that corporate hedging

reduces tax liability, and this is also supported by Geyer-Klingberg et al. (2017) as they found a statistically insignificantly weak relation between taxes, investments, and hedging behavior.

Agency conflicts and risk aversion issues also face mixed feedback in the prior literature. The research by Allyannis and Weston (2001) explains that prior literature has been confident that evidence supports the hypothesis of managerial risk aversion. This is supported by prior findings on the negative correlation between several option contracts and commodity derivative usage, and the positive connection between hedging activities and the value of stocks owned by managers and firm directors.

Fok et al. (1997) study the ownership structure effect on hedging determinants, and if it has potential firm value incentives. The research is rather supportive regarding the capital market imperfection theories as it accepts the general expectations of reduced financial distress costs, and reduced financing costs. The authors also support the expectation that managerial self-interests are mostly aligned with the shareholders because of the compensation programs, and hence firms are only hedging if it creates value to shareholders. In their analysis, both managerial and institutional ownerships appeared to have significant positive coefficients concerning corporate hedging decisions. This they argue is strong supportive evidence that ownership structure has a substantial force on a firm's tendency to hedge financial risks. However, studies by Arnold et al. (2014) and Geyer-Klingeberg et al. (2019) cannot find any systematic evidence that taxes or managerial issues are influencing factors in hedging decisions in nonfinancial firms.

Investment opportunities as hedging determinants are also rather well supported by recent literature as many papers support that firms with greater investment opportunities are more likely to engage in currency hedging. (Arnold et al., 2014, Gezcy et al., 1997, Fok et al., 1997, Bartram, 2000, Geyer-Klingeberg et al., 2017 and Allayannis & Weston, 2001)

Findings by Arnold et al. (2014) support this view by arguing that they found evidence that underinvestment issues and lack of assured internal funding are motivating the decision to hedge in nonfinancial firms. They also add that the evidence is limited, but still noticeable in the results which are supported also by 10% level of significance on the R&D expense variable in their meta-analysis outcomes. Allyannis and Weston (2001) also support the underinvestment hedging incentive. They explain that the theory is supported by findings regarding the connection between R&D expenses and currency hedging strategies. Gezcy et al. (1997) find that firms with better growth opportunities are increasingly likely to engage in currency hedging. They also emphasized that in this scenario, currency hedging is mostly done by financial derivatives instead of alternative solutions such as foreign-denominated debt. Gezcy et al. conclude that larger firms with better market position, institutional ownership, and higher managerial stock ownership are more likely to use currency derivatives. A paper by Fok et al. (1997) also supports this finding by assessing that larger firms are more prominently active in derivatives markets as they are attempting to secure sufficient financial position to continue the valuable investments into their operations.

The study by Gezcy et al. (1997) continues the underinvestment issue argument by mentioning that in addition to reducing the cost of external financing, currency hedging can also reduce the overall dependency on external financing in firms. With more appropriate risk management strategies, managers can allocate funds and resources to more valuable projects and investments. Firm value can hence also be created by improving internal fund usage (Bartram et al, 2009).

There are also papers that find capital market imperfections less significant as value creation enabling factors for hedging. These papers often consider firm-specific factors to be the most significant aspect of hedging decisions. Analysis by Geyer-Klingeberg et al. (2019) concludes that the most significant factors in hedging decisions are firm size, overall risk exposure, and firm capital structure. Contrary to prior theory and value

creation beliefs, Geyer-Klingeberg et al. find no consistent evidence that firms are deciding to hedge risk exposures to avoid underinvestment issues, for tax benefits, or for managerial self-interests. Common theoretical predictions appear to provide insignificant if any, explanatory power on financial hedging determinants. To this, Geyer-Klingeberg et al. (2017) add by explaining that classical determinants suggested by financial theory cannot fully explain the primary hedging decisions in practice, even if they still hold some basis on the topic. On the contrary, in a study by Geyer-Klingeberg et al. (2017), they describe that firm characteristics such as lower levels of financial liquidity and higher dividend payments are strongly associated with firms actively hedging. The study by Bartram et al. (2009) finds that large and more profitable companies are more likely to perform hedging, which is not consistent with the financial distress hypothesis present in financial theory. Similarly, also the underinvestment hypothesis is supported by findings in prior literature, but Bartram et al. find evidence that firms using financial derivatives often have lower capital expenditures and lower research & and development expenses. These findings are also counter to the underinvestment issue prediction in financial literature.

Moreover, the importance of hedging determinants affecting firm value is not necessarily the same in all geographical locations, explaining why companies can decide to hedge for different reasons around the globe (Geyer-Klingberg et al., 2019). They find in their study that particularly financial distress costs, managerial risk awareness, and availability of hedging substitutes have major geographical differences as hedging determinants. Firms in the United States were significantly more likely to hedge due to financial distress costs, even if the leverage ratio appeared to not be a significant influencing factor in the study by Geyer-Klingeberg et al. (2017). Companies in the US were also found to be more attracted by financial derivatives as the market is more well-established compared to other regions. In Europe, firms are more likely to hedge due to managerial risk aversion when compared to the United States (Geyer-Klingeberg et al., 2019). It was found to be evident that this was due to extensive stock and option

ownership programs Additionally, country-level risk exposures are found to vary massively depending on the region and sources of exposure.

Also, firm-specific factors are found to be more relevant for the decision to hedge than classical financial theory. (Geyer-Klingeberg et al., 2017 and Bartram et al., 2019) These mentioned firm-specific characteristics include leverage, debt maturity, liquid assets, dividend policies, and even operational hedging strategies. Firms with higher human capital investments are also more likely to hedge currency exposures (Hagelin, 2003). In more recent papers, R&D expenses and tangible assets appear to have a weaker relation with hedging than in earlier studies on corporate hedging which can also be observed when looking into papers supporting the underinvestment incentive.

Research by Bartram et al. (2009) conducts a large study containing 80% of the global market capitalization in nonfinancial firms. Bartram et al. argue that their massive data sample increases the power of statistical examinations and allows more comprehensive comparisons and analysis between different sub-samples. Bartram et al. explain that corporate risk management determinants might not follow the traditional capital market imperfection theories. Strong evidence provided proves that even if some findings are partly supporting the theoretical incentives, for multiple determinants the results are visibly inconsistent. Contradicting findings are surprisingly common for the most explanatory determinants analyzed in the research. Bartram et al. conclude their research by saying that the traditional financial theory is unlikely to provide any robust and consistent conclusions on the hedging determinants even if the sample is alternated.

Finally, Allyannis and Weston (2001) test in their research if there is a possible reverse causality between currency derivatives and firm value. This would mean that firms with higher firm value would more prominently decide to hedge, and on the other hand firms with lower firm value would decide to not hedge FX exposure. However, Allyannis and Weston reject this theory as they do not find any evidence to support the theory.

3.2 Corporate FX hedging strategies

Financial literature also covers the level and type of a firm's hedging activities in addition to overall hedging strategies. Corporate hedging activities are often associated with risk elimination and speculation. As mentioned previously, firms are primarily using financial instruments for hedging the FX risk rather than for speculative purposes (Bartram, 2000, Allayannis & Weston, 2001, and Allayannis & Ofek, 2009). However, there are exceptions as almost 50% of firms have declared to take some speculative view into their hedging positions (Bartram, 2019).

Instrument selection can be one of the most difficult challenges in any firm actively pursuing hedging benefits. Financial literature finds that the source of the currency exposure and firm characteristics are related to derivatives use and the selection of financial instruments used in the hedging strategy (Gezcy et al., 1997 and Clark & Judge, 2009). According to the papers, exposure related to higher volume of foreign operations is more commonly hedged by forward contracts only, or by forward contracts together with options and futures. These financial instruments are generally short-term contracts and can be used to hedge transactional activities. Exposure connected to foreign operations was found to be rarely hedged by currency swap contracts. This finding was justified by the nature of export transactions, which are generally frequent short-term contracts where actual money movement is settled only after the transaction or contract has been finished. Depending on the business and industry, pricing can also vary during the period of transaction if preliminary pricing is used more often. Hence, there is less certainty in the contracts, so firms are more prepared to hedge their currency positions.

Gezcy et al. (1997) find that currency risk associated with foreign debt is often hedged by currency swap contracts. Currency swaps are single transaction and long-term strategies which are more suitable for foreign debt exposure as these transactions are less frequent but certain for the entire length of the debt agreement. Clark and Judge (2009) describe that currency swaps and foreign currency debt are generally used to

hedge foreign exchange rate risk triggered by assets located in foreign countries, such as factories, terminals, or machinery and equipment.

According to Froot et al. (1993), hedging strategy is determined by multiple factors. Hedging strategy can also be affected by the source of the foreign exchange rate risk, and the total exchange rate exposure of investments and the firm's revenues. Froot et al. mention that some international companies could want to establish a fixed quantity of investments in each operating country by hedging the currency risk exposure, but overall industry competition and firm characteristics are the most relevant for most firms in decision-making regarding the hedging strategy. Froot et al. emphasize in their early study that optimal hedging strategy rarely involves eliminating risks from a firm's operations.

Bartram (2007) argues that many firms tend to strategically consider and hedge against the more larger exchange rate movements. This would mean that firms are often more exposed to exchange rate fluctuations which are smaller in value, but more continuous. This will lead into a situation where large exchange rate changes are only marginally more significant for firms hedging the FX risk.

Fok et al. (1997) studied corporate hedging determinants and found that firms tend to use both financial and operational hedging for risk management. This indicates that derivatives and operational hedging are complements in risk management rather than limiting alternatives. However, operational measures are mostly used to counter the long-term effects of extensive foreign exchange rate exposure.

Bessler et al. (2019) find recent and strong evidence that selective hedging is applied in certain industries which could interfere with any potential value effects from hedging. This raises more implications that in certain industries, companies are weighing trade-offs between speculative trading and firm value effects. Geyer-Klingberg et al. (2019) mention that regional differences are also influencing hedging strategies. The study

mentions that determinants previously found are well-studied but not all hedging determinants hold similar importance in all geographical locations. Also, certain cultural environment aspects can determine the willingness to make speculative trading decisions which supports the view that most companies are using financial derivatives for hedging purposes.

In addition, when considering the level of firm's hedging activities, it is explained in the study that firm size, interest coverage, and managerial option ownership were found to be the most noteworthy factors in the decision on degree of hedging (Geyer-Klingeberg et al., 2017 and Bartam, 2007). This is also aligned with the paper by Gezcy et al. (1997) where the authors found that larger firms with higher managerial stock option ownership are more prominently present in hedging markets. The only consistently relevant country-level factor in hedging magnitude decisions appears to be the size of the local currency derivative market. This supports the view that firms affiliated with more supply needs, are more actively hedging their risk exposures (Geyer-Klingeberg et al., 2017 and Bartram et al., 2019).

In their study, Froot et al. (1993) conclude that when a firm's cash flows are more closely correlated with future investment opportunities, firms are more unwilling to hedge extensively. Similarly, when firms' cash flows are more correlated with collateral values and the ability to raise external capital, firms are more willing to increase their hedging volumes. In addition, Bae et al. (2017) find that in Asian markets firms with larger FX risk exposures are more likely to engage in noticeably greater currency derivative transactions which aligned with the expectation in prior financial literature.

