VILNIUS UNIVERSITY
BUSINESS SCHOOL

SUSTAINABLE FINANCE & INVESTMENTS

Mantas Jonas Vilimas

THE FINAL MASTER'S THESIS

PAVADINIMAS: ***ĮMONĖS KAPITALO STRUKTŪROS ĮTAKA ĮMONĖS KAPITALO KAŠTAMS IR JOS VERTEI BALTIJOS ŠALYSE***	***TITLE:*** ***THE IMPACT OF CAPITAL STRUCTURE ON COST OF CAPITAL AND FIRM VALUE IN THE BALTIC STATES***

Student _____

(signature)

Supervisor _____

(signature)

_____

Name, surname, academic title, scientific degree of the supervisor

Vilnius, 2025

SUMMARY

VILNIUS UNIVERSITY BUSINESS SCHOOL

SUSTAINABLE FINANCE & INVESTMENTS STUDY PROGRAMME

MANTAS JONAS VILIMAS

THE IMPACT OF CAPITAL STRUCTURE ON COST OF CAPITAL AND FIRM VALUE IN THE BALTIC STATES

Supervisor – Antanas Laurinavičius doc. prof. dr.

Master's thesis was prepared in Vilnius, in 2025

Scope of Master's thesis (project) – 69 pages.

Number of tables used in the FMTP – 9 pcs.

Number of figures used in the FMTP - 29 pcs.

Number of bibliography and references - 62 pcs.

The FMTP described in brief:

The research is focused on determining whether capital structure is relevant and has an impact on cost of capital and company value specifically in the Nasdaq Baltic market. Understanding the factual relationship between financing decisions and these crucial variables is necessary for maximising shareholders' value and maintaining competitive advantage. Given the region's growing integration into international financial markets.

Problem, objective and tasks of the FMTP:

Thesis addresses the central problem of whether an entity's capital structure exerts a significant influence on its cost of capital and its market value within the specific context of the Baltic States' financial environment. The objective is to examine listed companies on the Nasdaq Baltic market to empirically assess this influence. This was achieved by synthesizing the theoretical development of capital structure models, developing a thorough empirical methodology using suitable econometric and diagnostic approaches, and carrying out a thorough analysis to produce results and recommendations that could be put into practice.

Research methods used in the FMTP:

A wide range of methods, including bibliometric analysis, regression analysis was applied.

Research and results obtained:

Panel data regression was applied in this study's empirical analysis of Nasdaq Baltic listed companies. The results confirmed that profitability (ROA) is the dominant factor reducing the cost of capital and increasing firm value, while the impact of financial leverage had relationship only with cost of capital rather than the value of the entity. Firm size and growth exhibited different results from the primary hypotheses.

Conclusions of the FMTP:

It was concluded that the Pecking Order Theory in the Baltics is validated by obtained results on profitability, i.e., higher profitability leads to lower WACC and Tobin Q. Although leverage decreases WACC because of the tax shield; however, it does not affect company value by creating size paradox, where firm with large asset balance is penalised with a lower Tobin Q.

Information about the publication of FMTP results or adaptation for publication:

The results obtained can be used to determine if listed entities in the Baltic States have a well-balanced capital structure, which could result in a decrease of capital cost and an increase in shareholder value.

SANTRAUKA

VILNIAUS UNIVERSITETO VERSLO MOKYKLA

SUSTAINABLE FINANCE AND INVESTMENTS STUDIJŲ PROGRAMA

MANTAS JONAS VILIMAS

ĮMONĖS KAPITALO STRUKTŪROS ĮTAKA ĮMONĖS KAPITALO KAŠTAMS IR JOS VERTEI BALTIJOS ŠALYSE

Darbo vadovas – Antanas Laurinavičius doc. prof. dr.

Magistrinis darbas paruoštas Vilniuje 2025 metais.

Puslapių skaičius 69.

Lentelių skaičius darbe 9.

Paveikslėlių skaičius darbe 29.

Bibliografijų ir nuorodų skaičius 62.

Trumpas darbo aprašymas:

Tyrimas skirtas nustatyti, ar kapitalo struktūra yra svarbi ir ar ji turi įtakos kapitalo kainai ir įmonės vertei Nasdaq Baltijos rinkoje. Suprasti faktinį ryšį tarp finansavimo sprendimų ir šių esminių kintamųjų yra būtinas siekiant maksimaliai padidinti akcininkų vertę ir išlaikyti konkurencinį pranašumą. Atsižvelgiant į didėjančią regiono integraciją į tarptautines finansų rinkas, tyrimas pateikia duomenimis pagrįstas įžvalgas apie kapitalo struktūros optimizavimą analizuojamoje rinkoje.

