Tuure Mäntynen

Hedging in airline risk management

[Subject]

School of Accounting and Finance
Bachelor's thesis in Finance
Bachelor's Degree programme in Finance

Vaasa 2026

UNIVERSITY OF VAASA
School of Accounting and Finance
Author: Tuure Mäntynen
Title of the thesis: Hedging in airline risk management: [Subject]
Degree: Bachelor's thesis in Finance
Degree Programme: Bachelor's Degree programme in Finance
Supervisor: Vanja Piljak
Year: 2026 **Pages:** 322

ABSTRACT:

The purpose of this thesis is to investigate how airlines manage their risks from financial perspective as well as from operational perspective. The airline industry is exposed to fuel price fluctuations and volatility, which affects financial stability and operating costs.

The performance and different hedging strategies with derivatives have been discussed a lot in the literature. Furthermore, the purpose is also studying effectiveness of different strategies using derivatives as hedging.

Thesis investigates hypothesis concerning the use of derivatives and how they affect earnings and cash-flows volatility and do they improve financial stability. The analysis examines the effectiveness of hedging and does hedging varies between airlines. Geopolitical circumstances are always big question in the industry and thesis also investigates how companies try to minimize operative risks.

Hedging jet fuel can lower earnings and cash flow volatility even though companies' values are variable and depend on context. Conclusions show that hedging effectiveness makes a difference in the choice of instruments and in market conditions. This leads airlines versatility in protecting themselves from an operational as well as financial perspective.

Literature often sees larger airlines on average more efficient in the use of derivatives and in risk management. This is explained through better resources and economies of scale but smaller airlines hedging strategies can have a positive effect especially when hedging is executed systematically and considering the airline's risk profile.

KEYWORDS: Hedging, Derivatives, Risk management, Volatility, Airline industry

Contents

1 Introduction

The airline industry is exposed to instability in fuel prices, which make up a notable portion of the total operating costs. Many airlines use derivatives such as options, swaps, forwards and futures to hedge against price volatility. However, hedging decisions involve trade-offs related to risk exposure, costs and market expectations. According to Swidan & Merkert (2019), hedging strategies can create companies' competitive advantages by locking the prices for the upcoming production impacts. That said, such strategies can also put companies at a huge disadvantage, when prices drop sharply because unhedged speculators can buy production inputs in the relatively cheaper spot market.

There are some special features in the industry, for example high overheads, cyclicity and competition. Because of the volatility of oil price, risk management has become important for airlines to seek to firm their financial performance. As Carter, Rogers & Simkins (2006) states, the US airline industry contributes an excellent environment to study impact of hedging on firm value. Airlines are exposed to relevant but hedgeable risks. One particularly significant risk facing airlines is their exposure to rising fuel prices.

Understanding how airlines use hedging to manage fuel price risk is very important not only for financial investors but also for policymakers and stakeholders interested in the stability of industry. The airline industry has a key role in national economies and has been regarded as an industry of national interest (Samunderu, Perret & Geller, 2023). Because fuel prices are still much more volatile and add up a large share of operating costs, successful risk management is crucial for maintaining financial stability and investors' confidence (Samunderu et al., 2023).

The cost structure of airlines consists of high fixed costs and dependence on fuel as a key input. Oil has been very volatile for crisis. For example, during the Covid-pandemic, crude oil prices dropped dramatically while in more recent periods they have fallen from around 120 USD to around 45 USD per barrel (Bouazizi et al. 2024). Following Russia's

invasion of Ukraine, western sanctions fettered the country's ability to trade euros and U.S dollars, which led to a harsh increase in oil prices. As a result, the price of crude oil rose from about 75 USD per barrel in December 2021 to around 125 USD by March 2022 (Falahati et al., 2024).

1.1 Purpose and research questions of the study

The airline industry is very highly open to fuel price volatility, and it affects operating costs and financial stability a lot. Previous studies such as Merkert and Swidan (2019) show that hedging measures can reduce earnings volatility, but the overall impact of derivatives on a company's financial performance remains uncertain. In this research we try to look a little bit closer into how airlines utilize financial derivatives to manage fuel price risk and are their effective strategies in improving financial stability. The objective of this study is to examine how airline industry uses derivatives to manage fuel price risk and evaluate that are these strategies effective in reducing financial volatility and improving companies' performance.

The research seeks to answer the following questions:

1. How do airlines use derivatives to manage exposure to fuel price volatility?
2. What types of derivative instruments are most employed?
3. How effective are different strategies in stabilizing financial performance?

Companies use derivative instruments for stabilizing cash flows and controlling their earnings volatility, which indicates that hedging may help airlines manage the financial impact of fuel price fluctuations. At the same time, hedging can strengthen firm's financial position and contribute to higher stability and firm value. Effectiveness of hedging may depend on broader market conditions, including oil price volatility and geopolitical uncertainty.

H1: Airlines that use derivative instruments to hedge fuel prices experience lower earnings and cash-flow volatility than airlines that do not hedge.
H2: Fuel hedging is positively associated with greater financial stability and firm value.
H3: The effectiveness of fuel hedging strategies depends on external factors such as oil price volatility and geopolitical uncertainty.

These hypotheses will be examined throughout the theoretical framework and the review of existing research.

1.2 Structure of the study

The purpose and research questions are introduced in the first chapter. Second chapter, risk management in airline industry, provides an overview of the airline sector and its unique characteristics. The chapter begins by describing the characteristics of the airline industry, such as cyclical demand, dependence on fuel as a major operational input and geopolitical risks. It then discusses the main risk factors in airline operations, including fuel price volatility, interest rate risk and operational uncertainties. The chapter further outlines approaches to risk management, covering both financial and operational methods used by airlines to mitigate these exposures. Finally, it explains the importance of fuel price risk management, demonstrating why fuel hedging has become a central strategic tool in protecting airline profitability and financial stability.