3.3 Firm value implications of FX hedging

As managing market risk exposures, such as foreign exchange rate risk, has become standard practice in many corporations, risk management should also be evident in firm value. Still, prior literature has not agreed on the firm value impact of hedging any f the market risks (Geyer-Klingeberg et al., 2019). Many recent risk management theories

suggest that hedging should be valuable for firm value creation for corporations and shareholders in the logic of shareholder maximation theory. Thus, the theory suggest that firm value can be increased by reducing the imperfections in the financial markets (Arnold et al., 2014, Ji and Wei, 2021, & Geyer-Klingeberg et al., 2017). However, recent empirical studies are conflicting with the traditional theories which have previously suggested that in perfect market conditions, risk management should be practically unconnected with firm value (Geyer-Klingeberg et al., 2019 and Bessler et al., 2019). Overall, empirical hedging studies have widely mixed conclusions on the relation between firm value effect and hedging determinants. Geyer-Klingeberg et al. (2019) suggest that the mixed results are a combination of differing data collection methods, model differences, and study quality.

Previously introduced capital market imperfection incentives are widely assessed with firm value. Allyannis and Weston (2001) provide exceptionally throughout research on the connection between foreign currency derivatives usage and firm value, which has also been broadly used as a source for further research. Their research is based on data collected from the years 1990 to 2000 and contains data only from nonfinancial firms in the United States. Allyannis and Weston agree in their study with the classical financial theories on capital market imperfections as a firm value-creating aspect. They provide an example by explaining that financial hedging should be rewarded by the financial markets as hedging should support firms in avoiding the underinvestment issue. They also support other hedging incentives around imperfect market conditions. The study by Hagelin (2003) finds consistent evidence that currency hedging increases firm value by reducing the indirect costs of financial distress or relieving underinvestment issues. Hagelin emphasizes in the paper that this finding is consistent with the fact that hedging is used according to the shareholder value maximation theory.

Research by Lau (2016) demonstrates that ROA and ROE are incremental drivers of firm market value, and hence FX hedging should create additional value as it is most acknowledged to enhance the profitability indicators. In multiple studies, currency

hedging is linked with a positive effect on a firm's performance when measured by profitability (Hagelin & Pramborg, 2005, Lau, 2016, Bessler et al, 2019).

Hagelin and Pramborg (2005) add one interesting contribution to the prior literature as they observe the effect that FX exposure has on the volatility around quarterly earnings announcements. They argue that hedging should stabilize earnings and hence firm value. But hedging should also increase volatility when FX exposure effects are made known to the investors in earnings announcements. This argument on abnormal volatility is found to be positively correlated with currency hedging. This finding is explained to stem from investors' inability to evaluate FX hedging with reasonable accuracy, creating abnormal volatility in firm value and lagged value effects.

Belghitar et al. (2013) explain in their study that hedging can create value only by reducing the overall FX exposure according to the cash flow volatility incentives, or by creating significant and efficient hedging policies where benefits outperform the costs of hedging transactions. An efficient hedging policy should either reduce or eliminate loss-causing exposures with minimal interference with beneficial exposures. Otherwise, the policy cannot create shareholder value. To study these expectations, Belghitar et al. study the currency hedging and firm value in the French markets. The results show no significant value increase for the overall sample, or when considering only firms with expected high FX exposures. According to the paper, this finding supports the view that firms are creating inefficient hedging programs and are not able to cover the costs of hedging. They also add that eased access to external financing due to hedging can allow firms to consider more value-increasing projects, but also value-decreasing investment opportunities. Emphasis is on the fact that even successful currency hedging does not automatically connect with increased firm value if the firm is not managed appropriately.

Managerial agency costs are also well documented as risk management incentives for firms. In addition to managerial risk-avoiding, managers can also use financial derivatives for market speculation and financial self-interests. This could cause harmful agency costs

for the shareholders of the company consequentially decreasing the firm value. This opens an opportunity for research concentrating on the potential negative value effects of managers' speculative behavior. Fauver and Naranjo (2010) attempt to tackle this issue in their study where they attempt to find value loss-causing traits of derivatives use. Firstly, Fauver and Naranjo provide behavioral findings that speculative derivative usage is more common in firms with low internal governance, and with higher interest rate exposure. However, speculative behavior is not found to be as common with FX exposure hedging. Fauver and Naranjo find evidence that overall financial hedging is decreasing firm value, if the firm has large agency costs and monitoring issues. They also indicate that this is economically significant, as for these firms with larger managerial issues, they find a decrease of 8,4% in Tobin's Q as a measure of firm value. According to the paper, this confirms the managerial risk aversion hypothesis presented extensively in prior financial risk management literature.

On the contrary, Allyannis et al. (2012) find strong evidence that firms with higher firm-level or country-level governance are experiencing significant hedging premiums in firm value. They estimate that the value premium is positive for 10,8% in companies with high internal governance within their global data sample. Allyannis et al. also find that the use of currency derivatives would neither increase nor decrease firm value in firms with weak corporate governance. When compared to conflicting findings by Fauver and Naranjo (2010), it is worth noting that findings by Allyannis et al. are exclusively on currency hedging and do not cover all financial risk management done by derivatives. Krause and Tse (2016) add to this finding by explaining that firms are also overinvesting. Especially larger firms tend to hedge more than necessary, and firms are hence reducing the amount of free cash flow. Krause and Tse explain that this relationship is mainly caused by conflicting interests between managers and shareholders.

Allyannis and Weston (2001) measure FX exposure by the volume of foreign sales. Their research on the value of currency hedging finds significant and strong evidence that currency hedging affects positively firm value. When comparing firms using currency

derivatives to non-users of currency hedging, they find a median hedging premium of 4%. This finding is consistent with the mean and median Tobin's Qs measured for the data sample. According to the study, the hedging premium of 4% would indicate a positive monetary value effect of approximately 153,1 million USD for firms actively using currency derivatives within the data sample in the study. Surprisingly, Allyannis and Weston also find that there is a positive currency hedging premium for firms with no significant FX exposure by foreign sales. Firms might still face FX risk exposure indirectly for example through industry competition and import and export of materials. However, the authors declare that the number of firms using foreign exchange derivatives is small within the firms which do not have any foreign sales. Allyannis and Weston also test their data sample for the generally expected capital market imperfection incentives. They argue that firm-specific features such as firm size, leverage, growth opportunities, profitability, financial market access, location, industry, and credit rating should also be considered to affect firm market value. Within their fixed-effects model, they find that firms hedging FX risk are valued higher than non-hedgers.

Research conducted by Bessler et al (2019), combines multiple relatively recent studies on derivatives usage and firm value to combine comprehensive meta-analysis on shareholder value creation from risk management. Overall, Bessler et al. (2019) find that their analysis provides strong and stable evidence of positive hedging impact on firm value. The study highlights that the effect is small but unmistakably noticeable from zero. The most relevant finding in the study is that the positive value effect is particularly reliable when hedging foreign exchange rate risk. A paper by Bachiller et al. (2021) finds evidence that financial hedging increases firm value when measured by Tobin's Q, especially for firms hedging FX exposure or alternatively all systematic market risks. Bachiller et al. define that the finding is significant at 1% threshold level for currency hedging premiums. Similarly, the study by Geyer-Klingeberg et al. (2021) estimates that firms actively doing currency hedging are facing a firm value premium of 1,8%.

The study by Bua et al. (2015) examines the connection between firm value and financial hedging of FX exposure in the Spanish markets. Overall, they find 1,5% hedging premium for firms hedging FX risk. In addition to currency derivatives, the paper also studies currency debt usage and finds that currency debt is associated with an even greater premium, as it appears to increase firm value by 7,5% on average suggesting that long-term hedging cycles are valued with a premium. Bua et al. contribute to the literature by finding that the volume of currency derivatives and currency debt contracts used also contributes to the size of the value premium positively. Increased hedging volume thus leads to an increase in hedging premium. However, they do not find any hedging premium to be associated with operational hedging strategies.

There are also papers that do not agree with the general positive value impact of currency hedging. Ji and Wei (2023) find robust evidence that the use of currency derivatives for hedging purposes, reduces firm value by 1,2% when measured with Tobin's Q. It is noteworthy, that value effects listed for commodity and interest rate hedging were found to reduce firm valuation by 9,5% and 6,7% respectively in the study. This contradicting finding on the currency hedging premium is still somewhat constant with other literature, as the negative hedging premium is estimated to be significantly lower than the premium associated with commodity price and interest rate risks. A study by Geyer-Klingeberg et al. (2021) agrees with this finding as in their meta-analysis of prior literature, the value effect of risk management appears to be systematically more significant for FX hedging than hedging interest rates or commodity prices. Additionally, firms using foreign currency derivatives appear to be valued higher than firms only hedging interest rates or commodity prices. Ji and Wei conclude their paper by mentioning that hedging can be valuable for firm value only if management's view on market development is accurate and based on professional estimations. This indicates that Ji and Wei support the risk management hypothesis of managerial risk aversion, but also argue that firms use derivatives for speculative purposes which is the primary source of the negative hedging premium found.

Also, unadjusted Tobin's Qs are estimated to be approximately 17% lower for firms using derivatives in research by Bartram et al. (2011). Unadjusted data seems to be aligned with many other papers as they find that firms actively hedging are often larger and older. However, the findings of the paper are reversed after the authors include controls for the firm's likelihood to use derivatives. Then, firms using derivatives are found to be associated with lower cash flow volatility, lower standard deviation of returns, lower systematic risk, and higher shareholder values. Hedging premium is nonetheless found to be insignificantly small, but still slightly positive.

Allyannis and Weston (2001) test their sample for potential industry-related effects on value creation by formulating industry-adjusted Tobin's Q. Allyannis and Weston find consistent evidence that higher firm value is also positively correlated with currency hedging when industry effects are considered in the research methodology. The results are relatively coherent with the findings made on the complete data. Hedging premium was found to be approximately 4% for all hedging firms, while industry-adjusted hedging premium is described to range between 4% and 5% for all firms included. Additionally, Carter et al. (2006) considers the aviation industry which is a well-known industry to be involved in active hedging. They find that derivatives used for jet fuel hedging are beneficial for firm value. A hedging premium of 5% is found to be generated especially from increased opportunity to make new and valuable capital investments. This finding supports the hedging incentive of the underinvestment issue. They also recognize that jet fuel prices are more volatile than foreign exchange rates even if the hedging premium is similar in sign to the currency hedging premium found in the literature. It can be concluded that a firm's industry should have an impact on the value premium that can be retrieved from FX hedging, also due to competitive exposures.

Currency fluctuations should also be considered to create variation in firm values for firms which are exposed to the FX risk. Allayannis and Weston (2001) find in their research on the US markets, that currency hedging premium is larger and statistically

significant in time periods where the US dollar has appreciated. This is caused by the influence of foreign exchange rate fluctuations and the asymmetric nature of FX rate movements. In scenarios where currency is appreciated, hedging should be more beneficial if the firm has a net long position on the foreign currency. On the contrary, in years where the operating currency depreciates, it is relatively less meaningful to hedge against the foreign exchange rate fluctuations for value creation. However, Allayannis and Weston emphasize that the hedging premium is still apparent and noticeable in both scenarios, during periods when the US dollar has appreciated or depreciated compared to other currencies.

Also, exchange rate fluctuations have recently sparked further discussion on whether firms should hedge their FX exposure extensively. Belghitar et al. (2013) explain in their paper that the asymmetric nature of currency exposures means that firms need to consider more carefully how they approach their derivative positions if they decide to hedge the risk. This is a consequence of recently growing evidence that gains on currency appreciations are greater than the potential losses on depreciations. This could suggest that firms can consider reducing the size of hedge positions against potential depreciation as it does not hold as great risk for the firm's stability.

