UNIVERSITY OF GOTHENBURG

SCHOOL OF BUSINESS, ECONOMICS AND LAW

Determinants of Airlines' Capital Structure during the Covid-19 pandemic

BSc Thesis - Industrial & Financial management

Gothenburg, January 2021

Maja Blanck - 980413

Simon Blanck - 950218

Advisor: Elisabeth Karlsson

Abstract

This study analyzes the impact of the variables: profitability, size, interest rate, and value of collateral assets on the American commercial passenger airline industry's capital structure during the Covid-19 pandemic. Further, it examines how the results stand in relation to the established capital structure theories', the trade-off and pecking order, predictions of impact, and explores reasoning for the outcomes. The quantitative study has a deductive method and uses statistical regression models to find that there is a significant correlation between the dependent variable capital structure and the independent variables profitability, size, and collateral value of assets, but no correlation with the variable interest rate. The results confirm that the variables profitability and collateral value of assets have a negative correlation to capital structure, and size has a positive correlation during the Covid-19 pandemic. Further, limitations to both the trade-off and the pecking order theory are found after analyzing the results and it is suggested to revise the models by adding limitations of applicability. The study claims a degree of generalizability and uses the results as well as evidence from earlier studies to reason and draw conclusions about not only the Covid-19 pandemic, but other financial crises. Conclusions such as limitations to both the pecking order theory and the trade-off theory when a crisis occurs are presented.

Keywords: Capital Structure, Airline industry, Financial Crisis, Trade-off Theory, Pecking-order theory.

Table of Content

1. Introduction

In this section, a background of the topics and a discussion about the problems regarding the topics will be presented together with the research questions and the purpose of this study.

1.1 Background

Since the beginning of time, humans have faced horrific pandemics that stretches from the black death in the 14th century to the covid-19 pandemic that we are facing today. Every pandemic has had different impacts on the economic environment and changed the way corporations operate. The famous economist John Maynard Keynes wrote in 1930 that the smallpox disease helped create the price revolution in the gold and silver era that occurred between the 14th-17th century. The disease killed a lot of native Americans and made way for the Europeans to colonize and develop the vacant areas of America, which opened doors to the exploration of mineral wealth and created the capitalist society we have today (Keynes,1930). Globally, as of 10th January 2021, there have been over 88 million confirmed cases of Covid-19, including over 1,9 million deaths, reported to WHO (WHO, 2021). Countries have initiated lockdowns, entry bans, forced physical stores to close, and other prevention measures to decrease the spread of the disease. The impact on the economic output gross domestic product (GDP) has, according to Schultz (2020), been historical. From the first half of 2020, the world GDP forecast has gone from 2,2% annual growth to -4% (Schulz, 2020). The UN's International Labor Organization predicts that in the second quarter of 2020, covid-19 may cost the equivalent of 305 million jobs in the G7 countries[1] (Kretchmer, 2020). The WHO Director-General commented on the Covid-19 pandemic and said that "Covid-19 has changed our world" and that "this is not just a public health crisis, it is a crisis that will touch every sector" (WHO, 2020a; 2020b).

Unemployment rates have skyrocketed; in the US alone are jobs that have vanished, because of the pandemic, close to 4 million and that can be compared with the 2008 economic meltdown where 2,6 million jobs were lost (Kretchmer, 2020; Uchitelle, 2009). The pandemic has not only affected the economy, but also the way people work, how consumers behave, and even how people interact with one another. The commercial airline sector is one sector that got hit hard on the account of Covid-19 when the countries' entry bans stopped almost all flights for a short period and thereafter continued to restrict operations (OECD, 2020). Around 110 000

[1] Canada, France, Germany, Italy, Japan, The United Kingdom and The United States.

flights per day were tracked in the middle of March 2019 and in the middle of March 2020, that number dropped to an astonishing 30 000 flights per day (Zaric, 2020). The International Air Transport Association's (IATA) analysis of the passenger revenue impact predicts a $252 billion loss, which is 44% below the 2019's figure (Zaric, 2020).

1.2 Research problem

The capital structure affects everything from the firm's overall risk perception, the ability to access funding, the return to the investors, and how a firm gets affected by an economic downturn (Berk and DeMarzo (2020). There are several theories about the choice of capital structures that has risen ever since Modigliani-Miller first presented their work in 1958. Theories such as Kraus and Litzenberger's (1973) trade-off theory, which was one of the first to debate the optimal capital structure, and Myers and Majluf's (1985) work on the pecking order. There is a lot of research that focuses on capital structure in a normal economic environment, but not a lot of research that studies capital structure during a pandemic or a financial crisis. Opler and Titman (1994) looked at how financial distress and corporate performance correlates. They found that highly leveraged firms lose substantial market shares to their more conservatively financed competitors in an economic downturn in the industry. Further, there are studies, such as Rajan and Zingales (1995) and Frank and Goyal (2003) that describe different variables that impact the choice of capital structure, for example, profitability, firm size, growth opportunities, and tangibility. But even though Opler and Titman (1994) and Kraus and Litzenberger (1973) include financial distress costs, they do not discuss what affects the capital structure in a financial crisis.

Choosing an optimal capital structure is not an easy task since there are countless combinations of equity and debt, and the accompanying risk, as well as cost of capital, have a dynamic relation to the combinations. As different capital structures convey various risks, the risk also lies within the capital structure's resistance to change when there is economic turbulence (Thedéen, 2018). Even though this is earlier known, there seems to be a gap in research about how certain variables affect the capital structure in the time of a financial crisis, which makes it an interesting case to explore. With a new perspective, that a modern-day pandemic i.e., a financial crisis brings, comes the opportunity to increase our knowledge on how a financial crisis can affect capital structure and further reevaluate and perhaps even revise established models and structures.

As implied, this financial crisis has affected all industries to some extent, but by isolating and examining one of the possibly most affected industries, this study strives to test existing theories and present which variables affect the capital structure in a modern-day financial crisis. That is the reason why the airline industry has been chosen, and specifically airlines with a majority of the flights being commercial passenger flights. Therefore, will this study examine if and how variables affect the commercial airline sector's capital structures and how that stands in relation to existing theories. Important to recognize is that this case study focuses on four specific independent variables and examines their correlation with the response variable, capital structure. Capital structure will onwards represent the debt-total asset ratio as the four independent variables. The variables are profitability, size, interest rate, and collateral value of assets, and will from here and on be referred to as the variables. These variables have been established capital structure affecting variables, by researchers such as Frank and Goyal (2003) and Rajan and Zingales (1995), and will now stand in the spotlight to see if that stays true in a time of financial crisis.

1.3 Research Questions

Based on the problem discussion the study aims to answer the following research questions:

- What variables have had an impact on capital structure in the American airline industry during the Covid-19 pandemic?
- Are established capital structure theories' predictions relevant to the capital structure results from the American airline industry during the Covid-19 pandemic?

1.4 Purpose

The purpose of this study is to, through a case study, explore what variables affect American commercial airline's capital structure during a pandemic, to draw conclusions regarding capital structure and financial crises. Further, this study aims to broaden the understanding of existing capital structure theories and explore their relevance in a time of financial crisis. By giving insights into the capital structure during a financial crisis, the aim is to give firms and investors an opportunity for better decision-making, such as decisions regarding financial precautions. Moreover, this study has a prospect of potentially shedding light upon limitations to established capital structure theories.

2. Theoretical Framework

In this section, the theories that this study is based on are presented together with theories about all the variables used in this study. Lastly, a table of the variables expected impact on the capital structure, based on the capital structure theories, are presented.

2.1 Modigliani & Miller theorem

Modigliani and Miller published a groundbreaking paper in 1958 named “The Cost of Capital, Corporation Finance and the Theory of Investment". The paper introduced the Modigliani-Miller (M&M) theorem that came to change the way of thinking about capital structure and laid the foundation of the evolution of modern capital structure theories. The main idea that Modigliani and Miller (1958) conveyed in 1958 was that the overall value of a firm will be independent of its capital structure and that the company’s cost of equity is directly proportional to the company’s leverage level. Modigliani and Miller continued working with the theorem and were able to publish an addition to the theorem in 1963, that incorporated taxes, bankruptcy costs, and asymmetric information into the theorem (Modigliani and Miller, 1963).

The first version of the M&M theorem (M&M I) holds under the assumption of a set of conditions, as the researchers refer to as a perfect capital market. Perfect capital market conditions are (Modigliani and Miller, 1958):

- Inexistence of taxes, bankruptcy costs, transaction costs, and issuance costs associated with security trading.
- Firms and investors trade the same set of securities at competitive market prices equal to the present value of their future cash flows.
- A firm’s financing decisions do not change the cash flows generated by its investments, nor do they reveal information about them.
- Homogenous information available to market participants

With the conditions satisfied, the theorem’s (M&M I) first proposition holds.

$$\mathbf{V_L = V_U} \qquad \text{(Equation 1)}$$

Where: V_L = the value of the levered firm (financing through a mix of debt and equity)

V_U = the value of the unlevered firm (financing only through equity).