Chapter three, derivatives in financial risk management, introduces the theoretical concepts necessary for understanding the role of derivative instruments. It describes the functioning of key derivative products, such as options, futures, forwards and swaps, and explains their use in hedging financial risks. We examine why companies use derivatives, for example to reduce profit and cash flow fluctuations.

Chapter 4 examines fuel hedging in aspects of airlines. We go through how airlines hedge against fuel price risk and what kind of derivative instruments they use. This chapter also

goes through which situations work for hedging and when they don't. Evaluating limitations of fuel price hedging and external factors, for example, sudden oil changes in markets or global crises, which affect the financial profitability of hedging strategies.

In the last chapter of the study presents the most important findings of the study and makes conclusions in related to the research questions and hypotheses.

2 Risk management in the airline industry

Aviation industry operates in volatile and cost-sensitive environment, where successful risk management is required to ensure profitability and long-term stableness. Airlines are exposed to numerous risks, such as exchange rates, interest rates, fluctuations in fuel prices and passenger demand. Fuel costs are typically one of the largest costs, accounting for up to 30-40% of total operating costs, making airlines particularly unprotected to oil price fluctuations (Sibdari, Mohammadian & Pyke, 2018). Thus, fuel price fluctuations can significantly impact airlines' decision-making.

In recent years, many airlines have supplemented financial hedging instruments, such as options and futures, with operational strategies to ease exposure to jet fuel price risk. According to Merkert and Swidan (2019), operational hedging, which is executed for example fleet or engine sharing, can effectively reduce operating costs and improve profitability when integrated with financial hedging. Merkert and Swidan (2019) also states that operational risk management and financial hedging are not replacement for each other, but they supplement each other as part of a company's overall risk management. According to Berghöfer and Lucey (2014), combining hedging to operational flexibility can lead to more efficient cost development. Hedging might not be enough alone to neutralize fuel price risk.

There is also pressure from the sustainability and environmental side that airlines are facing nowadays. Yilmaz and Atmanli (2017) states that transmission to alternative and ecological jet fuel brings opportunities and uncertainty. This requires adaptive risk management from airlines that makes a balance between environmental responsibility and economically to be efficient.

2.1 Characteristics of the airline industry

Airline industry is highly capital-intensive because business requires big investments in fleet and infrastructure. Companies also need long-term financial systems. Merkert and Swidan (2019) highlight the importance of liquidity, especially in capital-intensive industries, where large investments and high-cost structures demand controlling liquidity. Also, the scale of these risks set a high demand for industry in terms of risk management. Airlines operate with long-term investments and big workforce, which makes them vulnerable to sudden market changes (Sobieralski, 2021).

Industry is well known for its competition. The entry of low-cost carriers into the market has significantly changed the competitive landscape of air transport. Increased competition has weakened average profits, and ticket prices have gone down. Simultaneously, Airlines are facing fluctuations in demand. In these cases, airlines are exposed to risks, especially due to high volatility of key input prices, such as jet fuel (Merkert & Swidan, 2019).

Jet fuel is not just expense to airlines, but it is a risk channel, which separates airlines from many other industries. Güntner and Öhlinger (2022) states that airline stock prices and profits are reacting systematically to changes in oil prices and prices of the fuel is crucial revenue driver. In the industry it is very characteristic that companies have a big exposure to price changes in fuel. Kang, Gracia & Ratti (2021) also strengthen that oil price volatility is a crucial factor in airline valuation. According to them, oil price increase and jet fuel price volatility have an adverse influence on stock returns. They also add that hedging upcoming fuel purchases has positive impact on the smaller airlines. In the later chapters we spoke more about airlines sizes and their possibilities to hedge, because bigger companies have a marginal benefit.

According to Güntner and Öhlinger (2022), macroeconomical uncertainties and changes in oil prices effects direct to airlines stock returns, which reflect the cyclicity of the whole industry. Demand of the airlines and financial position are highly connected to economic

cycles and monetary policy. Also, Merkert and Swidan (2019) argue that airlines work in an environment where global shocks, geopolitical events and finance crisis, reflect quickly to results.

2.2 Main risk factors in airline operations

Airlines are subject to risks, having an influence on both short-term performance and ongoing stability. Economic risks, such as exchange rate fluctuations and interest rates, affect directly profitability and financing costs. Sobieralski (2021) suggests that interest rate fluctuations and central bank policy continuously affect the prices of transport assets, including airline stocks. Sobieralski (2021) also points out that macroeconomic factors, especially monetary policy tightening, tend to be capital costs and low investment.

Mendes et al. (2022) reason that the aviation industry still counts heavily on reactive risk management approaches in maintenance and safety systems. Mendes et al. (2022) state that despite the emergence of new predictive and data-driven methods, organizational factors and human errors remain relevant causes of operational disruptions. This contrasts with Lee (2023), who states that airlines are growingly investing in predictive systems to reduce losses caused by operational disruptions such as congestion, mechanical failures and extreme weather conditions.

According to Horobet et al. (2022), oil price level and its volatility have notable and negative effects on airlines' stock returns. Airline industry is in post pandemic world, and it has been more uncertain and more difficult to anticipate strategic choices. It demands from companies more comprehensive approach to changes in their industry and development of jet fuel price hedging practices. Fuel price risk is connected to other financial risks such as currency risks and financial market volatility.

In addition to economic and operational factors, airlines are exposed to demand and regulatory risks related to broader economic and geopolitical developments. Sobieralski

(2021) states that monetary tightening and rising interest rates can weaken air transport demand and increase cyclical risk, which in turn complicates investment and capacity management. This is supported by Karanki and Schaufele (2025), who argue that the financial performance of airlines is strongly linked to macroeconomic stability and how well they can adjust their capacity during economic fluctuations.