Darbo problema, tikslas ir uždaviniai:

Moksliniame darbe nagrinėjama pagrindinė problema – ar įmonės kapitalo struktūra daro reikšmingą įtaką jos kapitalo kainai ir rinkos vertei, atsižvelgiant į specifinį Baltijos šalių finansinės aplinkos kontekstą. Darbo tikslas – ištirti Nasdaq Baltijos rinkoje kotiruojamas bendroves, siekiant empiriškai įvertinti šią įtaką. Tai buvo pasiekta susintetinant teorinę kapitalo struktūros modelių raidą, sukuriant išsamią empirinę metodiką, taikant specifinius ekonometrinius ir diagnostinius metodus, ir atliekant išsamią analizę, siekiant gauti rezultatus ir rekomendacijas, kurias būtų galima pritaikyti praktikoje.

Darbe naudoti tyrimo metodai:

Taikyti įvairūs metodai, įskaitant bibliometrinę analizę, regresinę analizę.

Tyrimai ir gauti rezultatai:

Šiame tyrime, atliekant empirinę „Nasdaq Baltic“ listinguojamų bendrovių analizę, buvo taikyta panelinių duomenų regresija. Rezultatai patvirtino, kad pelningumas (ROA) yra dominuojantis veiksnys, mažinantis kapitalo kainą ir didinantis įmonės vertę, o finansinio sverto poveikis buvo susijęs tik su kapitalo kaina, o ne su įmonės verte. Įmonės dydis ir augimas parodė skirtingą rezultatą nuo pagrindinių hipotezių.

Darbo išvados:

Nustatyta, kad “Pecking Order” teorijos taikymas Baltijos šalyse yra patvirtintas gautais pelningumo rezultatais, t. y. didesnis pelningumas lemia mažesnę WACC ir Tobin Q. Finansinis svertas sumažina WACC dėl mokesčių lengvatos, tačiau jis neturi įtakos įmonės vertei, nes sukuria dydžio paradoksą, kai įmonė, turinti didelį turto balansą, yra nuvertinama akcininkų mažesniu Tobin Q rodikliu.

Rezultatų publikavimas:

Gauti rezultatai gali būti naudojami siekiant nustatyti, ar Baltijos šalyse listinguojamos įmonės turi subalansuotą kapitalo struktūrą, kuri galėtų sumažinti kapitalo kainą ir padidinti akcininkų vertę.

TABLE OF CONTENTS

Tables and figures

INTRODUCTION

Relevance of the topic. Nowadays, as more companies consolidate, mergers and acquisitions are a common occurrence, especially for entities that have strong market positioning. These types of companies are attractive to conglomerates because most of them have strong brand, product or service, loyal customers and so forth. These factors appeal to conglomerates because the acquisition or merger of a new enterprise contribute to shaping a stronger group of companies. Acquiring or merging with a new firm is challenging. One of the first step of this process is to evaluate the value of the entity which will be acquired. The value of the entity is determined by many factors, one of the main factors is capital structure. Thus, the topic is relevant as the increasing number of firms are consolidating through mergers or acquisitions and it is important to determine the value of the entity.

Secondly, the current economy is unstable, and many events occur daily that affects economy, such as Donald Trump's tariff wars, high employment in U.S., war in Ukraine, growing U.S. debt, etc. All these factors impact the economy and interest rates, which influence enterprise's capital structure. As the borrowing rate is changed by countries' central banks, it indirectly affects the cost of lending. Therefore, it is important for entities to build an optimised capital structure for growth and maximise firm value.

Moreover, businesses increasingly expand their operations globally. Competition is always growing in the global arena, and companies need to use their resources as effectively as possible. Consequently, the entity with an optimal capital structure is likely to outperform competitors as it allows it to minimise borrowing costs and maximise capital for expansion. Thus, it is crucial to effectively manage capital to outcompete competitors in the global arena.

Currently, many startups are being built and launched that offer new technological and futuristic solutions to different problems for B2B and B2C. Newly founded startups most commonly do not have enough capital to expand and scale their business due to unstable cash flows from operating activity. Hence, for these ventures, it is necessary to find a stable source of funding, whether this involves ownership dilution or borrowing cash. Thus, for newly established companies, the most important survival factor is to reach the most effective capital structure so that the cost of capital is below average.