As implied the first proposition (M&M I) states that the company's overall value is not affected by the capital structure. Modigliani and Miller (1958) reason that the capital structure cannot affect the value since the value is calculated as the present value of future cash flows. Further, there are no benefits from tax-deductible interest payments for a company with 100% leveraged capital structure in a perfect capital market, which supports the first proposition of the theorem. The second proposition of M&M I use the first proposition to derive an explicit relationship between the equity cost of capital and leverage. The second proposition establishes the following:

$$\mathbf{r_E = r_u + \frac{D}{E}\ (r_u - r_D)} \qquad \text{(Equation 2)}$$

Where: r_E = the cost of levered equity

r_u = the cost of unlevered equity

r_D = the cost of capital of debt

D/E = represent debt-equity ratio.

Proposition two (M&M I) states that the company's leverage level is directly proportional to the company's cost of equity. This means that a higher level of leverage induces an increased company default probability, and investors tend to demand a higher return (cost of equity) to compensate for the additional risk. (Modigliani and Miller, 1958)

The second version of the M&M theorem (M&M II) was introduced to tackle some of the theorem's limitations, and therefore include company taxes; bankruptcy, transaction, and agency costs; and asymmetric information in the market (Modigliani and Miller, 1963). Modigliani and Miller (1963) presented the second version of proposition one as:

$$\mathbf{V_L = V_U + \tau_C \times D} \qquad \text{(Equation 3)}$$

Where: τ_C = the tax rate

D = debt

M&M II's first proposition (Equation 3) establishes that tax-deductible interest payments that generate tax shields will give the leveraged firm a greater value than the unleveraged firm. The

main rationale for this proposition is that a firm's cash flows are positively affected by tax-deductible interest payments. M&M II present proposition two as:

$$\mathbf{r_E = r_u + \frac{D}{E} \cdot (1 - t_C) \cdot (r_u - r_D)} \qquad \text{(Equation 4)}$$

M&M II's proposition two (Equation 4) implies that the level of leverage has a directly proportional relationship with the cost of equity, similar to M&M I's proposition two. Nevertheless, the tax shield's presence does affect the relationship as it makes the equity cost less sensitive to leverage level. However, since the chance of a firm's default increase, because of the extra debt, investors tend to not react negatively to the firm taking on additional leverage since it also creates the tax shield that boosts value.

The impact on a firm's overall value from the interplay between expected future financial distress costs and tax-shields was studied, with the M&M theorem as the foundation, by Krause and Litzenberger (1973) with a result of the trade-off theory presented below.

2.2 Trade-off Theory

Kraus and Litzenberger published the article "A state preference model of optimal financial leverage" in 1973 that came to introduce the trade-off theory to the world. The trade-off theory, which has the M&M theorem as a foundation, tackle the absence of corporate taxes and bankruptcy costs stipulated by Modigliani and Miller in 1958 (Kraus and Litzenberger, 1973). It thereby weighs the benefits of debt reduction, through the use of a tax-shield, against the costs of financial distress associated with leverage, by introducing bankruptcy penalties and tax advantages into the firm valuation model (Kraus and Litzenberger, 1973). It is fair to say that the trade-off theory is a further developed version of the first M&M proposition and can thereby be said to replace it (Myers, 2003).

Kraus and Litzenberger (1973) present the trade-off theory as:

$$\mathbf{V_L = V_U + \tau_C \times D - (1 - \tau_C) \times PV_{BC}} \qquad \text{(Equation 5)}$$

Where: V_L = Total value of a levered firm

V_U = Total value of the firm unlevered

τ_C = Corporate tax rate

D = Total value of debt

PV_{BC} = Present value of the bankruptcy costs

The model can further be explained as the total value of a levered firm equals the market value of the firm without leverage plus the present value of the tax savings from debt less the present value of financial distress costs (Kraus and Litzenberger, 1973). The theory thereby constitutes the relationship between a firm's interest tax-shields and expected future financial distress cost and can thereby be used to determine the optimum debt level. The optimum level of debt is established, according to the theory, when the marginal benefits equal the marginal costs (Myers, 2003).

2.3 Pecking order theory

The pecking order theory (POT) was firstly introduced by Gordon Donaldson in 1961. Since then, the theory has been further developed and discussed by, among others, Myers and Majluf (1984) and even further by Myers alone both in 1984 and 2003. The theory is one of the main theories presented in the literature that reviews corporate capital structure, literature such as *Corporate Finance* by Berk and DeMarzo (2020) and *Handbook of Empirical Corporate Finance* edited by Eckbo (2009). The Pecking order theory is, according to Myers (1984), a theory that presents the order in which a corporation should choose to raise capital for investments. Myers and Majluf (1984) constitute that a corporation's order of prioritizing financing sources should be first preferring internal financing, thereafter external sources in the order of first debt and then equity. Myers (1984) states that there undeniably is a heavy reliance on internal finance and debt, and he does through numbers convey the case. Myers (1984) further explains the importance of asymmetric information and its affecting role in the pecking order, while referring to his and Majluf's joint study (1984). Firstly, the pecking order does not only assume that there is asymmetric information in the regards that managers as an advantage over outside investors, but it relies on its occurrences. Asymmetric information favors debt over equity as it signals confidence in an investment's profitability to the board and that the current stock price is undervalued, in contrast to issuing of equity that would signal lack of confidence in a project and an over-valued share price (Myers, 1984).

2.4 Capital Structure

Multiple established capital structure theories have been presented above, which convey the main idea of capital structure, but to add is how a firm's capital structure is often calculated, which is the debt-equity or the debt-total asset ratio. The debt-equity ratio is calculated as all interest-bearing debt divided by shareholders' equity and can, as implied, evaluate the amount

of leverage in a company. The debt-total asset ratio, on the other hand, divides all interest-bearing debt with total assets which displays what fraction of the total assets are funded by debt. It is therefore said to be an indicator of how leveraged a company is and further gives an implication of the risk profile regarding the leverage. (Berk and DeMarzo, 2020)

2.5 Profitability

Profitability ratios are made to assess how well a company is doing. The two most used profitability measurements are return on assets and return on equity (Berk and DeMarzo, 2020). Titman and Wessels (1988) claim that retained earnings, hence the profitability of a firm, is an important determinant of a firm's capital structure. While looking at profitability and the theories presented above, Titman and Wessels (1988) describe, based on evidence from Donaldson's (1961) pecking order theory, that firms prefer raising capital, first from retained earnings, second from debt, and third from issuing new equity. This behavior is suggested to be due to the costs of issuing new equity (Titman and Wessels, 1988). Titman and Wessels (1988) further argue that the high cost might be a reason for asymmetric information, and/or transaction costs. Profitability is also related to the trade-off theory in the sense that profitable leveraged companies will be affected by the tax-shield and increase their profitability with more debt (Kraus and Litzenberger,1973). Furthermore, high profitability should result in cheaper debt as the risk-related future cost of distress becomes lower (Kraus and Litzenberger, 1973). To note is that the pecking-order and the trade-off theory are contradictory in how profitability should correlate with capital structure.

2.6 Size

Morri and Cristanziani (2009) argue that there is a high degree of explanation between size and capital structure which both the trade-off and the pecking order theories also suggest. Both theories emphasize a relationship between size and capital structure, but interesting is that they are contradictory in the correlation. The Trade-off theory suggests, supported by both Morri and Cristanziani (2009) as well as Titman and Wessels (1988), that large firms have more diversified assets which decrease the risk of bankruptcy. Lower risk increases the company's stability and therefore increases the possibility to issue cheap debt. The trade-off theory also suggests that larger companies have better knowledge and access to the financial market whereby they get access to more favorable interest rates on debt (Kraus and Litzenberger, 1973). The pecking-order on the other hand suggests that larger companies are more thoroughly inspected and can therefore issue more sensitive securities. More securities outstanding

increase the equity and hence lowers the debt ratio. The Pecking-order also suggest, again, contradictory to the trade-off theory, that large firms may use less leverage, because they can issue equity at a lower premium than small firms, making it a cheaper source of funding. The reason is that equity does not require annual interest payments nor the repayment of principal (Myers, 1984).

2.7 Interest Rate

Research from Morri and Cristanziani (2009) shows that there is a relationship between capital structure and interest rate, but that it is somewhat hard to clarify if the relationship is positive or negative. They argue that the choice of leverage is based on factors such as company rating, interest level forecasts, and the demand for funding (Morri and Cristanziani, 2009). Interest rate correlation with capital structure is further supported by both the trade-off theory and the pecking order, but like Morri and Cristianziani's research can neither of these theories determine whether the relationship is positive or negative. As the pecking order theory states, the first choice of funding is always internal, the second external debt, and the third choice external equity. This means that the choice of a capital structure depends on the firm's financial situation (Myers, 1984). And according to the trade-off theory, should a firm increase debt as long as it does not entail bankruptcy risk cost (Kraus and Litzenberger, 1973).