In addition to currency fluctuations, financial hedging appears to be more incremental for shareholder value during any global financial decline as firms appear to be especially hedging to avoid the downside risk or *'lower-tail outcomes'* (Bartram et al., 2011 & Krause and Tse, 2016). Bartram et al. find evidence in their paper that firms actively hedging are linked with 15%-30% lower betas than firms avoiding financial derivatives. The variability of this percentage can be explained by firm-specific characteristics used to estimate the likelihood of hedging market risks. Hedging benefits during economic decline are made evident in the paper. Firstly, firms using derivatives were valued higher during the global economic downturn at the turn of the century in 2000 and 2001. Secondly, Bartram et al. find that firms using derivatives appear to significantly outperform firms not using derivatives during economically challenging periods. This

performance finding is reliable with all profitability measures, such as earnings, cash flow, or return on assets. This result could indicate that markets have assessed positive prices for risk management, or alternatively, this concludes the challenging and mixed results on the value implications of financial hedging. Lower betas can also signal that hedging lowers the firm's cost of external financing and hence benefits new investment projects and the profitability of the firm within longer horizons. This supports the risk management incentive of increased access to valuable investment opportunities.

Research by Allyannis and Weston (2001) finds also supporting factors for positive value creation from hedging policy changes. They find that firms starting new hedging policies face an increase in firm value when compared to firms that already had hedging policies implemented. This claim is also persistent in finding that firms quitting currency hedging activities completely appear to experience a decrease in firm value. It appears that financial instrument selection does not affect firm value either as Bartram et al. (2011) find no evidence that the type of derivative instrument has an impact on firm value when hedging the FX exposure. Most derivative instruments used for hedging are short-term in purpose, while firms' risk management horizons are practically limitless (Krause and Tse, 2016).

Geographical differences were included in the hedging determinants as a heavy influencing factor for the hedging behavior. It is suggested that hedging value premium is affected by locational characteristics, such as access to financial markets and the level of taxation within the region or a country (Geyer-Klingeberg et al., 2021). Research by Bachiller et al. (2021) adds to the geographical connection by explaining that it appears that the use of all derivatives is linked with a strong value effect in countries with common law and developed markets.

Bartram et al. (2011) suggest in their study that even if financial hedging by derivatives would not be linked with increased firm value, it will still significantly reduce cash flow

risk, experienced systematic risk, and total risk of the firm. This concluding evidence they find to be robust regardless of the firm's location, industry, or firm characteristics.

Geyer-Klingeberg et al. (2021) provide interesting aspects of the firm value effect and the mixed results in their meta-analysis review based on prior academic publications on the topic. Firstly, they find that journal quality appears to be linked with the size of the hedging premium found in the papers. Studies published in higher-ranked journals estimate the FX hedging premium to be approximately 2% lower than those published in lower-ranked publications. Secondly, they find that papers implementing operational hedging strategy, together with financial hedging appear to estimate consistently larger premiums for hedging FX exposure. Finally, they analyze that studies leaving out firm fixed effects and firm endogeneity seem to have an apparent upward trend in the findings for the magnitude of the hedging premium. They conclude by mentioning that it appears that most studies seem to have upward biases when positive hedging premium is found.

As noted widely in academic literature, the results on the connection between foreign exchange rate risk hedging and firm value are mixed. Estimates range from large positive premiums to negative findings. Differences in hedging premiums can be substantial between studies, and hence the consensus remains to be settled. The results vary depending on the used methodology and data in the studies. Different studies use varying econometric models, so it is difficult to standardize and make definite conclusions on the evidence generated.

3.4 FX hedging in the Nordics

This thesis concentrates the empirical on the Nordic markets due to the interesting aspects of this geographic region from the financial market perspective. All countries have distinctive market currencies while still largely operating in the Eurozone region and EU regulatory area. Even if the market size is relatively small in all Nordic countries,

it can provide interesting and new information regarding FX hedging and firm value factors.

In the Nordics, it is apparent in the prior literature that firms tend to use financial FX derivatives for risk reduction purposes, especially when the potential losses from FX fluctuation could lead to financial restrictions or underinvestment issues. No evidence is found on the hypotheses of financial distress costs and access to financial markets. In general, hedging is found to be beneficial for firms to be able to achieve their investment and financial targets. (Davies et al., 2006, Brunzell et al., 2011 and Hakkarainen et al., 1998)

Also aligned with other studies and prior findings, currency forwards are the most used FX hedging instrument in the Nordic markets (Davies et al., 2006 and Brunzell et al., 2011). Similarly, larger firms tend to be using FX derivatives more extensively also in the Nordics. Firms using FX derivatives also tend to be more liquid, investing more in growth opportunities, and international which is aligned with other markets in prior literature. Results of the paper by Davies et al. (2006) expand that country-specific results are extremely likely in the Nordics due to differing currencies, market profiles, and regulatory backgrounds. The importance of operational hedging alongside financial hedging is also highlighted by Amberg and Friberg (2016). The sample of Swedish firms in the study is found to be considering operational hedging more important than any financial hedging strategy. This is most likely linked to the long-term impact of operational procedures. Finally, it is found that firms from Finland appear to be more actively using derivatives which could indicate that Eurozone firms have better access to the derivative markets.

Brunzell et al. (2011) finds weak evidence that FX hedging provides additional firm value in the Nordics. However, the direction of the hedging premium is still slightly positive. Results are relatively similar to papers with larger sample sizes and countries with larger financial markets. The study by Jankensgård (2015) on Swedish nonfinancial firms also

finds that firms hedging FX exposure have 15% positive value premium when hedging is implemented in a centralized manner. This finding would indicate that FX hedging is valuable in terms of firm value only if the FX derivative usage is centralized rather than all subsidiaries completing independent hedging transactions.

3.5 Hypotheses of the study

The literature review gives some idea that FX hedging is generally linked with a small positive firm value premium. The magnitude of the premium varies between different samples and methodologies, but as this thesis uses a methodology comparable to Allayannis &Weston (2001), the expectation is that firm value-related findings are reasonably similar. Hagelin (2003) mentions in the paper that the theoretical expectation of a positive value effect is also aligned with the shareholder value maximation theory. Comprehensive research by Brunzell et al. (2011) also supports positive value impact even if the significance is not certain. Hence, the first hypothesis of the thesis is:

H_1: Foreign exchange hedging has a positive impact on firm value in the Nordics

As multiple papers find that larger firms are more active hedgers, it could also be expected that any value-creating impact would be larger due to these firms being able to hedge with greater magnitude (Brunzell et al., 2011, Bartram, 2007 and Geyer-Klingeberg et al., 2019). Economies of scale could suggest that larger firms can make more effective and proper hedging programs. Thus, the second hypothesis of the thesis is as follows:

H_2: Larger firms have greater value premium from FX hedging in the Nordics

Recent studies have also shown that the introduction of the Euro in 1999 has significantly reduced the volatility of foreign exchange rates in European countries, especially when firms are largely operating in the Eurozone (Bartram & Bodnar, 2007). Brunzell et al. (2011) also argues that firms operating in the Eurozone have better access to external

financing and financial markets in general. In the Nordic sample, this would mean that firms from Finland face weaker firm value premiums from FX hedging. Hence, the third hypothesis is:

H_3: Value premium of FX hedging is weaker for firms having the Euro as market currency

Finally, manufacturing firms are buying a lot of materials and supplies for their operations. As discussed, most of the firms actively hedging claim to primarily hedge their transactional FX exposure (Bartram, 2007 and Hagelin & Pramborg, 2005). This could mean that manufacturing firms which are actively making many contracts would use more hedging instruments to stabilize their cash flows in the short term. Lastly, materials and supplies are not always available in nearby markets which could lead to a situation where foreign markets are required more often. Thus, the final hypothesis is as follows:

H_4: The manufacturing sector has the greatest value premium from the FX hedging

4 Data & methodology

This chapter is constructed as follows, the data sample used for the empirical analysis on firm value effects of FX hedging in the Nordics is presented and discussed in the first part. In the latter part of the chapter, the methodology and regression variables are described to support the empirical model of the thesis.

4.1 Data

The empirical part of the thesis attempts to answer if currency hedging has any firm value impact in the Nordic markets. The topic is well-studied at a general risk management level, but the results on hedging value effects are largely mixed. Most of the papers are also concentrating on the US markets or other larger markets. Only a few papers consider the Nordic countries in their data sample when studying the relationship between FX hedging and firm value. In addition, the Nordic stock market offers interesting aspects for research as all individual countries have different market currencies, and hence different relationships to foreign exchange risk.

The sample includes Finland, Norway, Denmark, and Sweden from the Nordic region. The Nordic countries are largely similar in their economic environment, regulatory traits, and financial structure (Amberg & Friberg, 2016, Brunzell et al, 2011 & Davies et al., 2006). However, all countries have their individual market currencies which makes the geographic market unique. Finland is also part of the Eurozone which could mean that firms have less incentive to hedge the FX risk exposure. Norway also stands out from the other countries due to it not being part of the European Union. Additionally, Norway is unique due to its industrial concentration in the sea areas of the Atlantic and Arctic Oceans. This means that Norway is largely involved in oil extraction, fishing, and sea transportation which are not well-represented industries in the other countries.

The data used in the study is collected over the years 2016-2019. Sample for four years gives reasonable time to estimate any foreign currency hedging implications. This period

was partially selected also to avoid misinterpreting the value effects due to the global Covid-19 pandemic which started in the first quarter of year 2020. The data is mostly collected from the Orbis database. Categorial data for currency derivative usage, dividend policy, and information regarding foreign sales of the firms are collected from the firms' annual statements.

Table 1. Sample description.

Description	No. Obs	Hedgers	Non-Hedgers	% of Hedgers	% of Foreign Sales
Country					
Finland	41	35	6	85 %	70 %
Norway	40	29	11	73 %	63 %
Denmark	40	32	8	80 %	80 %
Sweden	84	63	21	75 %	71 %
Total sample	205	159	46	78 %	71 %
Industry					
Real Estate	26	14	12	54 %	29 %
Services & Utilities	40	29	11	73 %	58 %
Consumer Goods	22	22	0	100 %	88 %
Energy & Industrial	49	43	6	88 %	80 %
Healthcare Manufacturing	18	12	6	67 %	88 %
IT and Telecom	32	21	11	66 %	79 %
Basic Materials	18	18	0	100 %	86 %
Sector					
Manufacturing	103	93	10	90 %	85 %
Services	70	45	25	64 %	47 %
IT & Telecom	32	21	11	66 %	79 %

The objective of the thesis is to test how FX hedging affects firm value. For this purpose, the data sample used concentrates on larger firms in the otherwise smaller Nordic markets. Larger firms might have a higher capacity to use hedging instruments. The data sample includes all non-financial corporations which have a market capitalization of 450 million USD and higher (31.12.2022). To have a reliable sample over four years, all companies listed after the year 2016 were excluded from the sample. Finally, to test any country-specific differences, a minimum of 40 firms were included for all countries even if the firm's market capitalization was lower than 450 million USD. The total sample includes 205 firms and 818 observations over four years.

For the final part of the empirical analysis, firms are allocated to three different sectors according to the NACE industry classification available in the Orbis database. Three sectors included are *manufacturing, services,* and *IT & and telecom*. All firms in the sample are allocated to one of these. The manufacturing sector includes firms producing and developing goods or materials for selling purposes. These firms often have large manufacturing facilities and are buying or collecting a lot of raw materials for their respective industrial productions. Table 1 illustrates that the manufacturing sector is evidently more active in the hedging markets and more exposed to risks generated by foreign sales. The services sector includes firms that are generally offering different services to their customers. This includes for example retail stores, transportation, or real estate agencies. This sector appears to be less international as Table 1 shows that these firms are more domestic. IT & telecom sectors have been included separately as they can be characterized as hybrid versions of the manufacturing and services sectors. IT & telecom firms can for example be programming firms or network providers. Their product catalogue can vary between goods, materials, services, and utilities. In conclusion, these three sectors have distinctively different operating characteristics which allows for interesting comparison.