Problem. Does a company's capital structure have a significant influence on its cost of capital and its value in Baltic States?

Aim of the thesis. To evaluate whether a company's capital structure influences the company's cost of capital and its value by analysing enterprises listed in the Baltic States.

Objectives:

1. To analyse and synthesize the theoretical aspects of a company's capital structure, including the main theories and the latest scientific research in this field.
2. To formulate the comprehensive research methodology for the empirical analysis, including the specification of the econometric model, the selection of appropriate statistical methods, the application of diagnostic tests, and the definition of all calculation methodologies used for all key variables.
3. To conduct an empirical analysis to determine the influence of the capital structure of the selected market participants on their cost of capital and value and derive conclusions and practical recommendations for effective capital structure decision-making based on analysis results

Methods:

1. Literature analysis and synthesis
2. Systemic analysis and synthesis
3. Empirical analysis, utilizing statistical data analysis, panel data regression, diagnostic testing and correlation and regression analysis

Structure of the work:

1. Theoretical analysis by reviewing and synthesizing the latest empirical evidence regarding the influence of financial leverage on corporate finance metrics and new ways of financing.
2. Research methodology on panel data regression analysis defining the framework used and the selection of the method.
3. Assessment of the findings from Baltic-listed Nasdaq firms and testing model reliability using various tests.

Limitations:

1. Data were used for the period from 2020 to 2024.
2. Methods that were used to determine the cost of capital for the selected companies.
3. The linear regression model is constrained as it solely illustrates a negative correlation between debt and the cost of capital, neglecting the economic reality that, due to increased risk, the cost of capital cannot diminish to zero as leverage continuously rises.

1. CAPITAL STRUCTURE AND ITS THEORETICAL ASPECTS

This chapter of the thesis analyses the basic principles of capital, i.e., elements that constitute capital and the difference between debt and equity. Also, capital financing possibilities, the methods of financing, and the distinction between these methods are explored. Lastly, this section explores upon new financing methods, their advantages and disadvantages for companies and the cost of financing.

1.1. The concept of capital, its components, and financing methods

Firstly, it is important to understand what capital is, and it is quite hard to describe in a simple manner. Capital is a broad concept that encompasses many different terms, however, most commonly, it can be described as cash or a different asset that is invested (Hargrave, 2025). The capital can be borrowed or injected by the owner. This gives rise to the structure of capital and the balance between borrowed and owners' equity, see figure 1.1.

Figure 1.1

Capital structure equation

$$\text{Capital Structure} = \text{Debt} + \text{Equity}$$

Source: compiled by author according to Gratton, 2025

Capital is crucial to every enterprise in the world because it allows a company to grow by investing, expanding its operations, and so forth. Additionally, interest in capital structure has grown significantly as academic literature on this topic has increased over the last decade; it can be assumed that this is influenced by corporations that are interested in managing it effectively (Mahmoud et al., 2024).

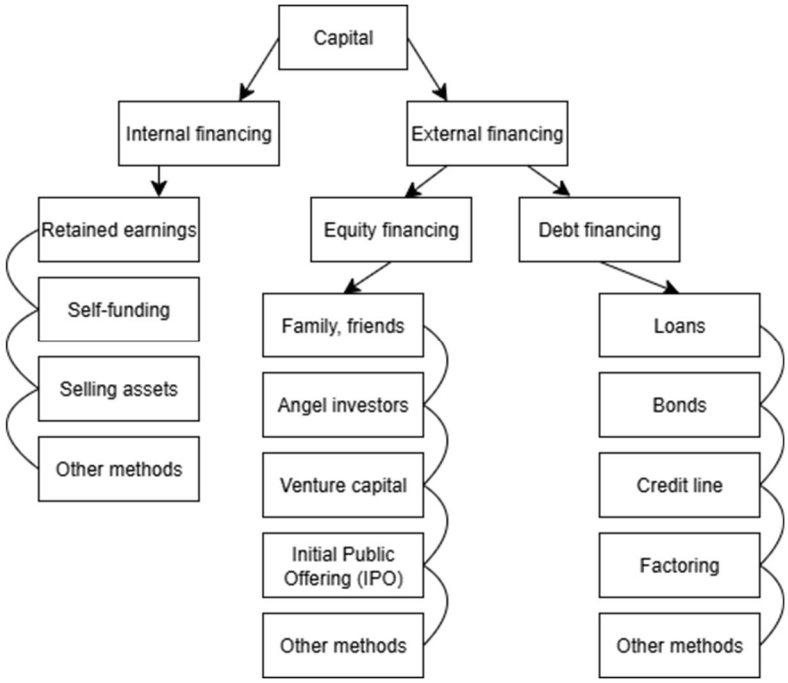
The company's structure of capital reveals whether the company relies more on borrowed capital or its shareholder equity (Gratton, 2025). Both types of capital have its own costs. Debt costs the interest expense that is paid to the lender, and the interest depends on borrower's creditworthiness (Hayes, 2025). The owner's equity costs as well, because the injected capital can be used somewhere else – in other investment projects, ventures, etc. In simple terms, it costs the amount of return that could be earned on another investment opportunity (Kenton, 2025). In general, most companies use a mix of capital, because it is unsustainable in the long term to rely only on one side of capital (borrowed or owner equity), because company cannot