2.8 Collateral Value of Assets

Work presented by Mayers and Majluf (1984), regarding the pecking order, argues that firms may find it advantageous to sell secured debt. Their model demonstrates that asymmetric information between managers and creditors, regarding securities, is associated with high costs and that issuing debt with collateral avoids these costs. For this reason, firms with assets that can be used as collateral are more likely to issue debt. Work by Galai and Masulis (1976), Jensen and Meckling (1976), and Myers (1977) also suggest a positive correlation between capital structure and collateral value of assets, due to the stockholder's incentives to expropriate wealth from the firm's bondholders. They explain that stockholders that issue debt that can be collateralized are restricted to use the funds for a specified project. Since no such guarantee can be used for projects that cannot be collateralized, more favorable terms may be required from creditors, which may lead firms with fewer collateral assets to issue more equity instead (Titman and Wessels, 1988). Morellec does in 2001 in his article "Asset liquidity, capital structure, and secure debt" suggest that there could be a negative correlation since managers

can exploit their debt and equity holders by selling uncollateralized assets underprized for short term funding.

2.9 Expected Impact on Capital Structure

Table 2.1 is compiled to give the reader a better overview of how the variables are expected to be impacted by the trade-off and pecking order theory explained above. A "+" sign represents a positive correlation between a variable and the capital structure measurement, for example, if profitability increase, the trade-off theory suggests that the debt ratio increase with it. The "-" sign states the opposite, and the "?" states that no conclusion could be drawn from the theories.

Table 2.1: Variables expected impact on capital structure. Based on the Theoretical framework.

Variables expected impact on capital structure		
Variable	**Theory**	**Expected impact on Capital structure**
Profitability	Trade-off	+
	Pecking order	-
Size	Trade-off	+
	Pecking order	-
Interest rate	Trade-off	+/-
	Pecking order	+/-
Collateral value of assets	Trade-off	?
	Pecking order	+

3. Research Design

This section describes how this study is designed and also explains the reasons why and how certain methods are used.

3.1 Research Strategy

Research strategy can, according to Bryman and Bell (2011), be described as a "general orientation to the conduct of business research". This study's research strategy is *quantitative*, meaning that it will in the process of collecting and analyzing data emphasize quantification and, in contrast to the qualitative strategy, employ measurements. Patel and Davidson (2019) say that a simplified explanation of a quantitative study is that it aims to clarify questions regarding "Amount, frequency, correlations between variables, and cause and effect". Further, the quantitative research strategy will include a *deductive* approach to the relationship between theory and research (Bryman and Bell, 2011). This relationship between theory and research Patel and Davidson (2019) describe as an approach that allows the researcher to derive hypotheses from existing theories and general principles, and then through empirical testing try the hypotheses to draw conclusions about the specific case. Patel and Davidson call the approach *hypothetico-deductive*, but as mentioned does Bryman and Bell (2011) call the nearly identical approach simply the deductive theory. Bryman and Bell (2011) summarize the approach used with six steps that are depicted in Figure 3.1.

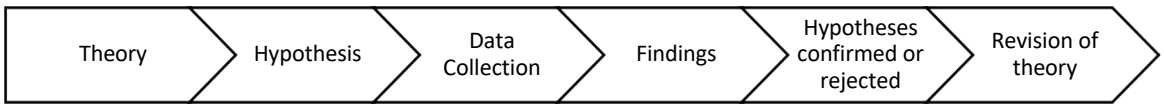

Figure 3.1: The Deductive Theory. Based on Bryman and Bell (2011)

A reason for choosing this approach was that the purpose of this study entails testing already existing theories. Also, what makes this approach special is that it is considered highly objective according to Patel and Davidson (2019). It is considered objective since it is already established theories that determines what data should be gathered, how it should be interpreted, and how to relate it to existing theories, meaning, that personal references and experiences have little to no effect on the result (Patel and Davidson, 2019).

3.2 Research Method

In line with the research strategy, the initial work that went into this study was to review already published literature on the research subject. The information found, which is presented

in the section theoretical framework, has the library of the University of Gothenburg and Google scholar as main sources. Using these channels resulted in the use of books that universities actively use in educating their students, as well as mainly peer-reviewed studies. While searching for information in the digital databases a few main search categories/areas, in different constellations, was used: *Capital Structure, Aviation industry, Financial Crises; Shocks; Downturns.* Based on the found theories, concerning the capital structure and different variables that affect the capital structure, the below-published hypotheses were created and the work of collecting and analyzing the data begun. With the below-published data analyzing methods it was possible to reject and/or confirm the hypotheses and conclude what variables affect the capital structure during financial crises and how that is in line or differs from theories' predictions.

3.3 Sample

According to the U.S. Bureau of Transportation, there is as of the first of January 2020 a total of 18 air carriers that belong to, what they call, "Group III". An airline's group affiliation indicates foremost the size of the carrier and Group III holds all American commercial airlines that generate over one billion U.S. dollars in operating revenue per year. (BTS, 2019) The sample was thereafter limited by excluding companies that, according to information gathered from the U.S. Exchange and commission and their individual websites, did not match this study's requirements of being an airline that to date files quarterly reports and where operations are predominantly commercial passenger transportation. The companies excluded was Atlas Air Worldwide Holdings INC, Federal Express CORP, Kalitta Air LLC, Polar Air Cargo, Republic Airways Holdings INC, and United Parcel Services INC (Atlas Air, 2020; FedEx, 2020; Kalitta Air, 2020; Polar, 2020; USA. SEC, 2020; UPS, 2020). After isolating the 12 companies that mainly transport passengers, Envoy Air Inc. and Frontier airlines were excluded since they both are wholly owned subsidiaries of respectively the American Airlines Group and the Indigo Partners (American Airlines, 2020; CAPA, 2020). Why this was necessary is that their financial results and information are presented in the larger corporation's financial reports. To mention is that the sample was limited to the airlines' quarterly reports from quarters two and three in the year 2020. Reasons for this were that the pandemic came to affect the industry first in the second quarter and also that the quarterly reports for the fourth quarter of 2020 were simply not available at the time of conducting this study.

3.4 Data collection method

The data required to analyze the airline industry and meet the purpose of this study is the sample group's individual financial statements, specifically their quarterly reports. This empiric data was exclusively gathered from the U.S. Securities and Exchange Commission (SEC) database. The database was accessible through SEC's website, under the headline *Company Filings* where all the sample companies' quarterly reports are publicly published.

3.5 Statistical processing

The data set was analyzed in four single linear regression models to examine whether the hypotheses would be accepted or rejected. The independent variables, that meet the statistical criteria and the significance level, was thereafter examined further in a multiple regression. To determine a variable's goodness of fit this study analyzed the R squared coefficient in each case, and to interpret the strength of the relationship between the dependent and the independent variables each correlation coefficient was analyzed. The calculations were all created with the tool Microsoft excel. The interpretation of the regression models and processes, as well the coefficients will be explained below.

3.5.1 Regression

The linear simple regression model, used in this study, examines how much the independent variable can explain the changes in the dependent variable. The simple regression equation is denoted as:

$$\boldsymbol{Y = b_0 + b_1 X} \qquad \text{(Equation 6)}$$

Where: b_0 = the interception of the line

b_1 = the slope of the line

The most suitable line within the scatterplot was calculated by using the method of the least squares, which is a method that minimizes the range of the predicted plots of the line and the actual plots, as in figure 3.2 below. (Jaggia and Kelly, 2016)

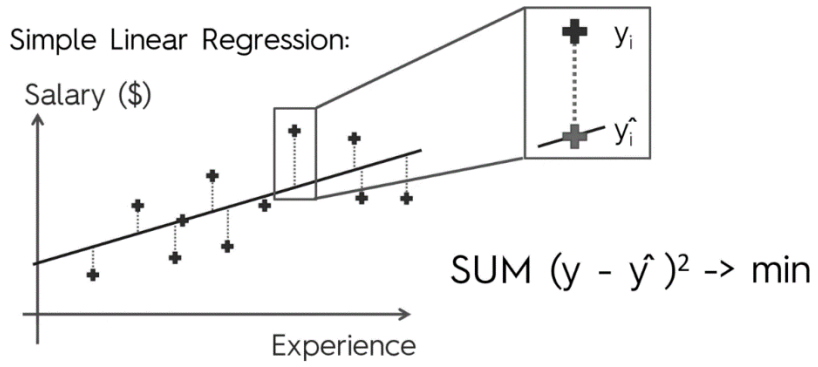

Figure: 3.2 Simple Linear Regression. Source: (Zang, 2019)

The correctness of the line created with the empiric material was then examined by using the coefficient R squared, also called the coefficient of determination. The multiple R ranges from 0 to 1 where 0 indicates that the plots are perfectly random scattered and 1 indicates a perfect fitting line. The F-significance of the model explains how reliable a model is, as well as presents the probability of the model's incorrectness. Commonly used significance levels are 1%, 5%, and 10%, and during this study was the 5% determination level of regression significance used. The multiple regression model is an extension of the simple regression model and it was used to study how the dependent variable was influenced by three of the independent variables. (Jaggia and Kelly, 2016)

3.5.2 Correlation

Correlation is a measurement of the extent to which two variables are related. Correlation can take the range of numbers between 1 and -1. A correlation of 1 indicates that the relationship between two sets of variables moves in the same direction. In other words, when one variable increases the other variable increases as well. A correlation of -1 indicates a perfect negative correlation which means that one variable increase and the other one decrease. 0 correlation describes a scenario when there is no relationship between the variables. (Jaggia and Kelly, 2016) Correlation can be described visually as in figure 3.3 below.