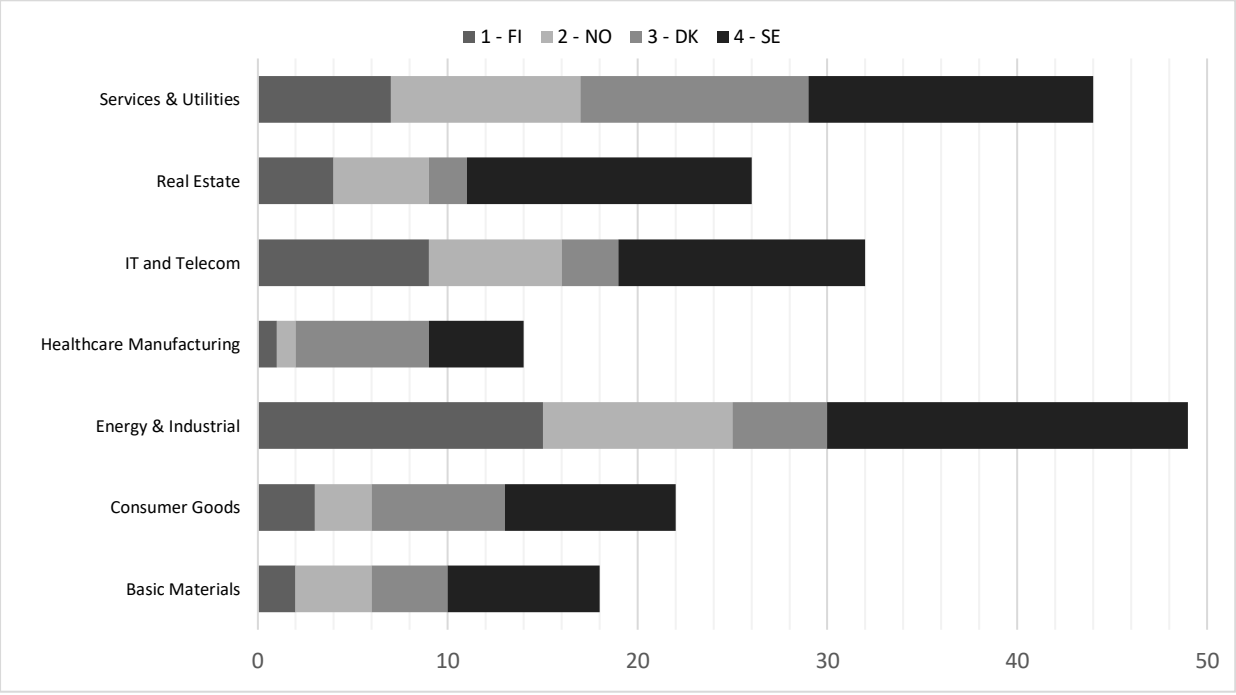

Figure 5. Industry-Country allocation.

4.1.1 Dependent variable

The dependent variable selection for the univariate and multivariate regressions is largely based on the great evidence provided by prior literature on firm value research.

Tobin's Q is chosen in most of the relevant studies concerning the firm value effects (Allayannis & Weston, 2001, Brunzell et al, 2011, Jin & Jorion, 2006 & Geyer-Klingeberg et al., 2021). In prior literature, there are many variations used of Tobin's Q formula, but for this thesis, Tobin's Q is defined as the rate of market value of assets divided by the book value of total assets. Geyer-Klingeberg et al. (2021) describe that Tobin's Q is often used in academic research regarding firm valuation due to the signaling power that it holds. When a firm's Tobin's Q is increasing, the prospect of a firm's value is also increasing.

$$Tobin's\ Q = \frac{Market\ Value\ of\ Assets}{Total\ Assets} \quad (1)$$

Market-to-Book ratio is also used in the thesis as a dependent variable to measure firm value in both univariate and multivariate tests. This is completed to investigate the sensitivity of the regression results to changes in specific measurements. Market-to-Book ratio is commonly used as an alternative dependent variable if Tobin's Q is not chosen in the prior literature (Allayannis & Weston, 2001, and Geyer-Klingeberg et al., 2021), so it makes the ratio a great variable to test this sensitivity.

$$Market\ to\ Book\ Ratio = \frac{Market\ Capitalization}{Total\ Equity} \quad (2)$$

4.1.2 Control variables

The *hedging dummy* (FCD) variable acts as the main variable tested in this thesis and it is used to indicate firms FX activities. FX hedging dummy has a value of one if a firm has declared in the annual statements that they have used any of the available FX instruments, such as currency forwards or currency swaps, and respectively dummy

value is zero if the firm declares to not be using FX instruments or does not share any information regarding foreign exchange risk. This dummy variable does not consider the magnitude or instrument type of the FX hedging activities firms have conducted, as this data is not consistently available from the annual reviews in all sample firms.

Foreign exchange exposure (EXPO) is considered as control variable in the thesis. According to Allayannis & Weston (2001) and Bartam & Bodnar (2007), international and well-diversified operations increase firm value. Multinational firms should also be more exposed to the FX risk due to their foreign sales, potentially in foreign currency. In this thesis, this geographical diversification is used as the measure of FX exposure and is defined by the ratio of foreign sales to total sales.

Firm size is often linked with derivative usage and is also considered in the data collection for this thesis. Geyer-Klingeberg et al. (2021) explain that 97% of the papers they have included in their meta-analysis on hedging and firm value have included firm size control variable. Also, research by Brunzell et al. (2011) finds that firm size is a significant factor in hedging decisions firms make, but their paper does not consider if the bigger companies have greater value premiums from hedging. The firm size variable is defined as the logarithm of the total assets in the multivariate regressions.

Prior literature has indicated that capital structure could have an impact on a firm's risk management decisions and firm value (Geyer-Klingeberg et al., 2019 & Brunzell et al., 2011). Following the methodology of Allayannis & Weston (2001), *leverage* (LEV) is used to estimate the capital structure effect on firm value. The control variable of leverage is formulated as the ratio of long-term debt compared to the total assets of the firm. *Debt-to-Equity* (DE) control variable also considers the hedging policy and capital structure of the firm. Debt-to-equity can be used to measure a firm's possibility to consider financial hedging activities. The debt-to-equity variable is acting as the alternative independent variable for leverage, and it should have similar estimation results.

Table 2. Summary statistics - all firms.

Group 1: All firms						
Variable	**No. Obs.**	**MEAN**	**MEDIAN**	**ST. DEV.**	**MIN**	**MAX**
Tobin Q	**818**	**1,82**	**1,05**	**2,24**	**0,00**	**15,09**
Finland	163	1,60	0,99	2,07	0,19	15,09
Norway	160	1,27	0,86	1,29	0,07	10,48
Denmark	160	2,53	1,40	2,72	0,08	13,51
Sweden	335	1,86	1,08	2,34	0,00	14,63
Market-to-Book	**818**	**3,87**	**2,71**	**5,35**	**-33,10**	**106,69**
Finland	163	3,28	2,34	3,48	0,46	29,49
Norway	160	3,36	2,36	9,02	-33,10	106,69
Denmark	160	5,38	3,49	5,22	0,36	26,48
Sweden	335	3,67	2,73	3,31	0,00	19,30
FX hedging	**818**	**0,76**	**1,00**	**0,43**	**0,00**	**1,00**
Finland	163	0,84	1,00	0,37	0,00	1,00
Norway	160	0,73	1,00	0,45	0,00	1,00
Denmark	160	0,78	1,00	0,41	0,00	1,00
Sweden	335	0,72	1,00	0,45	0,00	1,00
FX exposure	**818**	**0,71**	**0,86**	**0,33**	**0,00**	**1,00**
Finland	163	0,70	0,81	0,29	0,00	1,00
Norway	160	0,63	0,77	0,36	0,00	1,00
Denmark	160	0,80	0,96	0,34	0,00	1,00
Sweden	335	0,71	0,86	0,31	0,00	1,00
Firm size	**818**	**7,44**	**7,61**	**1,64**	**2,12**	**11,68**
Finland	163	7,39	7,78	1,71	3,00	10,80
Norway	160	7,48	7,71	1,65	3,23	11,68
Denmark	160	7,32	7,46	1,49	2,42	11,05
Sweden	335	7,50	7,75	1,68	2,12	10,94
Leverage	**818**	**0,18**	**0,16**	**0,13**	**0,00**	**0,61**
Finland	163	0,15	0,13	0,11	0,00	0,44
Norway	160	0,18	0,16	0,14	0,00	0,61
Denmark	160	0,18	0,16	0,14	0,00	0,51
Sweden	335	0,18	0,17	0,14	0,00	0,61
Debt-to-Equity	**818**	**0,62**	**0,33**	**6,51**	**-11,40**	**182,87**
Finland	163	0,23	0,23	0,45	-1,28	1,45
Norway	160	1,70	0,25	14,57	-8,98	182,87
Denmark	160	0,34	0,30	0,72	-1,04	2,65
Sweden	335	0,43	0,43	1,17	-11,40	13,62
Liquidity	**818**	**1,41**	**0,97**	**2,68**	**0,02**	**63,27**
Finland	163	1,20	0,95	0,80	0,15	4,14
Norway	160	1,40	1,01	1,26	0,02	9,76
Denmark	160	2,15	0,99	5,62	0,18	63,27
Sweden	335	1,17	0,96	1,08	0,03	10,29
Growth	**818**	**0,38**	**0,05**	**2,21**	**0,00**	**28,87**
Finland	163	0,12	0,04	0,36	0,00	3,91
Norway	160	0,50	0,06	2,47	0,00	21,82
Denmark	160	0,34	0,05	2,08	0,00	22,39
Sweden	335	0,46	0,04	2,63	0,00	28,87
Dividend	**818**	**0,74**	**1,00**	**0,44**	**0,00**	**1,00**
Finland	163	0,76	1,00	0,43	0,00	1,00
Norway	160	0,64	1,00	0,48	0,00	1,00
Denmark	160	0,66	1,00	0,48	0,00	1,00
Sweden	335	0,83	1,00	0,38	0,00	1,00
ROA	**818**	**8,79**	**7,81**	**11,34**	**-97,40**	**52,97**
Finland	163	8,66	7,58	8,52	-16,28	46,33
Norway	160	5,83	6,51	13,27	-97,40	33,57
Denmark	160	10,80	8,31	13,59	-38,93	50,83
Sweden	335	9,30	8,38	10,06	-78,71	52,97

Table 3. Summary statistics - hedgers and non-hedgers.