grow and compete with competitors that maximise capital from both dimensions (Maverick, 2024). The most important benchmark for understanding an enterprise's capital structure is the debt-to-equity (D/E) ratio, which provides a comprehensive ratio of the leverage used by the company by dividing company's total liabilities by the equity (Fernando, 2025).

Furthermore, company cannot grow by not increasing its capital, because it will not be able to invest, cover operational expenses, etc. Company can increase capital by two main methods – internal and external financing (Hargrave, 2025). The gathered information from different authors enabled to make up a clear structure on how capital funding divides, please see figure 1.2.

Figure 1.2

Capital financing methods



Source: compiled by author according to Claire, 2024, Maverick, 2024, Defacto, 2025

Figure 1.2 represents the capital financing structure. To begin with internal financing, there are only a few methods by which capital can be financed internally:

- Retained earnings: earnings can be used not only to pay shareholders but also for reinvesting in the company, new projects, equipment, etc.

- Self-funding: shareholders can use cash reserves or inject capital to finance operations and investment activities.
- Selling assets: owners can sell depreciated asset that is not used or is no longer necessary for business to finance further expansion.
- Other methods: this includes indirect methods, for example collecting receivables faster, delaying payables by negotiations, reducing operation costs, etc.

Overall, internal financing is healthy for both the entity and shareholders because owners do not need to give up anything (interests expenses or shares), however, to rely only on it can be dangerous, because the expansion will not be as fast as it could be, and the risk arises that competitors could outcompete them.

Moving on, second financing option is external. It is divided into equity and debt financing. In essence, equity financing is a capital raise through the sale of shares in return for cash. There are several main options that entities use:

- Family, friends: small entities, especially start-ups that only begin their journey, ask investment from family or friends.
- Angel investors: A high-net-worth individual who provides capital to small businesses or entrepreneurs (Ganti, 2025).
- Venture capital: A financial institution or other corporate investor who provides financing in return for equity in the company (Hayess, 2024).
- IPO: Company transition from private to public company by selling shares on stock exchange and dividing the equity in return for money (Fernando, 2024).
- Other methods: It is including crowdfunding, private equity, expansion capital, etc. (British Business Bank, n.d.).

To simplify, all these methods are related to financing in exchange for equity in the company. Each method differs only by risk and company maturity, e.g. for small entities is better to choose specific methods that would be different and would not fit to bigger entities.

Second of external financing option is debt. Debt financing does not require shareholders to give equity in exchange for cash, however businesses need to pay interest and make other commitments, such as signing predefined covenants, etc. The main debt financing methods are:

- Loans: Cash in return for interest payments + loan repayment. Loans are issued by banks, credit institutions, related companies and so on.

- Bonds: An investment product that a company issues. Individuals buy them in return for interest income and a coupon.
- Credit line: Almost the same as a loan in principle.
- Factoring: Factoring is a financing method where a bank finances (not fully) outstanding invoices immediately, in return for the whole cash flow in the future.
- Other methods: it can include P2P lending, advances and so on.

The main difference between equity and debt financing lies in this distinction: equity financing requires a company to dilute its shares, while debt financing requires the company to pay interest.