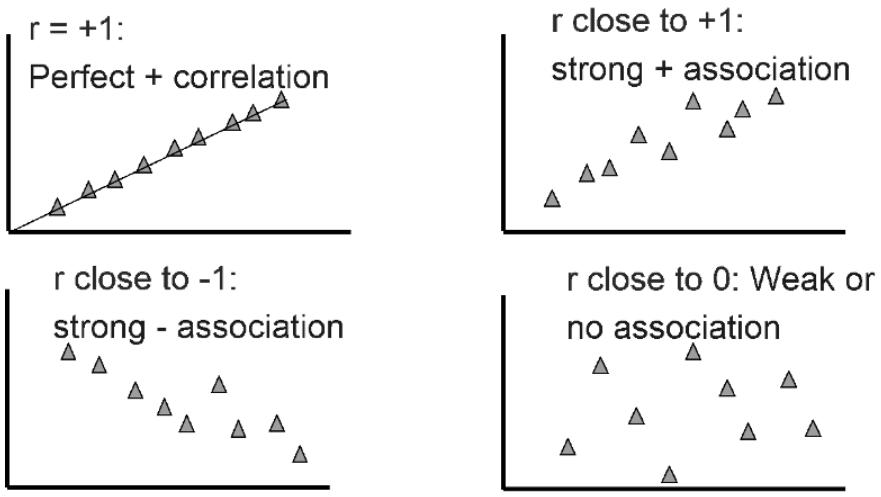

Figure 3.3: Correlation. Source: (Wayne W, 2019)

To interpret the value of the correlation coefficient this study used Rumsey's argument that a correlation of 0.3 to 0.5 (-0.3 to -0.5) indicates a weak linear relationship, 0.5 to 0.7 (-0.5 to -0.7) indicates a moderate linear relationship, and a correlation of 0.7 (-0.7) or higher (lower) represents a strong relationship (Rumsey, 2003).

While conducting this study the correlation coefficient was calculated identically to the way Jaggia and Kelly (2016) and many others has, which is as follows:

$$\boldsymbol{R_{xy}} = \frac{\sum(\boldsymbol{X_i}-\bar{\boldsymbol{X}})(\boldsymbol{y_i}-\bar{\boldsymbol{y}})}{\sqrt{\sum(\boldsymbol{X_i}-\bar{\boldsymbol{X}})^2 \sum(\boldsymbol{y_i}-\bar{\boldsymbol{y}})^2}} \qquad \text{(Equation 7)}$$

3.5.3 Diagnostic Test

In the process of creating a regression model, some potential issues and errors had to be examined before the data could be accepted (Jaggia and Kelly, 2016). Potential errors and issues will be described and summarized under the headlines below.

3.5.3.1 Multicollinearity

Multicollinearity exists when two or more independent variables have a linear relationship in a multiple regression. The linear relationship was examined by creating a correlation matrix with the independent variables, showing the correlation coefficient. The chosen guideline suggests that multicollinearity is severe if the correlation coefficient of the two variables is more than 0.8 or less than -0.8. If two independent variables did affect each other the regression model is biased in the sense that it is hard to distinguish how much each independent variable affects the dependent one. (Jaggia and Kelly, 2016). While examining the correlation matrix it

was clear that interest rate was not within the limits of -0.8 to 0.8 and thus rejected from the multiple regression.

3.5.3.2 Heteroskedasticity

Heteroskedasticity is a violation of the assumption that the variance of errors is constant. Specifically, heteroscedasticity is a systematic change in the spread of the residuals over the range of measured values. Heteroscedasticity is a problem because the regression model assumes that all residuals are drawn from a population that has a constant variance (homoscedasticity). In figure 3.4 a heteroskedastic residual plot is presented and the characteristic of heteroskedasticity is that the residuals create a cone-shaped area in the plot. Note that even if the dataset is heteroskedastic the regression model is not necessarily biased, though it presents an issue since the residuals are no longer efficient and make the F-significance questionable. (Jaggia and Kelly, 2016) In this study, similar residual plots as in figure 3.4 were constructed for each independent variable to analyze if the residuals indicate heteroskedasticity.

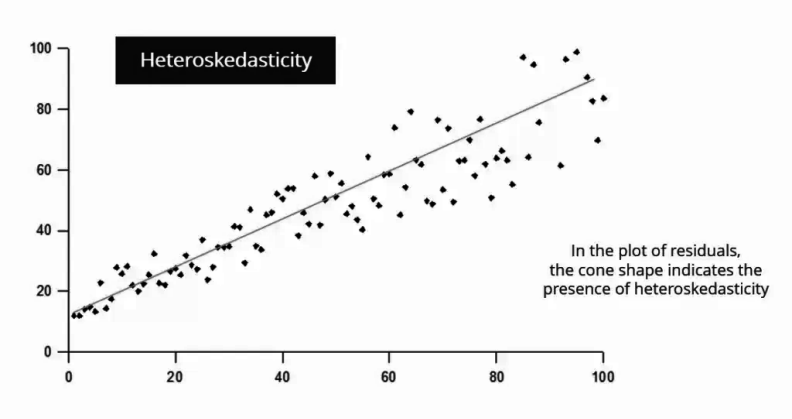

Figure 3.4: Heteroscedasticity Plot. Source: (CFI, 2020).

3.5.3.3 Non-normality

A common violation of the regression model is non-normality. Non-normality occurs when the dataset does not follow the bell-shaped curve of a normal distribution, which is presented in figure 3.5. (Jaggia and Kelly, 2016)

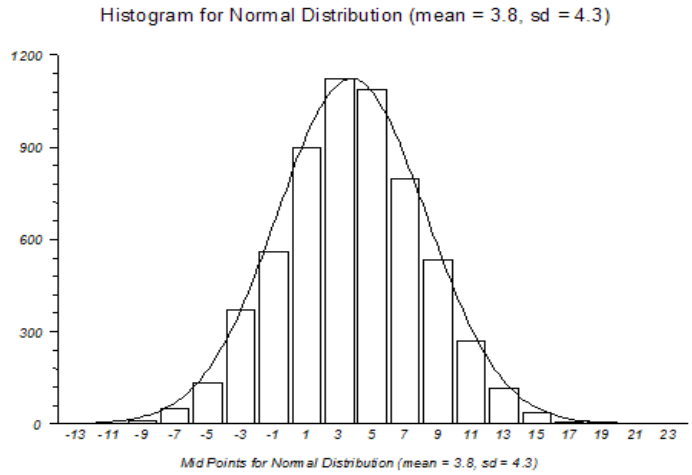

Figure 3.5: Histogram for Normal Distribution. Source: (StatsDirect, 2020)

Non-normality can cause problems when it comes to inferences from an estimation of results. A way to counter this effect is to include more observations in the sample to decrease the standard errors. When a dataset has enough data samples it is considered normally distributed and therefore is the non-normality violation often omitted (Jaggia and Kelly, 2016). Jaccard and Becker (2009) suggest that when a data sample include more than 15 samples the data is considered normally distributed. Since this study included at least 20 samples in each regression the violation of non-normality was therefore ignored.

3.6 Research quality

Patel and Davidson (2019) and Bryman and Bell (2011) express the vitality of ensuring a high level of quality in a quantitative study, and that the quality is dependent on the validity and reliability of the data, as well as replicability according to Bryman and Bell. Reliability, which is described as stability over time, can be tested by repeating the study and examining if variation occurs (Bryman and Bell, 2011). This study tackles that factor since it is a case study and that any repeated try would have to use the same quarterly reports and therefore would no change in the results occur. Replicability, which entails that the study must be capable of replication, is simply dependent on a clear presentation of the procedures (Bryman and Bell, 2011). This study aimed to tackle that factor by in this chapter, research design, clearly state the process and therefore allow for replication. Lastly, there is validity, which is divided into subcategories, that are concerned with the integrity of the conclusion (Bryman and Bell, 2011). The first subcategory, measurement validity, ensures that the measurement tests what it claims to measure, and the second, internal validity, ensures a trustworthy cause-and-effect relationship between the variables (Bryman and Bell, 2011). Measurement and internal validity

were ensured by using established statistical research methods, that purposely study cause-and-effect, that had been used in comparable research papers before. The last subcategory and the lone factor that is much debated regarding the quality assessment of particularly case studies is external validity or generalizability, which aims to assess if the result can be generalized beyond the specific context (Bryman and Bell, 2011). This paper does not have complete external validity, since how the studied industry has been financially affected is not necessarily how all industries were affected by the Covid-19 pandemic or that the pandemic itself is a perfect representation of all financial crises. Still, the study claims a degree of theoretical generalizability because of mainly three factors. Number one, the pandemic's main impact was net income loss, which relates to most financial crises. Number two is that the results in many cases correlated with the theories, and last but not least because the analysis and reasoning took the generalizability into account and drew objective conclusions.

3.7 Variables

This study's goal was to examine if there were significant relationships between the dependent variable and the four independent variables. The variables that were selected are all measurable and relevant to examine, based on this study's choice of industry. Different ways of calculating the variables have been shortly discussed, but how this study chose to calculate them will, along with the hypothesizes, be presented below.