Nowadays technology and communication are important in aviation industry and fleets are getting more new technologies. According to Dave et al. (2022), aviation industry has become increasingly attractive to cyber attack target including terrorists and nation state actors. Devices and systems, which are connected, vulnerabilities can allow vicious actions to be carried out. Dave et al. (2022) mention that attacks are not likely to end soon and cybersecurity must be taken seriously by aviation industry. Communications and security are important parts of airlines operational capacity, and stakeholders and leaders must know their weaknesses and effects if the company encounters these kinds of problems and they can't be underestimated.

All the risks cannot be led to markets and some of the main risks are operational. Jet fuel price is based on markets, and the risk can be relocated to there. environmental risks, such as pandemics and terrorist attacks cannot be channel to stock markets. Managing risks in the market is not complimentary and the price must be paid through the intermediary.

2.3 Approaches to risk management

Airlines use a wide range of strategies to ease risks, ranging from organizational and operational measures to financial instruments. From an economic perspective, derivative based hedging is one of the most common instruments to manage interest rates and fuel fluctuations. Chen and King (2014) show that corporate hedging significantly reduces corporate debt costs by reducing risk of bankruptcy and information asymmetry. According to Chen and King (2014) hedging improves credit ratings and stabilizes cash flow,

which is particularly important for highly leveraged and capital-intensive industries such as aviation. However, Merkert and Swidan (2019) note, financial derivatives alone may not be sufficient to manage long-term fuel price risk. Merkert and Swidan (2019) show many airlines have moved to a more balanced risk management approach by fusing financial hedging with operational flexibility to improve resilience to fuel market volatility.

Operational risk management strategies play an equally important role. According to Merkert and Swidan (2019), operational hedging, such as engine and fleet sharing, reduces operating and maintenance costs while improving fuel efficiency. Merkert and Swidan (2019) emphasize operational hedging complements rather than replaces financial hedging. Together they produce greater reductions in operating costs and improve profitability. According to Berghöfer and Lucey (2014) operational hedging measured by fleet diversity and derivative use is not statistically significant reducing jet fuel price risk.

Sobieralski (2021) points out that airlines stock values and cash flow expectations react heavily to monetary policy shocks and airlines manage their risks through adapting their investment and debt structure. Airlines are not directly connected to policy, but they need to be aware of now sanctions and environmental issues, which can harm the company's own policies. Managing risk doesn't remove interference but it can restrict their economic impact, for example in maintenance and in sudden failure modes in airplanes.

2.4 Fuel price exposure to airline operations

Fuel price risk is extensively considered one of the most critical risks to airlines, as jet fuel price fluctuations directly affect cost structures. According to Lim and Hong (2014) fuel constitutes a significant part of airlines' operating costs and sudden price shocks cannot typically be passed on to passengers through higher costs due to competition in the industry. Korkeamäki, Liljeblom & Pfister (2016) states that airlines who have better opportunities to transfer fuel cost increases to ticket prices hedge their fuel less than those with limited abilities. Lim and Hong (2014) argue that fuel price changes are

problematic because they can weaken profitability faster than other costs or market changes that are reflected in the financial situation with a lag. Bruckner and Abreu (2020) support the same idea, who show fuel price increases directly affect airlines' fuel behavior, although their perspective focuses on consumption rather than costs. According to Bruckner's and Abreu's (2020) results, fuel consumption systematically decreases with increasing fuel prices across a range of aircraft models.

Lim and Hong (2014) examine the effects of risk on costs and profitability, while Bruckner and Abreu (2020) approach the phenomenon through operational behavior and emphasize fuel savings effects. Bruckner and Abreu (2020) show in their model that a 0,39 USD/gallon increase in fuel prices reduces fuel consumption by 4,6% for the Boeing 737 and by 2,7-2,9% for other common narrow-body models, supporting the finding that prices have direct operational effects. According to Lim and Hong (2014) the share of fuel costs and the limitations of cost shifting, explain why such behavioral effects are economically important. Their cost structure diagram shows average operating costs rose sharply between 2005 and 2008, at the time as jet fuel prices rose to several dollars per gallon, but other cost items remained almost unchanged highlighting the direct impact of fuel prices on the overall level.

Lim and Hong (2014) emphasize the economic and competitive perspective and describe the constraints of the market structure that prevent the transmission of costs to ticket prices. Bruckner and Abreu (2020) instead highlight operational adaptation mechanisms: During periods of high fuel prices, airlines change their operating practices, such as taxiing patterns, flight speeds and the amount of fuel reserves, which reduces consumption and therefore costs in the short term. Studies of fuel price risk highlight both the sensitivity of the cost structure to price fluctuations and the varying ability of financial instruments to provide effective protection. Since operational measures alone are not sufficient to smooth out fuel cost fluctuations, airline risk management is increasingly based

on economic mechanisms that can directly influence cost predictability and cash flow stability.

3 Derivatives in financial risk management

Derivatives are a key instrument in managing corporate financial risk, as they allow companies to hedge against uncertainties arising from fluctuations in interest rates, commodity prices and exchange rates (Pengfei & Lei 2023). In the financial literature, the primary motivation for using derivatives is to reduce cash flow volatility, which helps firms stabilize their financial performance in uncertain market environments (Pengfei & Lei 2023). According to corporate hedging theories, smoothing cash flows can reduce the expected costs associated with financial distress and bankruptcy, thereby improving overall financial stability (Pengfei & Lei, 2023).