Group 2: Firms hedging FX risk						
Variable	**No. Obs.**	**MEAN**	**MEDIAN**	**ST. DEV.**	**MIN**	**MAX**
Tobin Q	620	1,55	1,00	1,70	0,07	13,51
Market-to-Book	620	3,48	2,63	3,24	0,16	26,48
FX hedging	620	1,00	1,00	0,00	1,00	1,00
FX exposure	620	0,76	0,91	0,29	0,00	1,00
Firm size	620	7,79	7,84	1,48	3,13	11,68
Leverage	620	0,17	0,16	0,13	0,00	0,61
Debt-to-Equity	620	0,45	0,33	1,15	-1,28	17,52
Liquidity	620	1,19	0,96	1,34	0,02	18,52
Growth	620	0,24	0,05	1,54	0,00	28,65
Dividend	620	0,79	1,00	0,41	0,00	1,00
ROA	620	9,08	7,73	8,46	-18,86	50,71

Group 3: Firms not hedging FX risk						
Variable	**No. Obs.**	**MEAN**	**MEDIAN**	**ST. DEV.**	**MIN**	**MAX**
Tobin Q	198	2,66	1,44	3,28	0,14	15,09
Market-to-Book	198	5,06	2,97	9,15	0,36	106,69
FX hedging	198	0,00	0,00	0,00	0,00	0,00
FX exposure	198	0,56	0,65	0,40	0,00	1,00
Firm size	198	6,35	6,30	1,66	2,12	9,74
Leverage	198	0,18	0,14	0,16	0,00	0,61
Debt-to-Equity	198	1,15	0,33	13,08	-11,40	182,87
Liquidity	198	2,12	1,09	4,85	0,03	63,27
Growth	198	0,81	0,06	3,54	0,00	28,87
Dividend	198	0,61	1,00	0,49	0,00	1,00
ROA	198	7,88	8,27	17,54	-97,40	52,97

Liquidity (LIQ) is included as a control variable as it is found that firms with low liquidity are more likely to hedge their risk exposures (Geyer-Klingeberg et al., 2021, Bartram & Bodnar, 2007, Allayannis et al., 2012 and Davies et al., 2006) Firms holding higher liquidity are also connected with riskier and higher number of investment projects and face lower risk of default. The liquidity variable is defined as the current ratio in this thesis.

Profitability usually means that firms are traded with a premium in the markets when compared to less profitable firms. If a firm hedging the FX risk is profitable, the firm should have a higher Tobin's Q (Allayannis & Weston, 2001). The profitability control variable is defined in this thesis as a ratio of return on assets (ROA) calculated by dividing net income by total assets.

Dividend payments are included as a control variable. According to Allayannis & Weston (2001), a firm paying dividends is less likely to be restricted by the availability of capital

to the firm's investment projects. This would indicate that the firm has greater access to the financial markets, and hence this thesis uses a dummy variable to indicate if the firm has paid any dividend during the fiscal year reported. This variable controls for the hedging incentive of financial distress costs and investment opportunities.

Growth opportunities are well-documented as one of the common hedging incentives for firms. According to papers by Allayannis & Weston (2001) and Brunzell et al. (2011), a firm's potential growth investment opportunities also have a significant effect also in the firm value. The control variable for investment opportunities is defined as capital expenditures divided by the total net sales in this thesis.

Additionally, the *operating industry* is also considered in the univariate and multivariate regressions by using industry dummies. The sample is divided into seven industries according to the UCIS industry classifications available in the Orbis database. Considered industries include real estate, services and utilities, consumer goods, energy and industrials, healthcare manufacturing, IT and telecom, and materials.

4.2 Methodology

The empirical model of the thesis consists of two parts. To find if foreign exchange hedging has value implications in the Nordics, univariate and multivariate analyses are completed with the Nordic data sample previously introduced. More comprehensive multivariate analysis is completed to reach higher explanatory power for the test results than what is generally achieved by running univariate models. The empirical concept largely follows the prior literature published on the topic (Allayannis & Weston, 2001, Brunzell et al., 2011, Davies et al., 2006, and Geyer-Klingeberg et al., 2021). Especially the research by Allayannis and Weston has widely been used as a reference paper for further research in the field of financial risk management.

4.2.1 Univariate test

In many papers (Allayannis & Weston, 2001 & Brunzell et al., 2011), univariate analysis is presented to estimate the primary hypothesis of the paper with simple regression estimation. Following this, the univariate test is completed to estimate if foreign exchange hedging has any impact on firm value in the Nordics in this thesis. This test should be able to estimate how firms actively hedging FX risk are performing compared to the firms not hedging the FX risk. Test results for univariate regression are presented in Table 4. The formula used in the univariate test is as follows:

$$ln(Tobin's\ Q) = \alpha + \beta_1 FCD + u \quad (3)$$

In the univariate test, Tobin's Q is used as a dependent variable as a measure of firm value. Only one explanatory variable is used in the estimation as the hedging dummy variable is tested to estimate the FX hedging effect in firm value. Additionally, the univariate test is also completed with the Market-to-Book ratio as the dependent variable. This test should be able to show if the two different value measurements of firm value give similar estimation results and explanatory power. The formula used for alternative market-to-book univariate tests is as follows:

$$ln(MB) = \alpha + \beta_1 FCD + u \quad (4)$$

4.2.2 Multivariate test

The univariate test is rarely holding enough explanatory power to estimate the regression reliably. The single-variable model attempts to answer only the main hypothesis of the thesis if FX hedging has any firm value impact in the Nordics. To reliably employ the full explanatory power of the hedging variable, a multivariate test often needs to be run to withdraw all value-creating aspects. In this thesis, multivariate analysis is run using Tobin's Q as the dependent variable with control variables previously introduced. The thesis uses pooled and fixed-effect OLS regressions for the estimations.

Ordinary least squares regressions are simple and often used estimation models when one attempts to link the relationship of specific variables. The pooled OLS model ignores the panel data structure and assumes that all firms have the same variables. On the contrary, the fixed-effect model considers potential firm-specific characteristics over time, reducing the overall biases which are more likely to be present in pooled OLS regressions. The formula used for multivariate analyses is as follows:

$$\ln(Tobin's\ Q) = \beta_0 + \beta_1 FCD + \beta_2 EXPO + \beta_3 SIZE + \beta_4 LEVE + \beta_5 LIQ + \beta_6 DE + \beta_7 ROA + \beta_8 DIV + \beta_9 GROWTH + \beta_{10-16} INDUSTRY \quad (5)$$

Similarly to the univariate test, the market-to-book ratio is also tested to see if the results are similar with multiple firm value measurements. However, MB is only used in the primary pooled and fixed-effect tests where the entire data sample is included to see for any potential differences in the value metrics. The formula used for market-to-book multivariate tests is as follows:

$$\ln(MB) = \beta_0 + \beta_1 FCD + \beta_2 EXPO + \beta_3 SIZE + \beta_4 LEVE + \beta_5 LIQ + \beta_6 DE + \beta_7 ROA + \beta_8 DIV + \beta_9 GROWTH + \beta_{10-16} INDUSTRY \quad (6)$$

4.3 Limitations of the research

Bessler et al. (2019) also observed that papers employing dummy variables to represent hedging found weaker value effects from hedging. Also, general limitations for this type of research are that the approach to hedging determinants and empirical studies cannot be properly standardized (Arnold et al., 2014). This triggers the scenario where different research results can often occur based on the utilized research method and data sample. This can also be linked to this thesis even if the methodology used in attempting to follow papers such as Allayannis & Weston (2001) and Geyer-Klingeberg et al. (2021). Sample selection and research methods are not exactly similar causing also unobserved variance in the estimation results.

Another limitation of the thesis is that part of the data has been collected manually from firms' annual statements. It should be obvious that this is not particularly convenient, and the process creates a higher probability of human errors in the data collection process. The manual data collection process is also made more complex as companies do not report their data in a similar format. Categorial dummy variables used in the thesis are collected based if the firm declares the usage of FX hedging instruments or presents dividend payment information. Financial risks are required to be covered in the annual reviews but the disclosed information regarding the usage of FX derivatives varies between firms. Some firms also declare their foreign operations in different ways, as geographical distribution can be declared based on net sales, external revenue, or percentage of total sales. This means that data collected for the foreign sales is mixed in parameters, but data will still be used as firms rarely change their reference format during the sample years.

5 FX hedging and shareholder value in the Nordic markets

The last chapter of the thesis covers the empirical analysis of the results and presents the general observations according to the hypotheses of the thesis. The chapter begins with the univariate results and continues with the analysis of multivariate results. The chapter attempts to answer the hypotheses of the paper by providing results for each segment to find if foreign exchange hedging impacts firm value in the Nordics.

5.1 Univariate analysis

Univariate analysis attempts to answer if a firm's FX hedging activities have any impact on firm value. Table four presents the regression results for univariate regression results for both examined dependent variables, Tobin's Q and Market-to-Book ratio. When using Tobin's Q as dependent variable, the coefficient for firms using FX hedging instruments (Hedging dummy) is negative and statistically significant at 1% level. FX hedging seems to be associated with 38% lower firm value premiums according to the univariate model where industry dummies are included. However, the explanatory power is relatively low for this estimation as the value of R-squared is 0,217 indicating that only approximately 22% of the firm value can be estimated with this specific regression model.

Table 4. Univariate results - pooled OLS regression.

	Tobin's Q	**MB**
Variable	**Coefficients** (T-statistic)	**Coefficients** (T-statistic)
Constant	-0,401*** (-4,413)	0,545*** (6,305)
Hedging dummy	-0,378*** (-5,037)	-0,169 (-2,365)
Industry dummies	Yes	Yes
Adjusted R-Squared	0,217	0,172
No. Obs.	818	818

***,** and * imply statistical significance at 1%, 5%, and 10%, respectively.

When the Market-to-Book ratio is used as the dependent variable, the results are fairly similar to the first model presented in Table 4. The coefficient of FX hedging is again negative as it shows that firms hedging FX risk are linked with 17% lower firm valuations. However, contrary to Tobin's Q model, the coefficient for the FX hedging variable is not statistically significant even at 10% level. In addition, the result for R-squared is only 0,172 which indicates that this model is not capable of estimating the firm value that effectively as only 18% of the Market-to-Book can be estimated. Interestingly Market-to-Book ratio appears to have a lower value of R-squared which could suggest that Tobin's Q might be a better and more precise dependent variable for estimating the value effects of foreign exchange rate risk management. The coefficient for FX hedging also appears to be significantly lower than when measured with Tobin's Q, even if the sign of the coefficient is negative in both models. Additionally, it is noteworthy that the univariate model compares firms utilizing FX hedging to firms that are classified as non-hedgers in the data sample. This means that a total of 198 observations of non-hedgers are compared to 620 observations of firms declaring to be using FX hedging instruments.

Results of the univariate regressions suggest that hedging of FX risk does affect firm value in Nordic firms. This would indicate that the first hypothesis could be declined as firm value appears to be negatively associated with firm value as hedging coefficients are negative -38% and -17% for Tobin's Q and Market-to-Book ratio, respectively. The first hypothesis expected that FX hedging would be associated positively with the firm valuation. However, the insignificant values of R-squared in both models mean that no conclusions should be made according to the results presented in Table 4. The univariate test confirms the previous expectation that more variables are required to make comprehensive conclusions on the value effect of FX hedging. The multivariate regression model should be able to allow higher explanatory power for the results.

5.2 Multivariate analysis

As the univariate tests signal, more variables are required to confidently estimate the value premium of foreign exchange hedging in the Nordic markets. This thesis now considers the multivariate regression and includes the control variables previously introduced in the thesis to estimate the value implications of foreign exchange hedging. Firstly, table 5 presents the regression results for pooled OLS regression. Results are firstly presented for the whole sample using both Tobin's Q and Market-to-Book ratio as dependent variables. The results are also shown when using only companies that have reported having foreign sales. This model has 759 observations meaning that approximately only 7% of the total sample is operating domestically. The dependent variable for this sample is Tobin's Q to has similar results as the main model of the thesis.