3.7.1 Capital Structure

The capital structure was examined as a dependent variable, meaning that the study examined how it has been affected by the independent variables. Eliasson (2006) describes a dependent variable as a variable whose outcome depends on other factors. Modigliani and Miller (1958), considered the founding fathers of capital structure research, used debt to total assets as a legitimate capital structure measurement which is why this study chose to use it as well. The debt to total asset ratio, defined as capital structure in this study, was computed as:

Total Debt / (Total Equity + Total Debt) = Debt to Total Asset ratio (Capital Structure)

3.7.2 Profitability

Singh & Bagga (2019) examined how profitability affects the capital structures in the Indonesian market by looking at two different profitability ratios, return on assets (ROA) and return on equity (ROE). The authors are using ROA and ROE as two dependent variables in two different regression analyses. Both measurements are considered valid but since both variables measure profitability in two different ways, it is not possible to include both in this

regression model. This study has chosen to examine ROA as the profitability variable, computed as:

Net income / Total Assets = Return on Assets (Profitability)

The profitability hypothesis:

H_0: The variable profitability does have an impact on the capital structure

H_1: The variable profitability does not have an impact on the capital structure

3.7.3 Size

According to Morri and Cristanziani (2009), there are three main ways of calculating a firm's size, which are revenues, number of employees, total assets. Other researchers such as Titman and Wessels (1988) and Bevan and Danbolt (2000) used revenue/sales and Al-Najjar, B., and Taylor, P. (2008) used the natural logarithm of total assets as the measurements of a firm's size. As implied, the Covid-19 pandemic caused a mass layoff in the airline industry which means that the measurement of employees includes a risk of error. The measurement of revenue might also skew the results since the revenues have had a substantial decline to abnormal levels. Therefore, did this study use the natural logarithmic transformation of total assets as the measurement of size. The reason behind the logarithmic dilution coincides with Smith's (1977) argument is that smaller firms have a higher cost for issuing equity, which indicates that a smaller firm will choose the cheaper debt. The natural logarithm reflected this study's view that the described size effect, if it exists, affects mainly small firms. The size was, in this study, chosen to be computed as:

Ln (Total Asset) = Size

The size hypothesis:

H_0: The variable size does have an impact on the capital structure

H_1: The variable size does not have an impact on the capital structure

3.7.4 Interest Rate

The trade-off theory as well as Morri and Cristanziani (2009) calculate interest rate as the interest cost of total debt divided by total debt, which is why this study chose to calculate it in the same way.

Interest rate is computed as:

Total interest cost /total debt = Interest cost ratio (Interest Rate)

The Interest rate hypothesis:

H_0: The variable interest rate does have an impact on the capital structure

H_1: The variable interest rate does not have an impact on the capital structure

3.7.5 Collateral Value of Assets

The variable collateral value of assets is by Mayers and Majluf (1984) as well as Titman and Wessels (1988) calculated as gross plant and equipment plus inventory divided by the total assets. This study, therefore, chose the same way of calculating since it is used by established researchers and because it allowed for comparison between the results and their theories. The collateral value of assets was, therefore, in this study, defined as:

(Inventory + Gross plants and equipment) / Total assets = (Collateral value of assets)

The Collateral Value of assets hypothesis:

H_0: The variable collateral value of assets does have an impact on the capital structure

H_1: The variable collateral value of assets does not have an impact on the capital structure

4. Empirical Findings

In this section, all our findings together with the diagnostic test are presented.

4.1 Diagnostic Test

In this section, the empirical findings from the diagnostic tests are presented.

4.1.1 Multicollinearity

Table 4.1: Correlation Matrix

	Collateral value	*Intrest Cost*	*Profitability*	*Size*
Collateral value	1			
Intrest Cost	**0,847315319**	1		
Profitability	0,373305832	0,204417726	1	
Size	-0,43772878	-0,506479585	-0,660310367	1

The correlation matrix is presented in table 4.1 and the only correlation that is violating the accepted limits -0,8 to 0.8 is the correlation between interest cost and collateral value of assets, which takes the value 0,85.

4.1.2 Heteroscedasticity

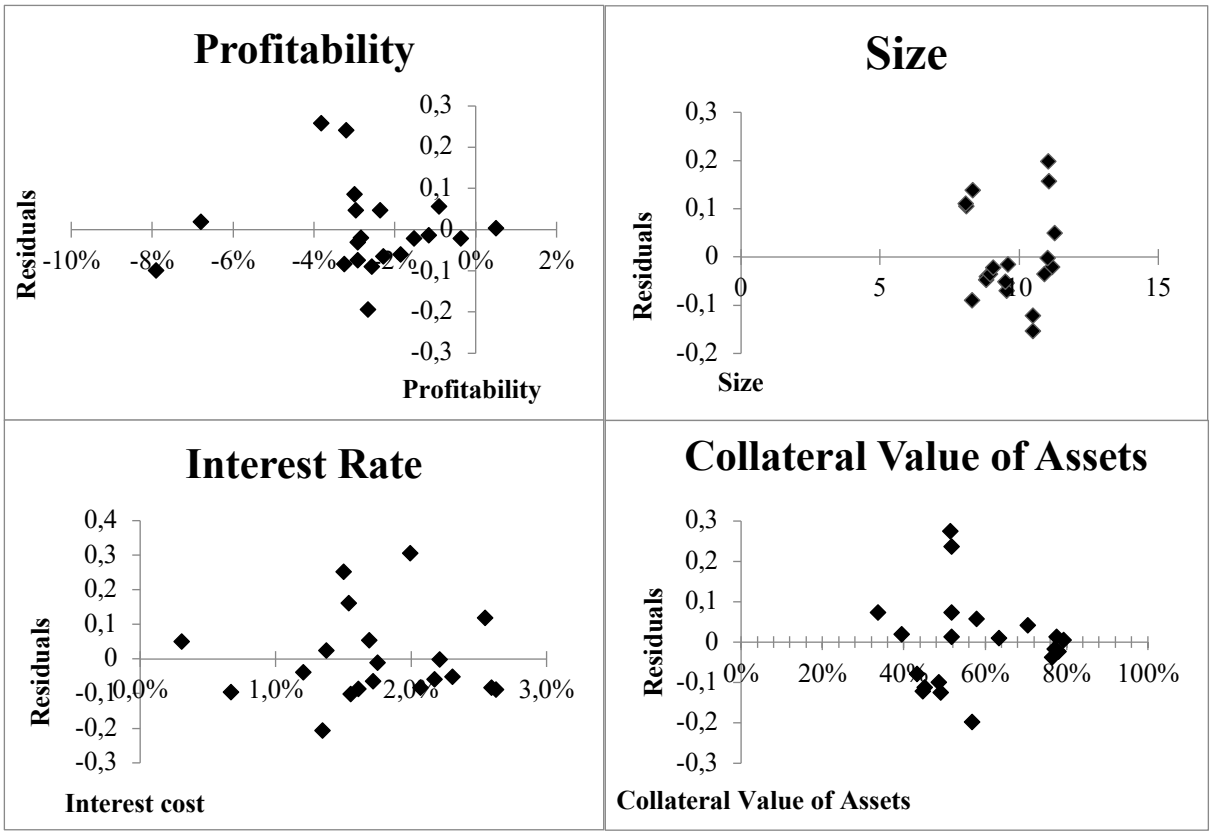

Figure 4.1: Residual Plot – All variables.

The plots in table 4.1 represent the residuals on each airline. The residuals are all random and do not follow a con-shaped pattern which implies that the data is not affected by heteroscedasticity.

4.2 Simple Regression

In this section, we will show our results from variables made by the simple regression.

4.2.1 Profitability

Table 4.2: Profitability - Regression

Regression Statistics	
Multiple R	**0,545782723**
R Square	0,29787878
Adjusted R Square	0,258872046
Standard Error	0,110148271
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,092652117	0,092652117	7,636598771	**0,012799777**
Residual	18	0,218387551	0,012132642		
Total	19	0,311039667			

Table 4.3: Profitability - Correlation

	Profitability	*Capital structure*
Profitability	1	
Capital structure	**-0,545782723**	1

The regression model and data presented confirm that there is a significant relationship of 1,28%, well below this study threshold of 5%. The multiple R of 0,546 suggests that there is a moderate relationship between the variables and by examining the correlation matrix, a negative relationship of -0,546 can be determined.

4.2.2 Size

Table 4.4: Size - Regression

Regression Statistics	
Multiple R	**0,665242712**
R Square	0,442547865
Adjusted R Square	0,411578302
Standard Error	0,098146638
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,137649941	0,137649941	14,28976783	**0,001370605**
Residual	18	0,173389727	0,009632763		
Total	19	0,311039667			

Table 4.5: Size - Correlation

	Size	*Capital structure*
Size	1	
Capital structure	**0,665242712**	1

The regression model and data presented confirm that there is a significant relationship of 0,14%, well below this study threshold of 5%. The multiple R of 0,665 suggests that there is an almost strong relationship between the variables and by examining the correlation matrix, a positive relationship of 0,665 can be determined.