Nowadays, as everything is developing at high speed, new financing instruments are emerging. It is important to discuss these new instruments as they allow entities to attract more capital and lower the cost of capital. Authors Miller et al. (2023) analyses DeFi's application in supply chain finance, which is a specialised form of capital financing. In simple terms, DeFi is decentralised finance that works via blockchain technology, and which allows Peer to peer (P2P) lending without intermediary which commonly is credit institution (Sharma, 2025). Above mentioned researchers explore pilot DeFi projects that were dedicated to P2P lending solutions, also, authors advocate for this capital financing method, as it:

1. Beneficial for small-medium entities by reducing costs of borrowing and making it more accessible (as it eliminates intermediaries and allows to lend cash directly).
2. Contributes to eliminating asymmetric information risk between borrower and lender via blockchain technology, as it helps to ensure higher quality over information about project that is financed (Miller et al., 2023).

Hence, the principle of financing is not new, however, the technology on which it is built is and it would benefit small and medium enterprises via its advancement on information sharing and eliminating third parties.

Another new way of capital financing emerged in 2013 was initial coin offering (ICO), it allows businesses to raise capital through launching its cryptocurrency coin and selling it to investors (Moxotó, Melo, & Soukiazis, 2021). According to the authors' analysis, the issued coin can be classified into several categories – cryptocurrency, security token or utility token. Each category has its advantages and disadvantages to investors. Cryptocurrency can be used as an investment without any benefits to investors, i.e., a security token guarantees rights to the company, project profit and utility token provides access to special services or products. As per research, this financing method makes financing more accessible, removes intermediate and

lowers transaction cost that affects borrowing cost. The booming period of this financing method started from around 2017, also, there is numerous successful cases in Lithuania, one of these is when the start-up “CarVertical” raised about 19 million USD during the ICO (Straigis, 2018). Overall, this method of financing is similar to crowdfunding with its own advancements, and it helps to attract capital more easily than the old financing methods.

As new methods of financing are being developed, entities gain more leverage through cheaper and more accessible capital, thus lowering the cost of capital and benefiting whole ecosystem of start-ups.

To sum up, an entity's capital consists of equity and debt, both elements have different costs. Capital can be financed internally or externally and external financing branches out into two financing methods – equity and debt financing. Debt financing has an advantage due to its simple method where entity only incurs direct costs (interest payments). Equity financing is attractive from another side – companies do not need to pay interest, only to give part of equity in company. The new financing methods were explored – DeFi and ICO. They are shaping financing in a new way by making cash more accessible to entities and by lowering costs of capital.

1.2. The evolution of capital structure theories and recent developments

Many capital structure theories emerged during the mid-20th century that explore how the mix of debt and equity affects the cost of capital and overall entity's value. The evolution of these ideas signifies a substantial paradigm change in financial philosophy, transitioning from initial static models to complex frameworks that account for imperfections in the market. The most popular and famous theories are listed below with a short description of what these theories stand for, please see Table 1.1.

Table 1.1

Most famous capital structure theories

Years	Title of the theory	Short description
1952	Net Income (NI) Approach	This theory argues that the cost of debt in a company's capital structure is lower compared to equity, because it is constant; thus, by increasing debt, the cost of capital decreases.
1958	Modigliani-Miller Capital Structure Irrelevance Theory (MM)	This theory is the foundation for all subsequent theories. It states that with perfect market conditions (e.g., no taxes, transaction costs, etc.) capital structure of entity would not have effect on firm value and cost of capital.
1959	Net Operating Income (NOI) Approach	NOI theory propose idea that entity capital structure doesn't have any effect to the company value, nor its cost of capital. Theory states that by increasing cheap debt proportion in capital structure the risk for equity holders arise, hence it's drives cost of equity offsetting any debt benefits.
1973	Trade-Off Theory	The concept argues that entities balance debt-to-equity ratio to reach optimal capital structure by adjusting benefits of debt against costs of financial distress, thus reaching a trade-off balance.
1976	Agency Cost Theory	Conflicts of interest between a company's many stakeholders - such as management and shareholders or shareholders and creditors.
1977	Signaling Theory	According to this notion, a company's financing choices may serve as a market signal. While a new equity offering may indicate a lack of confidence, a company releasing additional debt may indicate that it has faith in its future earnings to service the debt.
1984	Pecking Order Theory	This theory suggests a hierarchy of financing choices based on asymmetric information: businesses prefer to employ internal money first, then debt, and external equity as a last resort. It implies that there is a series of decisions determined by cost and ease rather than an ideal capital structure.

Source: compiled by author according to Khan et al., 2021.