In addition to reducing the costs of financial distress, derivative based hedging is theoretically justified due to its potential to mitigate underinvestment problems caused by unstable internal cash flows and expensive external financing (Pengfei & Lei, 2023). Stable cash flows improve the ability of firms to plan and finance long-term investments, which can increase firm value in imperfect capital markets (Anureet & Madhumathi 2024). In addition, hedging derivatives can reduce information asymmetries between managers and external stakeholders by reducing volatility of earnings and improving the predictability of financial results (Pengfei & Lei, 2023).

These theoretical arguments are particularly relevant for companies operating in capital intensive industries with high volatility in commodity prices, such as the airline industry. Airlines face significant financial risks related to fuel price fluctuations, demand uncertainty and exchange rate movements. These variables can impact profitability and operating costs. Because of the nature of high volatile fuel costs, derivatives have become a part of the airline industry’s financial management.

3.1 The role of derivatives in corporate risk management

Target in risk management with derivatives is not to speculate but keep the cash flow stable and consistent. What is seek by that is that investments stay on schedule and financial decisions can be made on time. Froot, Scharfstein & Stein (1993) state that derivatives are primarily used to manage a company's overall risk rather than to increase its risk level. Derivatives are seen as a tool where companies try to protect their operations from unfavorable market movements and reduce cash flow fluctuations.

So, what are the motives that companies want to hedge? Aretz & Bartram (2010) state that derivatives are just one part of wider financial strategy. The use of derivatives reduces the overall risk, and it is also found to have positive connection with the value of company. Bartram, Brown & Conrad (2011) argue that new users and companies who start to hedge with derivatives, they feel they are reducing the risk level and there is no speculation. Instrumental choices are made by exposure to companies. Guay (1999) also argues that derivatives do not cover the entire risk exposure, but they are part of financial strategy. It does not cut out entirely all risks, but the risk profile can change.

Risk management with derivatives is reasoned only if the market is imperfect. According to Aretz & Bartram (2010) value of using derivatives comes from capital market imperfections, which is the reason why stakeholders can't copy company level risk management on their investment decision. In these imperfections include for example direct and indirect costs of financial difficulties and the cost of external financing and tax factors. They also state that depending on where the firm is legally located, it may also influence hedging decisions. Derivatives are central tool in risk management, especially when cash flows and expenses are exposed to uncertainty. Goal is not to get profit but controlled risk reduction.

3.2 Types of derivatives and their characteristics

Companies can use derivatives in their risk management. There are different types of derivatives, which each of them has their own characteristics and suitability for hedging. In this chapter we take a closer look at futures, forwards, options and swaps. We examine their features and role in company's risk management.

Future and forwards contracts are same kind of working derivatives. They obligate companies to buy or sell, for example stock or even weather phenomenon, which are called an underlying asset. Assets have a predetermined price at a time when they must be bought or sold. Typically, forward contracts are traded in OTC markets and gains and losses are determined after contract's maturity. Futures are more standardized instruments, and they are traded from market to market. What is meant by that is gains and losses are registered all the time in the markets (Lioui, 1998).

With swap contracts companies can change their cash flow structure by changing them with others, which makes them competent with long term interest rate risk. Hedging exchange rates, forward contracts are the most used instruments and when hedging interest rates, swaps are most used. Swap contracts are usually made in OTC markets; their terms can be adjusted to respond to companies' individuals risks and needs. Swaps can be customized, which makes them effective risk management tool when standardized derivatives don't fit in with the company's risk profile. Negative side is when another side cannot fulfill their contractual obligation, risks can be higher (Bartram et al., 2011).

Options are little bit different from previous derivative instruments. Difference comes from there, that option provides the right but not the obligation to trade at certain prices. In this kind of payoff structure companies can hedge unfavorable price movements by limiting their losses, but at the same time they can still benefit from positive markets. Option contracts have usually higher costs compared to futures and forwards because there is a Premio, which you normally pay beforehand (Bartram, 2019).

3.3 Hedging effectiveness and limitations

Hedging effectiveness doesn't mean entirely removing the risk but managing them. According to Guay (1999) firms use derivatives not to increase, but hedge entity risk. Effectiveness also means reducing harmful risks without making unreasonable new risks or costs. The goal of using derivatives is to lower total risk and lower systematic risk. Efficiency is defined as reducing risk, not maximizing return (Bartram et al., 2011).

Airlines' fuel price hedging has been studied by comparing hedging and non-hedging airlines to examine whether the use of derivatives reduces fuel cost and earnings. Lim and Hong (2014) analyze fuel hedging in relation to airlines' operational costs and cost variability. They also state that airlines use fuel hedging contracts as a risk management tool to mitigate fuel price increases and protect themselves from unexpected fluctuations in fuel prices. However, effectiveness of fuel hedging continues to remain mixed, with outcomes dependent on the situation, hedging strategies and external factors such as oil price volatility.

All the risks cannot be hedged by financial instruments because notable losses break out from operational disruption and external shocks. According to Lee (2023) interruptions take place when flight schedules change from external factors such as cyber-attacks, mechanical problems and weather conditions. This differs from financial losses, because they come from physical and operative events and not from price changes in commodities. Airlines need also operational hedging with financial hedging, because alone financial hedging does not work.

Kang et al. (2021) argue that hedging efficiency can't be judged in isolation from the operating environment and external shocks can weaken the effectiveness of hedging. Even though companies use derivatives as their hedging tools, uncertainty can dominate financial results. There are limitations in hedging strategies because of external factors where companies cannot affect.

4 Fuel hedging in the airline industry

Fuel hedging is mostly used as a risk management tool in the airline industry. Jet fuel also makes up a large part of airlines' operating costs (Lim & Hong 2014). It's also important for airlines because they need to manage their cash flow and be aware of world events. Lim and Hong (2014) also state that the main goal of fuel hedging is to protect against price fluctuations, not to maximize profits. According also to Turner and Lim (2015) jet fuel constitutes a large part of the operating costs of passenger airlines, and airline results are vulnerable to fluctuations in jet fuel prices. Fuel hedging is a topic because it forms such a large part of airlines' operations.