Table 5. Multivariate results - pooled OLS regression.

	Tobin's Q	MB	Foreign sales > 0
Variable	**Coefficients** (T-statistic)	**Coefficients** (T-statistic)	**Coefficients** (T-statistic)
Constant	1,286*** (9,004)	2,091*** (14,013)	1,221*** (8,267)
Hedging dummy	-0,129** (-2,064)	0,082 (1,270)	-0,216*** (-3,246)
Foreign sales	0,139 (1,613)	0,003 (0,035)	0,438*** (4,227)
Firm size	-0,225*** (-13,537)	-0,210*** (-12,071)	-0,225*** (-13,305)
Leverage	-1,355*** (-7,186)	-0,760*** (-3,856)	-1,355*** (-6,840)
Debt to Equity	-0,001 (-0,380)	0,027*** (7,241)	-0,002 (-0,498)
Liquidity	0,019** (2,146)	-0,010 (-1,022)	0,007 (0,685)
Dividend	0,159*** (2,737)	0,069 (1,127)	0,189*** (3,205)
Profitability	0,027*** (11,,992)	0,022*** (9,450)	0,026*** (11,764)
Growth opportunities	-0,053*** (-5,018)	-0,034*** (-3,068)	-0,059*** (-4,853)
Industry dummies	Yes	Yes	Yes
Adjusted R-Squared	0,551	0,427	0,560
No. Obs.	818	818	759

***,** and * imply statistical significance at 1%, 5%, and 10%, respectively.

Investigating the results of the first model of Tobin's Q in the first column, it appears that FX hedging (*Hedging dummy*) has a coefficient of -0,129 meaning that firms actively hedging are associated with -13% value premium. This finding is also statistically significant at 5% level. Interestingly, dividend payments are found to have a positive coefficient to firm value at 16%. As mentioned in the control variable chapter previously, dividend payments are often linked with lower Tobin's Q as the firms are less restricted in capital. It is also worth mentioning that growth opportunities are found to have a significant negative link with firm value at -5%. Firm size is also found to have a negative relationship with firm value as the coefficient for the variable is -0,225 at a significance level of 1%. These are interesting findings as firm size and growth opportunities have commonly been found to be significant hedging determinants (Allayannis and Weston, 2001 and Geyer-Klingeberg et al., 2019). In the first model, foreign sales, debt-to-equity, liquidity, and profitability hold no statistical significance or relatively marginal coefficients.

The third model presented in Table 5 uses using sample which includes only firms that declared to have foreign sales, and hence foreign exchange exposure in some direct format. This model's estimation results are largely mirroring what model 1 (Tobin's Q) output has. The first of the two major differences compared to the first model is that the FX hedging dummy has a higher negative coefficient of -21,6%. This is also statistically significant at 1% level compared to the value premium of -13% at a significance level of 5%. Even more significant change is that FX exposure measured by the foreign sales is significantly and positively correlated with firm value as it is linked with 43,8% higher firm values. This could indicate that the significance of FX hedging increases when compared only within firms which are concentrically exposed to the FX risk. Surprisingly, both models estimate that profitability is positively correlated with firm value by 2,6%. This is relatively low when considering that papers have agreed that profitable firms are actively participating in FX hedging activities. Nevertheless, model 3 proves that the expectation of similar results between the whole sample and FX-exposed firms mostly holds.

The second model of Table 5 provides results for the same pooled OLS regression but when using the Market-to-Book ratio as the dependent variable. This model provides contradicting results compared to the one using Tobin's Q, as it finds that FX hedging is positively correlated with firm value. However, this finding is not statistically significant. Similarly, model 2 also finds the dividend payments coefficient to be statistically insignificant. Compared to the two models using Tobin's Q, the Market-to-Book ratio appears to do relatively weakly in estimating the value effect of FX hedging. The second model has an R-squared value of only 0,437 which means that it is almost 13% weaker in estimation than the first model using Tobin's Q as the measure of firm value. Also, it appears that coefficients are systematically smaller when Market-to-Book is used as the dependent variable, regardless of the control variable or sign of the coefficient.

What is noticeable from all models is that all consider leverage to be highly negatively correlated with firm value. Models 1 and 3 both estimate the coefficient to be -1,355 for leverage while model 2 in Table 5 has a coefficient of -0,76. Noticeably, all models estimate this to be statistically significant at the 1% level. This is aligned with the overall expectations that leverage is negatively associated with firm value.

These three models have higher R-squared values than the univariate tests previously conducted. Models 1 and 3 using Tobin's Q as a dependent variable have relatively high R-squared values at 55,1% and 56,0%, respectively. This shows that multivariate regression models are more suitable for this data sample, and they can explain approximately 56% of the firm value results. However, as R-squared values are still relatively low between 0,43-0,57, this might reveal that even further tests could produce higher explanatory power. For this reason, this thesis also utilizes the fixed-effect OLS regression to control for firm-level characteristics which can impact the firm value over time.

To possibly find more explanatory power, this thesis employs the fixed-effect OLS regression. The results of the overall tests for the sample can be found in Table 7. The first model in the table covers fixed-effect regression with Tobin's Q as the dependent variable. The second model uses the same formula but has the Market-to-Book ratio as the dependent variable. The final model in Table 6 considers a sample that only includes firms having foreign sales. Thus, the methodology is the same as in the results on Table 5 but the pooled regression model is changed to fixed-effect OLS regression.

Table 6. Multivariate results - fixed-effect OLS regression.

	Tobin's Q	MB	Foreign sales > 0
Variable	**Coefficients** (T-statistic)	**Coefficients** (T-statistic)	**Coefficients** (T-statistic)
Constant	1,744*** (5,515)	2,688*** (8,097)	1,303*** (3,788)
Hedging dummy	0,244** (2,507)	0,275*** (2,690)	0,280** (2,523)
Foreign sales	0,067 (0,306)	-0,169 (-0,734)	0,059 (0,268)
Firm size	-0,240*** (-6,198)	-0,248*** (-6,095)	-0,187*** (-4,467)
Leverage	-0,877*** (-4,228)	0,165 (0,759)	-0,795*** (-3,538)
Debt to Equity	-0,002 (-1,152)	0,026*** (13,205)	-0,002 (-1,008)
Liquidity	0,017** (3,089)	-0,011** (-2,006)	0,020*** (3,649)
Dividend	0,062 (1,472)	0,035 (0,792)	0,047 (1,102)
Profitability	0,004** (2,057)	-0,001 (-0,663)	0,005** (2,422)
Growth opportunities	-0,018** (-2,252)	-0,016* (-1,940)	-0,024** (-2,554)
Industry dummies	No	No	No
Adjusted R-Squared	0,914	0,889	0,913
No. Obs.	818	818	759

***,** and * imply statistical significance at 1%, 5%, and 10%, respectively.

The expectation of similar results between model 1 and model 3 in Table 6 holds also with fixed-effect regression due to almost 93% of the total sample being exposed to FX risk directly in their operations. Based on the results presented in Table 6, it can be concluded that the model including the whole sample and the model having all FX-

exposed firms do have almost identical results in all control variables employed. Remarkably, both models find a positive correlation for the FX hedging variable which is the opposite finding when compared to pooled OLS models where the correlation was found to be negative. These models estimate that the positive value premium for firms using currency hedging instruments is approximately 24% for the whole sample and 28% when comparing only firms having foreign sales, also at a statistical significance level of 5%. The size of the hedging premium is even unexpectedly high considering the prior literature where the effect is described to be relatively small. However, findings so far regarding the FX variable show that general findings are indeed somewhat mixed as mentioned widely in prior literature (Allayannis & Weston, 2001, Hagelin & Pramborg, 2005, and Geyer-Klingeberg et al., 2019).

Consistent with the models presented in Table 6, all fixed-effect models appear to signal that firm size is significantly and negatively correlated with firm value as the coefficient varies between -0,187 and -0,248. Similarly, models 1 and 3 using Tobin's Q find consistent evidence that leverage is negatively linked to value premium and this finding is also statistically significant at 1% level in all models using Tobin's Q. Firm value also appears to be significantly correlated with liquidity, profitability and growth opportunities, the latter being the only negative variable of the three. However, all three variables profitability, liquidity, and growth opportunities have rather low coefficients of 0,4%, 1,7%, and -1,8%, respectively. Especially profitable firms have been linked with higher firm value premiums from hedging in the prior literature, meaning that the finding of low-value premiums for profitable firms can be considered unexpected (Bartram, 2007 and Krause & Tse, 2016). Finally, both models using Tobin's Q find positive coefficients for foreign sales and dividend policy, but these findings are not statistically significant.

The model using the market-to-book ratio as a dependent variable has similar results. It is noteworthy to mention that the second model of Table 6 is noticeably weaker to give statistically significant results. Statistical significance is also found with different

variables when compared to models using Tobin's Q. Model 2 is the only model creating a coefficient of 0,026 at a significance level of 1% for the debt-to-equity ratio. This statistical confidence could be derived from the fact that market-to-book is considering equity more prominently. Models 1 and 3 do not give this variable statistical significance and find only a small negative correlation. Seems that market-to-book is also weak in estimating the effect of leverage as the model finds the opposite coefficient to other models, and it is also not significant. However, the variable for FX hedging finds similar results to models using Tobin's Q but with higher significance. Market-to-book ratio model estimates that firms hedging FX risk relate to 27% higher firm valuations. Finally, the second model appears to agree with other models that growth opportunities influence slightly negatively to firm value.

According to the results presented in Tables 5 and 6, the fixed-effect OLS regression models appear to be better at estimating the dependent variables. When all pooled regression models had R-squared values around 40% to 50%, fixed effect models had significantly higher R-squared results. Fixed-effect models using Tobin's Q as a dependent variable have R-squared of 0,914 and 0,913 which can be interpreted as extremely high. This would indicate that the independent variables employed in the models can explain 93,5% of the total variability of the firm's Tobin's Q, making the models and results reliable with this data sample. Model 2 using the market-to-book ratio as the dependent variable, also retrieves a high R-squared of 0,889 for the results. Consistently to the pooled OLS regression results, market-to-book is again found to be more unreliable in estimating the results when compared to Tobin's Q as the dependent variable, even if this difference is reduced in the fixed-effect regression.

Concluding the findings regarding the models using the whole data sample over the years 2016-2019, it can be understood that evidence on the value premium of foreign exchange rate hedging is indeed somewhat mixed. When fixed-effect models employed in this thesis suggest that the value premium would be positive, and firms actively hedging FX risks are valued approximately 25% higher, pooled OLS models have results

indicating towards negative correlation of nearly similar-sized coefficients. However, findings made with the fixed-effect OLS regressions appear to be marginally more significant statistically. Only pooled OLS with only FX exposed sample and fixed-effect model with market-to-book find statistically significant results at 1%, while other models have results with 5% statistical significance. Based on the evidence provided by the results, it could be concluded that foreign exchange rate risk hedging has a positive effect on firm value in the Nordics. This would mean that the first hypothesis of the thesis can be accepted but with little hesitancy. However, prior literature also finds that the evidence on the value premium is mixed and rather weak which is aligned with this thesis (Brunzell et al., 2011, and Bartram et al., 2011). The topic would need extensive further research to completely accept this hypothesis on positive value effect, also in the Nordics.