4.2.3 Interest rate

Table 4.6: Interest Rate - Regression

Regression Statistics	
Multiple R	**0,132411682**
R Square	0,017532853
Adjusted R Square	-0,037048655
Standard Error	0,130295872
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,005453413	0,005453413	0,321223323	**0,577873126**
Residual	18	0,305586254	0,016977014		
Total	19	0,311039667			

Table 4.7: Interest Rate - Correlation

	Interest cost	*Capital structure*
Interest cost	1	
Capital structure	**-0,132411682**	1

The regression model and data presented above show that the significant level is 0,578, well beyond this study threshold of 5%, which indicates that this regression is not significant. The multiple R of 0,132 and the correlation of -0,132 are therefore irrelevant since this regression is biased.

4.2.4 Collateral value of assets

Table 4.8: Collateral value of assets - Regression

Regression Statistics	
Multiple R	**0,447038545**
R Square	0,19984346
Adjusted R Square	0,155390319
Standard Error	0,117586947
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,062159243	0,062159243	4,495598188	**0,048135651**
Residual	18	0,248880424	0,01382669		
Total	19	0,311039667			

Table 4.9: Collateral value of assets - Correlation

	Collateral Value of assets	*Capital structure*
Collateral Value of assets	1	
Capital structure	**-0,447038545**	1

The regression model and data presented confirm that there is a significant relationship of 4,81%, close to this study threshold of 5%. The multiple R of 0,447 suggests that there is a weak relationship between the variables and by examining the correlation matrix, a negative relationship of -0,447 can be determined.

4.2.5 Multiple R & Significance

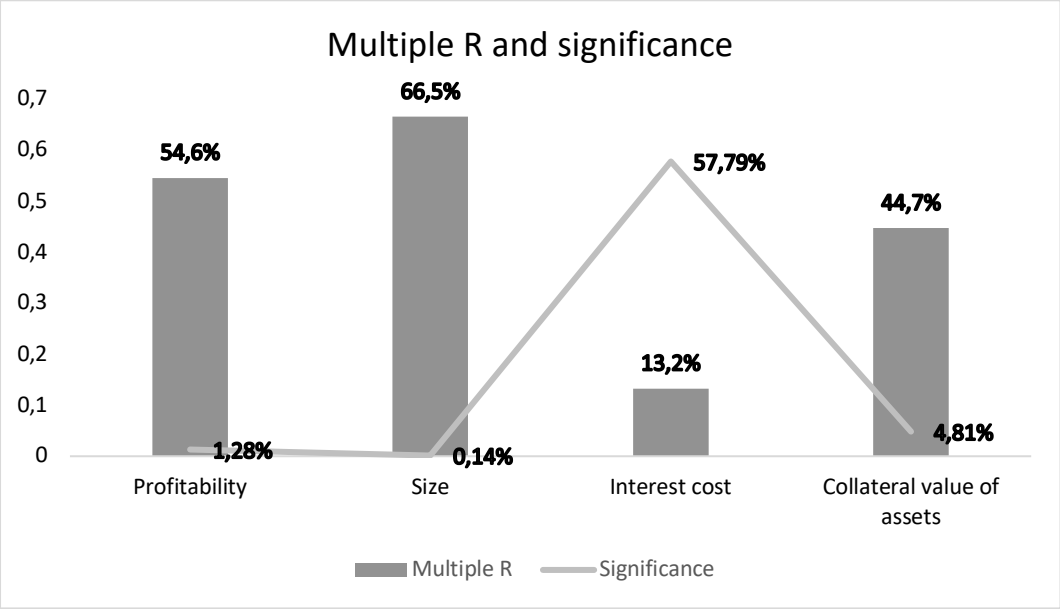

Figure 4.2: Multiple R & Significance - All variables

Figure 4.2 shows a compiled shart of all the Multiple R values together with the significance value on each variable. Figure 4.2 strengthen the overall picture of what variable having the strongest impact and also how accurate the test is by showing the significance levels.

4.3 Multiple Regression

Table 4.10: Multiple Regression

Regression Statistics	
Multiple R	**0,736635982**
R Square	0,542632569
Adjusted R Square	0,456876176
Standard Error	0,094293231
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0,168780254	0,056260085	6,327604848	**0,004921053**
Residual	16	0,142259413	0,008891213		
Total	19	0,311039667			

Variables included in the multiple regression are profitability, size, and collateral value of assets. The multiple R shows a strong explanatory relationship of 0,737 and a significant level of 0,492% that is well within the threshold of 5%. Note that interest rate is excluded from the multiple regression.

5. Analysis and Discussion

In this section, all the findings about the variables are discussed and compared towards the theories. Reasons of why certain outcomes occurs will also be discussed.

5.1 Profitability

The empirical material gathered and presented confirms that profitability has a significant impact on American airlines' capital structure, which means that the H_0 profitability hypothesis is accepted and H_1 rejected.

H_0: The variable profitability does have an impact on the capital structure

H_1: The variable profitability does not have an impact on the capital structure

The acceptance of hypothesis H_0 supports both the pecking-order and the trade-off theory in the argument that profitability has an impact, even though the theories are contradictory in the character of correlation. The empirical findings reveal that the correlation is negative, indicating that when the airlines' profitability is low, their choice of funding lands on debt or existing equity spending, hence an increase in the debt ratio. In this study, the profitability ratios showed to be negative or close to zero in every case (Appendix 2), which means that the net income was negative. The pecking-order theory states that the first choice of funding always will be internal, the second will be debt, and the third choice will be equity. With no net income, the company's annual internal funds cannot be chosen as funding since it is non-existent. The companies can on the other hand use internal funding from a cash pile that will finance the deficits instead of more issued debt, but in either way, the debt relative to equity will increase and statistically show a negative correlation between profitability and capital structure. The only way possible to show a positive correlation from negative profitability is if a company issues more equity. In a time of crisis, risk-averse investors tend to be scared due to the uncertainty of the company's future earnings, and the willingness of buying newly issued equity from crisis-ridden companies might seem irrational. The Trade-off theory suggests a positive correlation, between profitability and capital structure, due to the incentives of the tax-shield. This benefit becomes absent when the earnings are negative and almost irrelevant while discussing companies in crisis, since the advantages of tax-shields become less attractive when profitability is low. By summarizing the results, this study finds that in times of crisis a negative correlation between capital structure and profitability, given that profitability is negative or close to zero, might occur because of the company's financial situation. The study does not

have enough evidence to support the conclusion that a negative correlation holds when profitability is positive. Discussing the trade-off's and the pecking order's theory in the context of profitability is relevant in a normal economic environment, but their relevance and accuracy in a crisis, when profitability is zero, is problematic.

5.2 Size

The empiric material gathered and presented confirms that also size, as the second variable, has a significant impact on American airlines' capital structure. Alike the profitability hypothesizes, the H_0 size hypothesis is therefore accepted and H_1 rejected based on the empiric data.

H_0: The variable size does have an impact on the capital structure

H_1: The variable size does not have an impact on the capital structure

Much like the variable profitability, is the acceptance of the size hypothesis H_0 supported by both the pecking-order and the trade-off theory agreeing that size has an impact, even though the theories also here are contradictory in the character of correlation. Size proves to, in this case, have a positive correlation with capital structure, which is in line with previous studies such as Morri and Cristanziani's (2009), Titman and Wessels's (1988), and the trade-off theory as they all strongly agree on that size and capital structure have a positive correlation. This study confirms that this conclusion still holds in this situation. The pecking-order seems, in this case, to be questionable with its assumption that larger firms are more closely observed by investors and therefore have the option to issue more sensitive equity, which will create a negative correlation. Possible thoughts on the matter are that issuing sensitive equity is challenging in a time of crisis and that is why the pecking order becomes obsolete in this case. Even further, based on the facts from Morri and Cristanziani (2009) and Titman and Wessels (1988), does the pecking-order's assumption on issuing of sensitive equity not even hold in a normal economic environment, making the assumption questionable at all times. This study strengthens the reliability of a trade-off theory conclusion, stating that bigger companies have more diversified assets, making it easier to issue cheap debt due to lower risk by diversification. Both Morri and Cristanziani's (2009) and Titman and Wessels's (1988) strongly supports this argument in their research as well. With established research and this study's results, it is reasonable to argue that the trade-off theory is the one that reflects the reality the most in the context of size's correlation to capital structure.

5.3 Interest Rate

The empirical findings regarding interest rate confirm that there is no significant relationship between interest rate and capital structure. Therefore, it is possible to reject the H_0 interest rate hypothesis and accept the H_1 hypothesis.

H_0: The variable interest rate does have an impact on the capital structure

H_1: The variable interest rate does not have an impact on the capital structure

This study shows that there is no significant relation between interest rate and capital structure in a time of crisis, but Morri and Cristanziani (2009) find in their research that there is a significant relationship during normal conditions. Looking beyond the fact that this study's results present no significant relationship, it is worth to mention that Morri and Cristanziani (2009) have a problem determining the character of the correlation, the same problem as the pecking order and the trade-off theory have. Morri and Cristianziani (2009) further establish in their research that the choice of capital structure is highly affected by interest rate forecasts. The interest cost, which is determined by the interest rate, should therefore have a significant relationship with the capital structure. Likely reasons why this study's results show the opposites is that their conclusion is not adapted to a time of crises and/or that every company's interest rates forecast is unique. If every company has different views of the future interest rates, some will lock their rates on debt for a long time paying more now and others will do the opposite. The results of a regression model will, as it did, show a nonsignificant relationship since the plots will be widespread all over the chart. Even if the results state no relationship, we cannot ignore the fact that interest rate most likely has an impact on the capital structure, but it is difficult to prove it statistically due to the dissimilarities in interest rate forecasts. Morri and Cristianziani (2009) still managed to prove a relationship and an explanation could be that in 2009, when their paper was written, the interest rate forecasts were much alike. Note that these are thoughts of the outcome and the true reason behind the ambiguousness of the interest rates need further research.