Because of strong competition and narrow margins, airlines have restricted ability to put fuel costs increases on to passengers. Turner and Lim (2015) note that competition has gone up so high that costs cannot be passed on to consumers. They also point out that when input price increases, airlines have limited cash flow. Those are the main reasons why airlines must manage fluctuations and costs even better.

Airlines use commonly cross-hedging strategies, using contracts based on commodities that demonstrate a big correlation with fuel prices. As a result, airlines have a limited set of appropriate commodity instruments available for hedging purposes (Turner & Lim, 2015). According to Swidan (2019), futures contracts are usually used to lock in fuel prices over a specified period. They also shape the basis of many hedging strategies.

The academic literature introduces mixed evidence on the outreach to which fuel hedging provides cost efficiency and enhanced financial outcomes. Like Lim and Hong (2014) states that fuel hedging and its impact on airlines is theoretically uncertain. One of the main reasons why I wanted to study more about this subject is based on that information. Swidan et al. (2019) point out that the economic value of hedging depends on costs, market conditions and strategy.

4.1 Fuel price risk and its importance

According to Cai, Zhang and Zhang (2025), the range for fuel costs of an airline company can be from 20% to 50%. Jet fuel is one of the largest, if not the largest expenses for airlines. Of course, expenses always depend on time period and what the situation is in the world. Airlines want to protect their companies from uncertainty, and hedging is one way to defend themselves.

From a financial perspective, oil-price shocks affect stock market returns, influencing firms' expected earnings, which shows that fuel price risk reaches operational costs and capital market valuation (Apergis & Miller, 2009). Therefore, fluctuations in fuel prices impact input costs, but they also change investors' expectations of upcoming risks. Firms with high fuel intensity, fuel price risk is financially relevant and not just operational concern.

Cai et al. (2025) pointed out that oil price shocks can be different, and they are not always the same. Kilian (2009) argued that there are three categories for the oil price movements: oil supply shocks because of quick changes in crude oil supplies, cyclical demand shocks and demand shocks linked to uncertainty regarding future oil supply. There may be sudden movements in aggregate demand that affect airlines' stock market performance.

Airline stock price volatility is driven by multiple types of oil price shocks. Cai et al. (2025) says that airlines differ in their approaches to managing fuel price risk. Some of them rely on financial hedging on jet fuel buys to limit unprotected oil price fluctuations, whereas others follow operational strategies, such as net sales diversification to reduce sensitivity to economic decline.

According to Apergis and Miller's (2009) data, the findings are useful to investors who have to understand the effect of oil price changes on doubtlessly. For example, the airline industry's leaders and workers, who make their bread with hedging, need a more

thorough assessment of the competence of hedging policies touched by oil price changes. In this way fuel price risk constitutes a core challenge for the airline industry, making risk management and hedging decisions relevant in both theory and practice.

4.2 Fuel hedging instruments and strategies

Swidan et al. (2019) states that airlines try to manage exposure to jet fuel price volatility by using derivative contracts, with cross-hedging playing a key role in the absence of jet fuel contracts. For example, an airline might have to cross-hedge its exposure to jet fuel by buying oil futures. According to Adams and Gerner (2012), accomplished cross-hedge needs the existence of an option oil product, which has a pretty similar price behavior. Jet fuel and crude oil are two different commodities, but they are highly correlated. That's one of the main reasons they will probably function adequately as a hedge.

Strategies can vary across airlines, and they require decisions about hedge ratios and the choice of hedging instruments. According to Swidan et al. (2019), future contracts are listed and standardized derivatives, which have an advantage in high liquidity and centralized counterparty risk management because stock markets monitor marginal demands based on prices and volatility. Because of this, it allows hedging positions to held until maturity or to be closed before maturity. Jet fuel futures are not widely used in big stock markets; airlines implement jet fuel prices hedging normally through cross-hedging strategies, using futures on other highly correlated oil products, such as heating oil or crude oil. According to Cao & Conlon (2023), even though airlines act in financial and physical derivative markets, use of jet fuel derivatives is limited and illiquid in both markets. Exchange listed jet fuel futures don't fit long term hedging when OTC jet fuel derivatives are expensive and there is a counter-party risk. Because of this, airlines use often cross-hedging strategies using other commodities which are following closely jet fuel price.

Cao & Conlon (2023) state that only one cross-hedging instrument offers just a limited risk reduction. Composite hedging is a strategy where companies use several hedging instruments together, where the goal is to reduce spot position risk with the help of effective diversification. In contrast, combining new jet fuel swaps with future strategies, it can reduce the basis risk, which comes from unperfect correlation between spot price and hedging instrument.

Combining swaps and futures can achieve benefits in jet fuel price management and additional benefits come through using composite hedging. Results remain after transaction costs are considered. In situations, where straight jet fuel hedging instrument is illiquid, alternative and strongly correlated use of instruments is justified. It is also added that comparing multiple models and instruments with different risk metrics supports more effective execution of fuel price hedging and results should be considered with different variations (Cao & Conlon, 2023).

According to Swidan et al. (2019), although hedging fuel price risk using futures can significantly reduce market risk, the overall benefit of the hedge can be reduced because of the associated cash collateral requirements. Perfect hedging reduces the portfolio's VaR metric, but at the same time requires very large cash assets, which are challenging to acquire even for financially strong airlines due to tight financing conditions in the industry.

$$VaR_a = Percentile_{(1-a)}(NPV_{Base} - NPV_1), \quad (1)$$

Where, VaR_a is maximum expected loss at the chosen confidence level, NPV_{Base} is a net value of fuel in the baseline scenario, NPV_1 is corresponding net value in different price scenarios and $Percentile_{(1-a)}$ is difference in the lowest percentile.