In addition to foreign exchange hedging, a firm's liquidity ratio, profitability, and dividend payments are found to have a positive correlation with firm value. A small positive correlation with profitability is found in all models, even if the significance is weaker in fixed-effect models. Conflicting with preliminary expectations, dividend payments are consistently found to be positively correlated with firm value, as both significant findings in pooled OLS have a value premium of 16% for firms paying dividends. A firm's higher liquidity ratio is found to have approximately 2% positive effect on firm value with significance at 5% level. This could mean that ability to investors value a firm's ability to meet short-term obligations. Foreign sales are also found to have a small positive relation with firm value. However, the control variable for foreign sales is found to be statistically significant only in one pooled OLS regression, which uses the sample of FX-exposed firms only. That regression model indicates that firms would relate to 44% higher firm values, but this result is weakened by the contradicting results provided by all other models used.

As mentioned before, firm size is found to have a negative correlation with firm value in all models, and the findings are also significant in all models. This finding is surprising as the coefficient is relatively high at around -22% which is not what could have been

expected based on prior literature where firm size is often linked with higher hedging volumes and firm value (Brunzell et al., 2011, and Bua et al., 2015). But based on the evidence covered, the second hypothesis of the thesis is declined as it appears that the results support value premium for smaller firms in the Nordics, instead of the larger firms as initially expected in the thesis. Another significant finding is that leverage is negatively correlated with firm value. Coefficients for leverage are high in all models employed, which could indicate that potentially higher financial distress costs and uncertainty are valued lower in the Nordics. This is aligned with the study by Brunzell et al. (2001), as they mention that the Nordic market appreciates financial stability and maintainable growth development. Finally, growth opportunities are found to be negatively correlated with firm value. This could be linked with the leverage variable which would mean that the Nordic markets could be cautious with firms with extremely ambitious growth plans and projects, and hence value these companies lower. The debt-to-equity ratio is also found to have an extremely small negative coefficient with firm value, but these findings are also deemed to be insignificant. A negative correlation with the debt-to-equity ratio could also support the findings made on leverage and the firm's growth opportunity variables.

Based on the univariate test and multivariate results presented in Tables 4, 5, and 6, the Market-to-Book ratio appears to be weaker than Tobin's Q in estimating the value impact of FX hedging activities. This becomes apparent when considering the R-squared values of all the above-presented models. Pooled OLS regression seems to be the model where this difference is the strongest with 13% lower explanatory power when compared to the model using the same sample with Tobin's Q as the dependent variable. This could be caused by the difference in definitions as the formula of Tobin's Q utilizes assets and the market-to-book ratio applies equity into the formula. These measures can hence be rather distant from each other depending on the company's characteristics. Hence, in the final parts of the empirical analysis, only Tobin's Q is used to estimate the value effect of foreign exchange hedging to have better and more reliable results for comparison.

5.2.1 Country effect on FX risk management and firm value

In the following sub-chapter, the thesis examines if there are any possible country-specific findings regarding the value premium of foreign exchange rate risk hedging in the Nordics. As previously stated, the Nordic market is interesting in the sense that regulatory and economic profiles are similar in all four covered countries, Finland, Denmark, Norway, and Sweden. However, all countries have their distinctive characteristics and national market currencies with Finland being part of the Eurozone. In addition to the country-specific test, this chapter and the regression result presented in Table 7 attempt to answer the second hypothesis of the thesis. The hypothesis expects that FX risk hedging is associated with lower value premiums in firms that operate in countries with Euro as the market currency. In this sample data, this would mean that Finnish firms are found to have lower value premiums from hedging the foreign exchange risk than firms from Norway, Denmark, or Sweden.

Table 7 presents results for the fixed-effect OLS regressions used for this part of the thesis. The formula for the regressions is the same as used in previous parts of the thesis, but the sample data has been alternated according to the country examined. As mentioned in the previous chapter, due to the weaker estimation power of the market-to-book ratio in comparison to Tobin's Q, fixed-effect models employed here utilize Tobin's Q as the dependent variable to estimate the firm value premium. The relevancy of these results is altered by the fact that sample sizes are smaller when the data is divided into only one country. However, data uses mainly bigger firms so data can also be considered indicative on an individual country level. Further research could benefit from having larger datasets for all Nordic countries to have more consistent and comprehensive results.

Nevertheless, the fixed-effect models presented in Table 7 provide excellent R-squared values implicating that the variability of firm value can be explained by the control variables at an extremely creditable level with this model. Especially the results for Sweden have a high R-squared value as it is shown to be 0,944 which is exceptionally

good. Models for Finland, Norway, and Denmark also provide high R-squared values averaging approximately 0,90. This small difference in Sweden's favor is not surprising considering that Sweden's sample is more than double in size when compared to all other countries. The sample size for Sweden is 84 firms in total which covers 41% of the sample used in this thesis.

Table 7. Country results - fixed-effect OLS regression.

Variable	Finland Coefficients (T-statistic)	Norway Coefficients (T-statistic)	Denmark Coefficients (T-statistic)	Sweden Coefficients (T-statistic)
Constant	2,758*** (3,612)	2,283*** (2,875)	2,740** (2,426)	-0,504 (-1,126)
Hedging dummy	0,361 (1,248)	0,160 (0,741)	-0,170 (-0,770)	0,607*** (4,422)
Foreign sales	-0,501 (-0,895)	1,723** (2,199)	-0,282 (-0,673)	0,748** (2,109)
Firm size	-0,361*** (-3,246)	-0,452*** (-5,141)	-0,255* (-1,839)	-0,044 (-0,856)
Leverage	0,592 (0,731)	-0,823** (-1,714)	-0,230 (-0,373)	-1,125*** (-3,649)
Debt to Equity	-0,440*** (-2,763)	-0,003 (-1,454)	-0,083 (-0,541)	0,011 (0,603)
Liquidity	-0,103 (-1,551)	-0,033 (-0,910)	0,010 (1,206)	-0,003 (-0,113)
Dividend	0,079 (0,827)	-0,067 (-0,913)	-0,026 (-0,199)	0,115* (1,932)
Profitability	0,014** (2,392)	0,001 (0,424)	-0,000 (-0,033)	0,013*** (3,648)
Growth opportunities	0,061 (0,731)	-0,001 (-0,051)	0,007 (0,276)	-0,050*** (-4,564)
Industry dummies	No	No	No	No
Adjusted R-Squared	0,904	0,912	0,875	0,944
No. Obs.	163	160	160	335

***,** and * imply statistical significance at 1%, 5%, and 10%, respectively.

Finland is the only country in the sample that is part of the Eurozone and has the Euro as its market currency. The second hypothesis of the thesis attempts to find if FX hedging is less relevant in terms of firm value for firms operating in euro markets than in comparable national currency markets. As presented in Table 1, Finnish companies are active in FX hedging markets as 85% of the sample have declared to be using FX hedging instruments. According to the results presented in Table 7, Finnish companies hedging the FX risk are related to 36% higher firm valuations in the markets. This finding would not directly support the second hypothesis, but it should be mentioned that the finding

is not statistically significant. The coefficient is still noticeably positive and distinguishable from zero, even if the significance is not at an extremely high level as the p-value is 0,215. Parallel to previous results presented, firm size in Finland appears to be negatively correlated with firm value at a significance level of 1% and profitability has a small positive correlation at 5% level of significance. In contrast to other countries covered, Finnish companies seem to have a significant negative correlation between debt-to-equity ratio and firm value. Finnish firms have a lower standard deviation in the debt-to-equity ratios in comparison to other countries as presented in Table 2. This might indicate that Finnish firms have a more standardized capital structure or Finnish firms are more matured in the markets with lower growth ambitions. This is also supported by the fact that Finnish companies appear to have significantly lower capital expenditures than the three other countries when observing the growth variable.

Considering the other variables from the Finnish results, it is worth mentioning that opposite to all other regression results, leverage is found to have a positive coefficient of 0,592. However, this result is not statistically significant which is also applicable to variables of foreign sales, liquidity, dividend policy, and growth opportunities. All results for these variables are aligned with the prior results presented for the total sample.

Norway is the first country with national currency in the sample as the market currency of Norway is the *Norwegian Kroner*. Norway is also distinguishable from other countries in the sample by it not being part of the European Union, and for its exposure to oil extraction and fishing in the Arctic Ocean and the Atlantic. Another distinctive finding regarding the market characteristics of Norway is that Norwegian firms seem to be less profitable during the years 2016-2019 when measured by ROA. This could mean that Norwegian firms are operating in industries utilizing a lot of assets in comparison to other countries, thus these firms would be investing more into operations. These market characteristics are reflected in the fact that Norwegian firms are less active in the hedging markets and are having less foreign sales in comparison to other countries in the sample.

The result presented in Table 7 provides the result of the value premium of FX hedging in Norway. It appears that firms are associated with 16% higher firm value when using the FX hedging instruments but this coefficient is not considered significant. This does not mean that the finding could not be true, but the reliability of the finding is not particularly high with this Norwegian sample. Significant and negative correlation is found with leverage and firm size variables matching the result presented for the whole sample data in Tables 5 and 6. The variable for FX exposure measured by the percentage of foreign sales is particularly interesting in the result of the Norwegian sample. Results show that the foreign sales variable has a positive correlation with firm value, and the coefficient is particularly high at 1,723. The finding is also measured to be statistically significant at 5% level. This would indicate that Norwegian firms having international sales are valued significantly higher than firms operating domestically which is interesting as Norway has the lowest foreign sale percentage from all countries included in the thesis. All other control variables for Norway are nearly zero and statistically insignificant in the results presented in Table 7.

Denmark is the second of the countries using the national currency of the *Danish Kroner*. Table 2 provides interesting aspects of the Danish sample. According to summary statistics presented in Table 2, Danish firms are generally smaller, more international, and have higher liquidity ratios. Interestingly, Danish firms are also valued noticeably higher on average than firms in the other three countries. This feature holds with both measures of firm value, Tobin's Q, and market-to-book ratio. Foreign exchange risk hedging appears to have a negative correlation with firm value in Denmark. The results in Table 7 show that firms hedging FX risk are connected with -17% lower firm valuations in the markets, but this finding is insignificant also for the Danish sample. Nevertheless, negative results for Denmark are conflicting with all other countries and previous models using the fixed-effect OLS regression model. For Denmark, the only variable that has statistically significant results is the firm size which appears to be negatively correlated at 10% significance level. Finally, parallel to the results of the Norwegian sample, control

variables for Denmark's debt-to-equity, liquidity, dividend policy, profitability, and firm's growth opportunities are insignificant and vary between -2,6% and 0,1%.

As a conclusion, the Danish sample has the weakest explanatory power from the regression model and almost fails to provide any significant findings. This could also be the result of mixed firm-specific characteristics in the Danish markets. However, the Danish model still has a high value of R-squared at 0,913 which could indicate that results are not entirely incorrect but just statistically insignificant.

Finally, the last country included in the sample is Sweden where the market currency is the *Swedish kronor*. In general observations from Tables 1 and 2, it can be concluded that the sample of Sweden ranks on average on all market characteristics. The only variable where Sweden stands together with Finland is dividend policy, meaning that firms in Sweden pay dividends more often in comparison to Denmark and Norway. As mentioned above, the sample size of Sweden is sufficient for throughout regression test, and hence the results should be more accurate. This can be observed to be true as six different variables have statistical significance in the results. From the results presented in Table 7, it can be observed that foreign exchange rate hedging has a positive correlation with firm value in Sweden, with value premium being considerably high at 60%. This finding is also statistically significant at 1% level which indicates that Swedish firms undoubtedly have a positive value premium from hedging the foreign exchange rate risk. Sweden is the only one to have any statistical significance for the FX hedging variable. Additionally, the variable for foreign sales has a statistically significant coefficient of 0,748 in relation to firm value indicating that internationally operating firms are valued higher also in Sweden. Matching with Finland, profitability is found to have a significant positive correlation and leverage negative correlation. Unlike other Nordic countries, growth opportunities are found to be a significant variable for firm value generation as the variable is found to be associated with approximately 5% lower firm valuations.