5.4 Collateral value of assets

As the last variable, collateral value of assets is analyzed, and the results show that there is a significant relationship between the variable and capital structure. Consequently, the collateral value of assets hypothesis H_0 is supported and accepted, while the H_1 is rejected.

H_0: The variable collateral value of assets does have an impact on the capital structure

H_1: The variable collateral value of assets does not have an impact on the capital structure

Confirming that there is a significant relationship between collateral value of assets and capital structure supports the pecking-order, agreeing that the variable has an impact. Since it is complicated to demonstrate a reasonable connection between the trade-off theory and collateral value of assets, we leave that analysis undisputed. Analyzing the results further, it is clear that the variable has, in this case, a negative correlation with capital structure, meaning that an increased collateral value of assets would decrease the level of debt to total asset, which contradicts the pecking-orders theory's prediction of correlation character. Another pecking-order conclusion states that asymmetric information brings more cost when issuing equity, and that becomes highly relevant in a time of crisis, since the amount of asymmetric information tends to increase in a fast passed and unsteady economic environment. Thus, should creditors' risk appetite be lower, and they would require more collateral for their money. Although this study's results show a negative correlation, the reason might be in line with Morellec's (2001) research that managers sell uncollateralized assets for short term funding. This assumption does also seem logical since airline managers need liquidity to fund their deficits which makes uncollateralized assets highly valuable. Decreasing collateral value of assets with unchanged or increasing debt levels creates a negative correlation, exactly like this study empirical data presents.

5.5 General discussion

The multiple regression does, as implied, not include interest rate since it is biased by multicollinearity and does not show an acceptable significant level in the simple regression. The empirical findings present this study's result on the multiple R of the multiple regression as 0,74, which proves that the multiple regression and correlation can be classified as strong. Therefore, can it be concluded that the three variables profitability, size, and collateral value of assets undoubtedly have a large impact on the capital structure, in this case. Further, by looking at the variables' significance levels it is safe to say that size has the largest significance and therefore plays the leading part in determining the capital structure, in reference to the other variables. To note is that this speaks of this specific case, but that it does not provide enough evidence to claim that these outcomes will signify all financial crises. These outcomes

do, as implied, only reflect how the variables impacts capital structure in a financial crisis similar to the one Covid-19 has brought. Some people might argue that Covid-19 is exceptional, and this study does not deny or confirm that argument, but each crisis that has a similar effect on the financials, such as an extreme decline in net income and a change in investor's attitude, as the Covid-19 will likely display the same results. As can be read in the theoretical framework, it is confirmed that the well-established and trustworthy capital structure theories the trade-off theory, and the pecking order interestingly contradict one another in many cases in the aspect of predicted correlation character between the discussed variables. This phenomenon is further discussed in the later chapters as this study hopes to have addressed this problem and shed some light upon the limitations of the theories.

6. Conclusion

In this section, a summary of the most important finding from the analysis will be presented together with answers to the research questions and suggestions on further research.

6.1 Thesis conclusion

To summarize, it can be said that the variables profitability, size, and collateral value of assets had an impact on the capital structure in the American airline industry during the Covid-19 pandemic, and interest rate did not. Regarding profitability, the empirical findings showed a negative correlation which is in line with the pecking order's prediction. A reason for this is that when profitability is close to zero or negative during a crisis the correlation will likely fall under the prediction of the pecking-order, as negative. The trade-off theory's prediction became irrelevant since the tax-shield benefits could not be used. Regarding the variable size, it shows a positive correlation that corresponds with the trade-off's theory predictions and is therefore concluded to fit the trade-off's argument on diversified assets. The correlation coefficient of size and capital structure does further not fall within the pecking-order's prediction, and a reason for that is described to be because issuing of sensitive equity is challenging in a time of crisis. Regarding the third variable, interest rate, it is established that there, in this case, does not exist a significant relationship between the variable and capital structure, and to discuss the variable in contrast to the theories became irrelevant since the significant level is out of its limits. The main discussion presented concerning interest rates points out that it is possible that the variable has an impact on the capital structure, but that it is difficult to prove it statistically due to the dissimilarities in interest rate forecasts. The last variable, collateral value of assets, is proven to have a significant relation to the capital structure which is in line with the pecking-orders prediction, but it contradicts the theory by presenting a negative character of correlation. A reason for a negative correlation is presented to be because managers sell uncollateralized assets for short-term funding. It is further established that size is the variable with the largest impact on capital structure, in reference to the other variables, and that there are limitations to both the pecking order and trade-off theory when a crisis occurs.

6.2 Further research

Research recommended is to look closer at the mechanism behind the impact on the capital structure on each variable and to examine how the variables impact the capital structure during different crises. Examine the impact of the variables before the crisis and then after the crisis to see differences in the variables' impact on the capital structure could be one approach to take. It would also be interesting to analyze how the Trade-off and the Pecking-order theories are relevant in different industries, to see if they are better applied to more or less conservative capital structures.

7. Acknowledgement

First of all, we would like to thank the University of Gothenburg and the school of business, economics, and law for giving us the opportunity to conduct this research. We would further like to express our gratitude to our advisor, Elisabeth Karlsson, who guided us thourghout this project and helped us keep moving forward. We would also like to thank our fellow students for their efforts in offering insights into the study and giving us new perspectives during the process. There are many names that could be said, but instead, we would like acknowledge everyone who played a role in our academic accomplishements.

8. References

Al-Najjar, B. and Taylor, P. (2008), "The relationship between capital structure and ownership structure: New evidence from Jordanian panel data", *Managerial Finance*, Vol. 34 No. 12, pp. 919-933.

American Airlines., (2020). American Airlines Group [online]. *American Airlines.* [Viewed: 2020-11-27] Available from: https://www.aa.com/i18n/customer-service/about-us/american-airlines-group.jsp

Atlas Air., (©2020). About Us [online]. *Atlas Air.* [Viewed: 2020-11-27] Available from: https://www.atlasair.com/about-us/what-we-do/

Berk, J. and DeMarzo, P. (2020). *Corporate finance.* 5th ed., Harlow: Pearson Education Limited.

Bryman, A., and Bell, E. (2011). *Business Research Methods.* Oxford: Oxford University Press.

CAPA., (2020). Indigo Partners [online]. *Centre For Aviation.* [Viewed: 2020-11-27] Available from: https://centreforaviation.com/data/profiles/airline-groups/indigo-partners

CFI., (2020) Heteroskedasticity [online] *Corporate Finance Institute.* [Viewed: 2020-12-07] Available from: https://corporatefinanceinstitute.com/resources/knowledge/other/heteroskedasticity/

Donaldson, G. (1961) *Corporate Debt Capacity: A Study of Corporate Debt Policy and the Determination of Corporate Debt Capacity.* Boston: Division of Research, Harvard School of Business Administration.

Eliasson, A. (2006). *Kvantitativ metod från början*. Lund: Lund Studentlitteratur.

Envoy air., (©2020). Our Company [online]. *Envoy Air.* [Viewed: 2020-11-27] Available from: https://www.envoyair.com/our-company/

FedEx., (©1995-2020). Aviation policies & perspectives [online]. *FedEx.* [Viewed: 2020-11-27] Available from: https://www.fedex.com/en-us/about/policy/aviation.html

Galai, D and Masulis, R., (1976) "The Option Pricing Model and the Risk Factor of Stock." *Journal of Financial Economics,* 3 (January/March 1976), pp. 53-81.

Jaccard, J., and Becker, M. A., (2009). *Statistics for the Behavioral Sciences*, 5th ed. Belmont, CA: Wadsworth Cengage Learning.

Jaggia, S. and Kelly, A., (2016). *Business statistics: communicating with numbers,* 2nd ed. S.l: Mcgraw-Hill.

Jensen, M and Meckling, W., (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics* 3 (October 1976), pp.305-60.

Kalitta air., (2020). Our Company [online]. *Kalitta Air.* [Viewed: 2020-11-27] Available from: http://www.kalittaair.com/ourcompany

Kretchmer, H., (2020). How coronavirus has hit employment in G7 economies. [online] *World Economic Forum.* [Viewed: 2020-11-23] Available from: https://www.weforum.org/agenda/2020/05/coronavirus-unemployment-jobs-work-impact-g7-pandemic/

Litzenberger, R. H., and Kraus, A., (1973). A State-Preference Model of Optimal Financial Leverage. *Journal of Finance, 28*, pp. 911-922.