VaR is a statistical method, where its objective is to estimate the maximum loss of an investment portfolio or hedged position at a predefined probability level over a given period (Swidan et al., 2019).

The problem with hedging is therefore not its ability to reduce risk, but the airline's willingness to tie up big amounts of capital in cash collateral, which increases funding risk and liquidity. High hedging ratios require a large amount of cash to be tied up, so that the financial benefit from the risk reduction can be fully compensated (Swidan et al., 2019).

Jet fuel price risk can be managed through operational hedging business decisions and through financial hedging using derivative instruments. Even though, Berghöfer and Lucey (2014) states that widespread financial hedging does not completely eliminate fuel price risk exposure. Berghöfer and Lucey (2014) argue also that jet fuel hedging with using derivatives should manage as one part of wider risk management framework. It's not just one separate solution. This aspect strengthens Swidan et al. (2019) conclusion that there is no one hedging strategy which controls all market conditions. Airlines must adapt their strategies to their risk profiles and operational characteristics.

4.3 Determinants of hedging decisions

When market incompleteness makes risk management justified in terms of value, companies start to hedge their risks. (Smith & Stulz, 1985). They also argue that main factors driving hedging decisions include mitigating agency problems between company's stakeholders and reducing bankruptcy costs. In these situation risk management can add to the company's value by reducing possibility of financial distress and level income streams. Specifically, firms hedge their risks to confirm that they can finance investment projects without relying on expensive external financing (Froot et al., 1993). Unstable cash flows can lead to postponing investments and underfinancing, even if the investments are

ultimately profitable. As a result, hedging is seen to coordinate financing and investment decisions and reduce the risk of underfinancing (Froot et al., 1993).

Primarily, companies start using derivatives to reduce risk and not to increase risk. Furthermore, the decision to use derivatives varies between companies depending on the expected benefits from hedging risks. Use of derivatives is consistent with the companies' risk exposure and reflects deliberate risk management behavior (Guay, 1999). Depending on the expected benefits of hedging, decisions about using derivatives can vary across firms. Companies who have higher exposure to financial risks are more likely to use derivatives. Hedging decisions are connected with companies' risk profiles and reflect risk management behavior rather than being driven by speculative motives (Guay, 1999).

The use of derivatives is more common in big companies and in companies with relevant exposure to currency and commodity risks. In addition to that, the environment of companies and their accessibility to derivative markets affect how actively they hedge risks (Bartram et al., 2011). Using derivatives is associated with lowering systematic and overall risk, which supports the assumption that hedging decisions are not random but determined by the firm's size and structural characteristics. This strengthens the view that hedging is a strategic decision that reflects the operating environment and companies' financial position (Bartram et al., 2011).

Size of the company is a key factor that explains fuel hedging decisions. Airlines with greater financial capacity are more likely to be active fuel hedgers than smaller airlines. This is connected to economies of scale and improved access to derivatives markets, which lower the costs of hedging. Bigger and larger airlines usually have greater absolute fuel cost volatility, which encourages managing risks (Korkeamäki, Liljeblom & Pfister, 2016). According to their studies, airlines that pay dividends are more likely to use jet fuel derivatives than those that do not pay dividends. Kang et al. (2021) argue that hedging upcoming jet fuel purchases has especially favorable effect for smaller airlines. They

point out that hedging upcoming jet fuel purchases has a clear effect on smaller airlines and they affect airline stock returns.

Airlines fuel hedging decisions are specific and company strategic and there is no universal hedging mechanism (Swidan et al., 2019; Korkeamäki et al., 2016). They state that in fuel hedging there are many moving parts, where financial instrument choices reflect company-specific risk tolerance and operating environment.

One of the determinants we can add is the company's size and its possibilities to use cash flows to hedge. Berkowitz et al. (2025) are considering, is hedging always good through investors perspective. Larger companies act mainly as effective risk managers when smaller ones might use derivatives more optimizing their profits than reducing their risk exposure. Added to that, smaller hedgers seem to achieve improvements in annual returns which are measured with Sharpe ratio.

4.4 Effects and outcomes of fuel hedging

Bartram et al. (2011) argue about using financial derivatives to reduce company's market risk and total risk. The impact of derivative instruments is observed to be positive on the value of the company, but it is more tender to internal concerns. In their research they give some view into main findings by drawing time series about volatility and cumulative returns of derivative users and from those who don't use derivatives. One of the reasons for interpretation of results and emergence of differences is endogeneity. Differences between companies who use and don't use derivatives may be due to factors which have not been considered in analysis but effect to company's risks and controlling them. Bartram et al. (2011) also add that more risky companies use derivatives in the way that their risk profile basically reminds less riskier companies and it gives a reason for interpreting the use of derivatives and risk level carefully.

According to Guay (1999), companies who start to use derivative instruments for the first time experience a decrease in their risk exposure in the next year. Airlines' total risk and market risk get tinier, after hedging strategies are taken part of their risk management. This can be added up for the cash flow volatility increases airlines risk to encounter financial difficulties and increases the costs of underinvestment. Airlines with volatile operating profits have an incentive to exploit hedging strategies (Guay, 1999).

Passive hedging strategy and selective strategy can end up with different results. Korkeamäki et al. (2006) studies how passive and active hedgers strategies varies and how they effect on results. They also look at differences on passive and active strategies impacts in companies value where fuel price fluctuations are bigger compared to situations where fluctuation is smaller. Passive hedging is a strategy where the company hedges fuel price risk systematically without changing hedge angle based on market insight. What is meant by selective hedging is opposite to passive hedging. Companies change their angles depending on expectations for fuel price developments. It may seem speculative, even though it is not the target. Hedging and firm value have a weak relationship in the research. Companies using passive hedging strategies have higher company value compared to selective hedgers. This is highlighted especially at times when airline companies are exposed to jet fuel price risk (Korkeamäki et al., 2006).