In contrast to other models and all above covered country-specific results, the variable for firm size is not found to be statistically significant for firm value in Sweden. The numerical magnitude for the negative coefficient of firm size is also reduced in the Swedish results, as it is found to be only -4,4% in comparison to approximately -20% in all other regression models presented above. In addition to firm size, debt-to-equity and liquidity are also found to be insignificant in estimating the firm value.

Based on the results presented in Table 7, it appears that FX hedging has a positive value premium in Finland, Norway, and Sweden, while the Swedish results are also statistically significant. The second hypothesis of the thesis assumes that firms operating in euro markets have weaker value premiums from foreign exchange hedging. As FX hedging has a positive correlation with firm value and premium is retrieved to be 36%, this hypothesis can be declined as the results show that firms in Norway and Denmark have weaker coefficients for FX hedging. However, this result is not statistically significant and sample sizes are also relatively small for these countries. Hence, this hypothesis cannot be entirely declined as untrue. The hypothesis should be studied further in the Eurozone markets to completely understand the firm value created by FX hedging.

5.2.2 Industry effect on FX risk management and firm value

The final sub-chapter of the empirical part of the thesis attempts to answer how a firm's operating sector affects the value premium retrieved from hedging the foreign exchange rate risk. The fixed-effect formula is also used for this part of the thesis with Tobin's Q as the dependent variable for firm value. All 205 firms are divided into three operating sectors according to the industry classification available in the Orbis database, manufacturing, services, and IT & Telecom. Minor industry classifications are also considered, for example, a healthcare providers and laboratory firms are classified as services and a firm developing healthcare machinery or supplies is classified as manufacturing sector.

As in all fixed-effect OLS regressions employed in this thesis, also this industry-specific model achieves extremely high R-squared values. Values for R-squared vary between 0,910 and 0,919, but there is no particular difference regarding the explanatory power between the samples. The formula used for the regression tests is the same as in the previous chapters, but the dataset is alternated according to the sector classifications.

Table 8. Industry results - fixed-effect OLS regression.

	Manufacturing	Services	IT & Telecom
Variable	**Coefficients** (T-statistic)	**Coefficients** (T-statistic)	**Coefficients** (T-statistic)
Constant	1,824*** (2,902)	0,982* (1,798)	1,676 (1,593)
Hedging dummy	-0,078 (-0,371)	0,040 (0,275)	0,541*** (3,241)
Foreign sales	1,694*** (3,989)	-0,575** (-2,193)	0,089 (0,070)
Firm size	-0,372*** (-5,883)	-0,115 (-1,650)	-0,235*** (-3,398)
Leverage	-1,067*** (-3,486)	-0,704** (-2,101)	-0,409 (-0,724)
Debt to Equity	0,044* (1,951)	-0,106*** (-4,939)	-0,003 (-1,340)
Liquidity	0,021 (1,088)	0,019*** (2,747)	-0,076 (-1,227)
Dividend	0,038 (0,607)	0,030 (0,438)	0,045 (0,540)
Profitability	0,002 (0,838)	0,009 (1,511)	0,008* (1,867)
Growth opportunities	0,005 (0,388)	-0,005 (-0,475)	0,065 (0,726)
Industry dummies	No	No	No
Adjusted R-Squared	0,915	0,910	0,919
No. Obs.	412	278	128

***,** and * imply statistical significance at 1%, 5%, and 10%, respectively.

The manufacturing sector includes companies that produce or develop products for selling purposes. These firms are most likely exposed to foreign exchange rate risk through their international production lines or material and supply purchases. Table 1 shows that in the manufacturing sector, 90% of the firms are hedging FX risk. 85% of the firms are also having foreign sales which is the highest percentage of the three sectors included. Hypothesis four of the thesis expects that the manufacturing sector will benefit

the most from FX hedging in terms of firm value since these firms are more likely international, have higher operation costs, and are operating in larger facilities.

From the results presented in Table 8, is it found that the manufacturing sector has a negative coefficient of -7,8% from FX hedging which does not support the expectation of a larger hedging premium for manufacturing firms. The negative value premium is surprising for the sector as most of the firms are actively participating in FX hedging activities and international transactions. Aligned with the general findings presented previously in the thesis, firm size and leverage are found to be negatively correlated at a statistically significant level with firm valuation. For manufacturing firms particularly, it becomes apparent that foreign sales are significantly correlated with firm value. According to the results, foreign sales have a value premium with a coefficient of 1,694 which is particularly high. This finding is not that surprising considering that most of the Nordic manufacturing firms are already operating internationally, which indicates that manufacturing firms selling goods mainly domestically are valued significantly lower than competing firms having foreign operations. This is also logical when considering that foreign sales allow larger trading markets and an increase in sold volumes. Finally, parallel to prior results in the thesis, dividend policy, growth opportunities, and profitability are found to have nearly zero impact on firm valuation in the Nordics.

The service industry includes mainly firms that are offering and creating services for business and private customers. These firms include for example transportation carriers, healthcare providers, and retail stores. The distinctive feature of the service sector is that more than 50 percentage of the firms included are operating only in the domestic markets. Also, only 64% of the firms have declared to use FX hedging instruments in their risk management programs.

Results in Table 8 illustrate that the service sector faces 4% value premium from FX hedging, but this coefficient is not statistically significant. Nevertheless, this finding is still positive in comparison to the manufacturing sector where value premium is found

to be negative. An interesting aspect of the service sector results is that foreign sales are found to have a significant negative correlation between foreign sales and firm value which indicates that domestically operating firms have a value premium in the service sector. Surprisingly and in contrary to other models, liquidity and debt-to-equity ratio are found to be significant variables in the service sector, the liquidity variable having a small positive correlation and the debt-to-equity ratio having a negative -10% correlation coefficient. This could indicate that relatively higher financial flexibility is valued higher in the Nordic service sector. Finally, it is worth noting that unlike in other sectors, the firm size variable is found to be insignificant even if the direction is still negative like most of the results in the thesis.

The final sector to be included is IT & Telecom which is characterized as a mixture of the two sectors already discussed. IT & Telecom firms have foreign sales at a similar level to the manufacturing sector but are close to the service sector's FX hedging activity levels. Approximately 79% of the IT & Telecom firms have declared foreign sales, but only 66% are actively using FX hedging instruments. Firms in this sector are for example industrial programmers, national network providers, and software developers. Some firms can also be a mixture of all three sectors included in the thesis but are included in the IT & Telecom sector due to industry classifications available in the Orbis database.

Interestingly, the IT & telecom sector has the biggest firm value premium from hedging as it is found to be around 54%. This coefficient is also statistically significant at 1% level indicating that the positive correlation is reliable in the IT & Telecom sector. Given that the sample size for the IT & Telecom sector is the smallest of the three sectors, the fact that it is the only sector with a statistically significant FX hedging variable is somewhat unanticipated. In addition to the FX hedging variable, firm size is found to be negatively correlated with firm value which is aligned with the general results found for the Nordic firms. Profitability is also linked with a small positive correlation. From the other variables, it can be observed that foreign sales are not found to be significantly correlated with higher firm values which is opposite to other sectors tested.

To conclude the part test of the thesis, it can be said that FX hedging is confidently most valued in the IT & Telecom sector. For the manufacturing sector, foreign sales, firm size, and leverage are the most significant value implications, which could indicate that large and international firms do not receive noticeable FX hedging premium in the manufacturing sector. On the contrary, for the service sector liquidity and capital structure appear to have the most significant impact on firm value. IT & Telecom is again a mixture of both mentioned sectors, meaning that firm size and profitability are found to be significant in the sector. In terms of the topic of the thesis, it is valuable that a statistically significant correlation between FX hedging and firm value is also found in the IT & Telecom sector. Based on these remarks, it can be discussed that the fourth hypothesis of the thesis is declined as the manufacturing sector appears to not have a positive value premium in the Nordics. This finding is surprising when considering that the manufacturing sector is the most active in the use of FX hedging instruments and the most exposed to foreign exchange risk due to the high percentage of foreign sales and supply purchases.

6 Conclusions

This thesis presents financial FX risk management as a valuable tool for nonfinancial firms to reduce their risk exposure and support firm value creation in the Nordics. Examining the impact of financial hedging can often be difficult as data is not consistently available and hedging incentives can be largely different between firms and geographic regions. Prior literature has studied the relation between currency hedging and firm value mostly in larger markets, and results have been largely mixed depending on used methodologies and data samples. Thus, this thesis examines if financial FX hedging has any firm value impact specifically in the smaller Nordic markets.

For this purpose, a data sample of 205 nonfinancial firms from Finland, Norway, Denmark, and Sweden is collected over four years and Tobin's Q is used as a proxy for firm value. The Nordic market provides an interesting platform for risk management research as the market is relatively small, but it has some interesting features such as domestic currencies, the presence of the European Union, and common legislations and cultural characteristics. Geographical differences also affect the industry distribution between the four countries which adds one more interesting element to the thesis.

Financial theory and prior literature on financial hedging suggest that firms are mostly using derivatives for hedging purposes, and specifically to reduce the cash flow volatility firms are facing through the fluctuations of foreign exchange rates. The risk of a firm's investment opportunities being less valuable is often considered to be one of the most important hedging incentives alongside financial distress costs and profit creation. Prior literature is largely mixed on the impact of FX hedging on firm value. However, the literature still agrees that the impact appears to be more commonly neutral or positive, but not extremely sizeable.

This thesis finds that FX hedging is rather consistently associated with greater firm value in the Nordics. For the whole Nordic sample, the value premium is 25% for firms actively hedging the foreign exchange risk, and this finding is also statistically significant at 5%

significance level. This value premium is rather sizeable in comparison to prior literature where the value premium is often found to be closer to the range 0%-5%. Positive FX hedging premium is also found when considering country-specific samples in the Nordics, but only Sweden has a statistically significant hedging premium. Aligned with prior literature, capital structure, profitability and investment opportunities are found to be significant firm value drivers. Aligned with the paper by Brunzell et al. (2011) on Nordic markets, firm value appears to be negatively correlated with firm size meaning that markets value firms with growth potential.

When comparing the firm value impact between different industry sectors, it is found that FX hedging has a greater value premium in the IT and Telecom sector. Hedging premium is found to be 28% in this sector, while premiums for manufacturing and service sectors are found to be -7,8% and 4%, respectively. it is worth mentioning that the value premium for the IT and Telecom sector is the only one with statistical significance. Contrary to the expectations, the manufacturing sector which is often associated with a high percentage of foreign sales and has a negative firm value premium from FX hedging. Thus, it can be concluded that different industry sectors are facing differing value premiums from hedging activities, depending on the industry characteristics such as the portion of foreign sales, capital structure, and the competitive FX exposure.

Based on the findings of this thesis, it can be concluded that the Nordic markets are consistent with prior literature by providing somewhat mixed results depending on the sample and methodologies. Hence, further research in the Nordics could be recommended with a more broad and accurate data sample regarding the FX derivative use. Such research could include all listed firms in the Nordics and use data that is collected directly from the firms. Such research could open a more detailed analysis on different financial risk exposures, and on any firm-specific hedging policies which cannot be collected from the annual reports. More specific research on the country level would also provide more insight into the factors affecting firm value around FX hedging, especially for Finland, Norway, and Denmark.

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