Modigliani, F., and Miller, H., (1958). The cost of capital, corporate finance and the theory of investment. *The American Economic Review*, 48 (3), pp. 261-297.

Modigliani, F., Miller, M., H. (1963), Corporate income taxes and the cost of capital: A correction, *American Economic Review* 53, pp. 433-443.

Morellec, E. (2001). Asset liquidity, capital structure, and secured debt. *Journal of Financial Economics*, 61(2). pp. 173-206.

Morri, G., and Cristanziani, F., (2009). What determines the capital structure of real estate companies?: An analysis of the EPRA/NAREIT Europe Index. *Journal of Property Investment and Finance*, 27, pp. 318-372.

Murray, Z.F., and Vidhan K.G., (2009) Trade-off and Pecking Order Theories of Debt. In: B.E. Eckbo., *Handbook of Empirical Corporate Finance.* Amsterdam: North Holland pp.135-202.

Myers, S,C., (1977)."Determinants of Corporate Borrowing." *Journal of Financial Economics* 9 (November 1977), pp. 147-76.

Myers, S.C., (1984). The Capital Structure Puzzle. *Journal of Finance*, 39(3). pp.575–592.

Myers, S. C., (2003).*" Financing of Corporations".* In G. Constantinides, M. Harris, and R. Stulz (Eds.), *Handbook of the Economics of Finance: Corporate Finance*. Amsterdam, North Holland: Elsevier. pp. 215–253

Myers, S.C. and Majluf, N., (1984) "Corporate Financing and Investment Decisions When Firms Have Information Investors Do Not Have." *Journal of Financial Economics* 13, pp. 187-221.

OECD, (2020). Covid-19 and the aviation industry: Impact and policy responses [online]. *Organisation for Economic Co-operation and Development.* [Viewed: 2020-11-25] Available from: http://www.oecd.org/coronavirus/policy-responses/covid-19-and-the-aviation-industry-impact-and-policy-responses-26d521c1/

Opler, T.C., Titman, S., (1994). Financial distress and corporate performance. *The Journal of Finance XLIX* (3), 1015}1040

Polar., (©2020). Our Company [online]. *Polar Air Cargo.* [Viewed: 2020-11-27] Available from: https://www.polaraircargo.com/our-company/overview/

Rumsey, D.J., (2003). *Statistics for dummies*. Hoboken, N.J: Wiley.

Schulz, C., (2020). Global economic outlook: lessons from the pandemic. In: *The IFS Green Budget* [online]. London: The IFS. pp. 40-77 [Viewed: 2020-11-25] Available from: https://www.ifs.org.uk/publications/15077

Singh, N.P., and Bagga, M., (2019). The Effect of Capital Structure on Profitability: An Empirical Panel Data Study [online]. *Jindal Journal of Business Research*. 8(1), pp.65–77. [Viewed: 2020-11-27] Available from: https://doi-org.ezproxy.ub.gu.se/10.1177/2278682118823312

Smith, C., (1977) "Alternative Methods for Raising Capital: Rights versus Underwritten Offerings." *Journal of Financial Economics* 5, pp. 273-307.

StatsDirect, (©2020). Normal Distribution(s) [online]. *StatsDirect.* [Viewed: 2020-12-07] Available from: https://www.statsdirect.com/help/Default.htm#distributions/normal.htm

Thedéen, E., (2018). Will the banks withstand the next crisis – what role will capital

requirements play?, transcript, [online]. *SNS/SHOF Finance panel, 9 October.* [Viewed: 2020-12-10] Available from:

https://www.fi.se/contentassets/3db9c82ec7584858a4fab3d9e491c780/erik_thedeen_klararbankernanastakris_20181009_eng_ny.pdf

Titman, S., and Wessels, R., (1988). The Determinants of Capital Structure. *The Journal of Finance*, 43 (1), pp. 1-19

Uchitelle, L., (2009) U.S. lost 2.6 million jobs in 2008 [online]. *The New York Times.* [Viewed: 2020-11-25] Available from: https://www.nytimes.com/2009/01/09/business/worldbusiness/09iht-jobs.4.19232394.html

UPS., (©2020). About UPS [online]. *UPS.* [Viewed: 2020-11-27] Available from: https://www.ups.com/us/en/about.page

USA. SEC., (2020). *EDGAR Search Results - Republic Airways holdings INC – All Company Filings*. [online]. Washington DC: Securities and Exchange Commission. [Viewed: 2020-11-27] Available from: https://www.sec.gov/cgi-bin/browse-edgar?action=getcompany&CIK=0001159154&owner=exclude&count=40

USA. Department of Transportation., (2019). *Bureau of transportation statistics accounting and reporting directive – Air Carrier Groupings 2020* [online]. Office of airline information [Viewed: 2020-11-27] Available from: https://www.bts.gov/topics/airlines-and-airports/number-332-%E2%80%93-air-carrier-groupings-2020

Wayne, W (©2019). The Correlation Coefficient (r) [online]. *PH717 Module 9 – Correlation and Regression* [Viewed: 2020-12-07] Available from: https://sphweb.bumc.bu.edu/otlt/MPH-Modules/PH717-QuantCore/PH717-Module9-Correlation-Regression/PH717-Module9-Correlation-Regression4.html

WHO, (2020a). Media briefing on COVID-19 – 11 March 2020 [online]. *World Health Organization.* [Viewed: 2020-11-25] Available from: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---27-july-2020

WHO, (2020b). Media briefing on COVID-19 – 27 July 2020 [online]. *World Health Organization.* [Viewed: 2020-11-25] Available from: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

WHO, (2021). Coronavirus Disease (Covid-19) Dashboard [online]. *World Health Organization.* [Viewed: 2021-01-10] Available from: https://covid19.who.int/?fbclid=IwAR1J9pBJKnlG4kVdPvv426FiYoAQdqNyM1Kg_A1b_cjqI5kBrnKn2HGRHD0

Zang, S., (2019). Machine Learning for Product Owner, IT Project Manager (Crash Course Part 2) – Regression Methods. [online]. *Bytes For Business.* [Viewed: 2020-12-07] Available from: https://bytesforbusiness.com/en/machine-learning-for-product-owner-it-project-manager-crash-course-part-2-regression-methods/

Zaric, H., (2020). Covid-19's impact on the aviation and travel industry. [online] *The Gap Partnership.* [Viewed: 2020-11-25] Available from: https://www.thegappartnership.com/insights/covid-19-s-impact-on-the-aviation-and-travel-industry/

Appendix 1 - Group III Air Carriers[2]

Alaska Air Group, INC

Allegiant Travel CO

American Airlines Group, INC

Atlas Air Worldwide Holdings, INC

Delta Air Lines, INC

Envoy Air, INC

Federal Express CORP

Frontier Airlines, INC

Hawaiian Holdings, INC

JetBlue Airways CORP

Kalitta Air, LLC

Polar Air Cargo

Republic Airways

SkyWest, INC

Southwest Airlines CO

Spirit Airlines, INC

United Airlines Holdings, INC

United Parcel Services, INC

[2] USA. Department of Transportation, (2019).

Appendix 2 – Data Input

US Airlines	ROA	Size	Intrest cost	Collateral Value of assets	Capital structure
Alaska Air Group, INC (Q2)	-1,53%	9,55	0,67%	48,54%	72,42%
Alaska Air Group, INC (Q3)	-2,92%	9,60	1,20%	43,26%	76,58%
Allegiant Travel CO (Q2)	-2,84%	8,09	2,21%	63,43%	77,50%
Allegiant Travel CO (Q3)	-0,90%	8,08	1,75%	70,49%	77,92%
American Airlines Group, INC (Q2)	-3,20%	11,08	1,50%	51,67%	104,91%
American Airlines Group, INC (Q3)	-3,82%	11,05	1,99%	51,39%	108,81%
Delta Air Lines, INC (Q2)	-7,91%	11,19	0,31%	39,40%	87,97%
Delta Air Lines, INC (Q3)	-6,80%	11,28	1,54%	33,64%	95,75%
Hawaiian Holdings, INC (Q2)	-2,67%	8,29	1,35%	56,72%	59,48%
Hawaiian Holdings, INC (Q3)	-2,37%	8,32	1,37%	51,77%	82,45%
JetBlue Airways CORP (Q2)	-2,28%	9,55	1,61%	79,30%	70,81%
JetBlue Airways CORP (Q3)	-2,93%	9,51	2,31%	77,50%	72,33%
SkyWest, INC (Q2)	-0,38%	8,82	2,59%	78,04%	68,36%
SkyWest, INC (Q3)	0,50%	8,82	2,63%	76,45%	67,63%
Southwest Airlines CO (Q2)	-2,57%	10,48	1,55%	77,01%	69,44%
Southwest Airlines CO (Q3)	-3,25%	10,48	1,72%	45,09%	72,56%
Spirit Airlines, INC (Q2)	-1,86%	8,96	2,07%	49,05%	69,80%
Spirit Airlines, INC (Q3)	-1,16%	9,05	2,17%	44,68%	71,87%
United Airlines Holdings, INC (Q2)	-2,96%	10,91	1,69%	57,80%	84,49%
United Airlines Holdings, INC (Q3)	-3,01%	11,02	2,55%	51,72%	88,56%