Berkowitz et al. (2025) study in their research relationship between The Sharpe ratio and hedging. Hedging strategies impacts can be examined through the reduction in risk as well as from the perspective of risk adjusted return. Fuel hedging has a negative effect on both total and idiosyncratic volatility in the airline industry, and this relation is important because hedging is minimizing the risk exposure. They also add questions about firm hedging and its effectiveness compared to individual investors. What is meant by that is effects are not unequivocal and there are open questions left in the study field.

5 Conclusion

This thesis examines the use of derivatives in the airline industry and how their risk management works in different scenarios. More closely, thesis study fuel price risks and how smaller and bigger aviation companies work and do they have different strategies for managing fluctuations in jet fuel prices. The thesis also includes a theoretical section about environmental effects in the aviation industry. Companies are not only exposed to financial risks and decisions, but nowadays they need to understand policies and possible crises, which can lead to bankruptcies. Crisis can form fast and for example Covid-19 was difficult for the industry because demand dropped in traveling.

Previous studies show that managing financial risks by derivatives is not an easy task and companies have different strategies for them. Bigger companies, who have financial advantage are more supposed to hedge with derivatives, because of their cash flow. Even though, some of the studies show that smaller companies, who start to hedge, have bigger benefits because it effects more in stock returns and it looks good for the investors. Previous studies also show that bigger hedgers manage well in reducing the total stock price volatility with derivatives, but small hedgers might be described as speculators because of their timing in hedging.

The literature supports hypothesis that fuel hedging reduces cash flow volatility and it has effect on airlines earnings. Derivatives are used as risk management tools in larger airlines, but it can be questioned in the smaller ones. Do they have more speculative risk profile and how their strategies differ because of their smaller cash flows. Literature shows positive effects about hedging with derivatives, but results are vulnerable for the market conditions and company's characteristics.

The findings suggest that companies who start to hedge with derivatives have a positive effect. Effective fuel hedging can reduce earnings volatility but at the same time it can be a risk in its own, if the commodity prices drop and competitors can buy them cheaper.

From the findings we can also add that fuel hedging has a positive impact on firm value and companies have good financial stability. In addition, there is no certainty in financial performance by using derivatives, because of the complex environmental crisis which is followed by commodity price fluctuations. Hedging jet fuel should not be detached solution, it should be part of wider risk management where airline's size and market conditions are also considered.

When we look at the results, it must be taken account that the previous studies are from different continents and different years, which means that they are not fully comparable together. Aviation industry is changing all the time due to new politics and technology, so time of the research also influences in results. Future research could focus on comparing large and small airlines' differences in hedging and how their risk profiles are different from each other. In addition, further studies can study differences between active and passive hedging and how they differ in various circumstances.

References

Abreu, C. & Brueckner, J. (2020). Does the fuel-conservation effect of higher fuel prices appear at both the aircraft-model and aggregate airline levels? *Economic letters.* https://doi.org/10.1016/j.econlet.2020.109647

Adams, Z. & Gerner, M. (2012). Cross hedging jet-fuel price exposure. *Energy Economics. p. 1301 – 1309.* http://dx.doi.org/10.1016/j.eneco.2012.06.011

Anureet S. & Madhumathi, R. (2024). Do corporate hedge theories explain the natural hedge strategies of firms? A meta-analytic review. *International Review of Economics and Finance. https://doi.org/10.1016/j.iref.2024.05.040*

Apergis N. & Miller, S. (2009). Do structural oil-market shocks affect stock prices? *Energy Economics. p. 569–575.* https://doi.org/10.1016/j.eneco.2009.03.001

Arets K. & Bartram, S. (2010). CORPORATE HEDGING AND SHAREHOLDER VALUE. *Journal of Financial Research. p. 317–371.* https://doi.org/10.1111/j.1475-6803.2010.01278.x

Atmanli A. & Yilmaz, N. (2017). Sustainable alternative fuels in aviation. *Energy 140 p. 1378-1386*. https://doi.org/10.1016/j.energy.2017.07.077

Bartram S, Brown, G. & Conrad, J. (2011). The Effects of Derivatives on Firm Risk and Value. *Journal of Financial and Quantitative Analysis. p. 967-999.* https://www.jstor.org/stable/23018425

Bartram, S. (2019). Corporate hedging and speculation with derivatives. *Journal of Corporate Finance. p.9–34.* https://doi.org/10.1016/j.jcorpfin.2017.09.023

Berghöfer, B. & Lucey, B. (2014). Fuel hedging, operational hedging and risk exposure — Evidence from the global airline industry. *International Review of Financial Analysis Vol. 34, Pages 124-139.* https://doi.org/10.1016/j.irfa.2014.02.007

Berkowitz, J., Dasari, K. & DeLisle, R. (2025). The Effect of Fuel Hedging in the Airline Industry on Returns, Volatility, and on the Return-to-risk Relationship Analysis. *The Energy Journal.* https://doi.org/10.1177/01956574251315449

Bouazizi, T., Guesmi, K., Galariotis, E. & Vigne, S. A. (2024). Crude oil prices in times of crisis: The role of Covid-19 and historical events. *International Review of Financial Analysis 91*. https://doi.org/10.1016/j.irfa.2023.102955

Cai, Y., Zhang, Y. & Zhang, A. (2025). Oil price shocks and airlines stock return and volatility – A GFEVD analysis. *Economics of Transportation.* https://doi.org/10.1016/j.ecotra.2025.100396

Cao, M & Conlon, T. (2023). Composite jet fuel cross-hedging. *Journal of Commodity Markets.* https://doi.org/10.1016/j.jcomm.2022.100271

Carter, D., Rogers, D. & Simkins, B. (2006). Does Hedging Affect Firm Value? Evidence from the US Airline Industry. *Financial management Vol. 35 Issue 1, p53-86. 34p.* https://doi.org/10.1111/j.1755-053X.2006.tb00131.x

Chen, J. & King, T. (2014). Corporate hedging and the cost of debt. *Journal of Corporate Finance p. 221-245.* https://doi.org/10.1016/j.jcorpfin.2014.09.006

Dave, G., Choudhary, G. Sihag, V. You, I. & Choo, K. (2022). Cyber security challenges in aviation communication, navigation, and surveillance. *Computers & Security.* https://doi.org/10.1016/j.cose.2021.102516

Falahati, A., Karimi, M., Khanzadi, A. & Zeinedini, S. (2024). Impact of oil and gold prices on Bitcoin price during Russia-Ukraine and Israel-Gaza wars. *Resources policy.* https://doi.org/10.1016/j.resourpol.2024.105405

Froot, K., Scharfstein, D. & Stein, J. (1993). Risk Management: Coordinating Corporate Investment and Financing Policies. *Journal of finance. p. 1629-1658.* https://doi.org/10.2307/2329062

Guay, W. (1999). The impact of derivatives on firm risk: An empirical examination of new derivative users. *Journal of Accounting and Economics. p. 319-351.* https://doi.org/10.1016/S0165-4101(98)00032-9

Güntner, J. & Öhlinger, P. (2022). Oil price shocks and the hedging benefit of airline investments. *Journal of Economic Dynamics & Control 143.* https://doi.org/10.1016/j.jedc.2022.104507

Hong, Y. & Lim, S. (2014). Fuel hedging and airline operating costs. *Journal of Air Transport Management p. 33–40.* https://doi.org/10.1016/j.jairtraman.2013.12.009

Horobet, A., Zlatea, M., Belascu, L. & Dumitrescu, D. (2022). OIL PRICE VOLATILITY AND AIRLINES' STOCK RETURNS: EVIDENCE FROM THE GLOBAL AVIATION INDUSTRY. *Journal of Business Economics and Management. p.284-304.* https://doi.org/10.3846/jbem.2022.16094

Kang, W., Perez de Gracia, F., & Ratti, R. (2021). Economic uncertainty, oil prices, hedging and U.S. stock returns of the airline industry. *North American Journal of Economics and Finance 57*. https://doi.org/10.1016/j.najef.2021.101388

Karanki, F. & Schaufele, R. (2025). Profit Efficiency: Insight into airline business models and strategic choices. *Journal of Air Transport Management.* https://doi.org/10.1016/j.jairtraman.2025.102863

Kilian, L. & Park, C. (2009). THE IMPACT OF OIL PRICE SHOCKS ON THE U.S. STOCK MARKET*. *International Economic Review. p. 1267–1287.* https://doi.org/10.1111/j.1468-2354.2009.00568.x

Korkeamäki, T., Liljeblom, E. & Pfister, M. (2016). Airline fuel hedging and management ownership. *The Journal of Risk Finance.* http://dx.doi.org/10.1108/JRF-06-2016-0077

Lee, K. (2023). Airline operational disruptions and loss-reduction investment. *Transportation Research Part B: Methodological.* https://doi.org/10.1016/j.trb.2023.102817

Lei, W. & Pengfei, J. (2023). Hedging with derivatives to increase firm value. *Finance Research Letters.* https://doi.org/10.1016/j.frl.2023.103981

Lioui, A. (1998). Currency risk hedging: Futures vs. forward. *Journal of Banking & Finance. p. 61–81.* https://doi.org/10.1016/S0378-4266(97)00039-3

Mendes, N. Vidal Vieira, J. G. & Mano, A. P. (2023). Risk management in aviation maintenance: A systematic literature review. *Safety Science 153*. https://doi.org/10.1016/j.ssci.2022.105810

Merkert, R. & Swidan, H. (2019). Flying with(out) a safety net: Financial hedging in the airline industry. *Transportation Research Part E: Logistics and Transportation Review*, E 127 206-219. https://doi.org/10.1016/j.tre.2019.05.012

Mohammadian, I., Pyke, D. & Sibdari, S. (2018). On the impact of jet fuel cost on airlines' capacity choice: Evidence from the U.S. domestic markets. *Transportation Research Part E: Logistics and Transportation Review*, E 111 1-17. https://doi.org/10.1016/j.tre.2017.12.009

Rajendran, M. & Saharan, A. (2024). Do corporate hedge theories explain the natural hedge strategies of firms? A meta-analytic review. *International Review of Economics and Finance. https://doi.org/10.1016/j.iref.2024.05.040*

Samunderu, E., Perret, J.K & Geller, G. (2023) The economic value rationale of fuel hedging: An empirical perspective from the global airline industry. *Journal of Air Transport Management*. https://doi.org/10.1016/j.jairtraman.2022.102324

Sobieralski, J. (2021). The impact of central bank policy on transport asset prices: Evidence from the US airline industry. *Research in Transportation Business & Management 41.* https://doi.org/10.1016/j.rtbm.2021.100649

Stulz, R. (1984). Optimal Hedging Policies. *Journal of financial and quantitative analysis p. 127-140.* https://doi.org/10.2307/2330894

Swidan, H., Merkert, R. & Kwon, O. (2019). Designing optimal jet fuel hedging strategies for airlines– Why hedging will not always reduce risk exposure. *Transportation Research Part A. p. 20-36.* https://doi.org/10.1016/j.tra.2019.09.014