Earliest theories which are NI and NOI were based on different assumptions about market and the cost of debt. MM theory should be distinguished from others, because it serves as the foundational benchmark for all subsequent research in the field. The main reason for its differentiation is that the concept starts with a null hypothesis by stating that in a perfect market, a company's capital structure would not have any effect on financing costs or a firm's value. The theory even promoted a reversed version of itself, which allows the identification of which factors have an impact on capital structure, i.e., information asymmetry, transaction costs, regulations and taxes (Chen, 2024). The subsequent theories (trade-off, pecking order, agency cost) which emerged later, was just upgraded versions of main MM concept by more realistic assumptions that were ignored in the foundational approach. For example, the Trade-Off concept adds the cost of bankruptcy, while the Pecking Order theory adds information asymmetry, consequently each concept fulfils others moving towards well-structured model.

As the new research emerges that expands upon primary theories, it is important to determine what was newly discovered and revealed by recent studies, in order to understand capital structure evolution and refine, and challenge foundational theories. The following table presents recent models of capital structure, please see table 1.2.

Table 1.2

New models of capital structure

Capital structure model	Short description of methodology
Brusov–Filatova–Orekhova (BFO) model	Capital structure theory based on MM concept while addressing key limitations and arguing that it should be assessed that firms have a finite lifespan, cash flows are not always stable, tax payments frequently can be inconsistent, and the debt principal should be paid.
Baseline model	New model focused on challenging foundational theories' assumptions by exploring reliable access to funding, dynamic funding needs, and imperfect managerial knowledge impact on a firm's capital structure.
The Four-Factor Model	It focused on consolidating four critical factors into a single approach to more precisely determine the optimal capital structure for a firm.

Source: compiled by author.

Brusov and Filatova (2023) argue that there should be introduced new stage of capital theories. Their research suggests adaptation and generalization of Brusov–Filatova–Orekhova (BFO) theory and the Modigliani–Miller (MM) theory in companies which is in the fifth stage in evolution of capital structure. The BFO is a modern theory of capital structure that started to emerge from 2008, but it is not a new concept, but rather a generalization of the MM theory. The new concept removed some of limitations and brought definiteness to the MM theory, added a lifetime span to the approach because MM theory did not account for it and assumed that companies operate for infinite period (Brusov & Filatova, 2023). As per the researchers, the fifth stage of capital structure evolution accounts for variables that was previously ignored:

- Variable income: Older models assumed that an entity's earnings are stable and slightly growing year-on-year (YoY); however, in the real world, companies' cash flows always fluctuate more significantly, thus it is necessary to account for this.
- Tax payments: traditional theories typically assume that tax payments are made once a year or that the tax shield received as a single continues benefit. The new stage considers these factors, as well as advance tax payments. The frequency of tax payments and advances influence the timing of tax benefits and cash flows, which impacts company financial decisions, hence the model can more accurately predict cost of capital.
- Payment of the debt body: Lastly, it was oversimplified earlier that the main theories assumed that the debt principal is never paid. As in the real world, this approach is inaccurate, thus, the fifth stage incorporates debt amortisation as this decrease over time affects the company's value and WACC calculations.

In general, the authors propose to rely on a more generalised and practical capital structure theory, where certain limitations are overcome by incorporating variable income, tax payments and payment of the debt body. However, not all limitations are addressed (since there are many), but with new advancements the fifth stage of capital structure theory is more applicable to the real-world models. Crucially, the core distinction remains as MM is applicable to perpetual companies compared to BFO which is valid for a company of any age.

On the contrary, DeAngelo (2022) challenges foundational capital structure models other assumptions compared with Brusov and Filatova (2023). As to research, there are three aspects which were not considered in foundational theories – reliable access to funding, dynamic funding needs and imperfect managerial knowledge. According, to the author DeAngelo (2022) the Trade-Off and Packing Order models lack real-world assumptions, because they are focused on optimizing the mix of debt and equity while not accounting for reliable access to funding, i.e., firms

cannot always get financing. Secondly, the research criticizes static models as they are fundamentally flawed because they are fixed in time and ignore investment policy. Hence, these models fail to capture the dynamic business needs, as firm is not static, but constantly evolves, changes investment direction and so forth. Thirdly, it is stated that although dynamic models recognise the importance of funding over time, their weakness is the assumption of perfect managerial knowledge and the reliance only on a firm's economic fundamentals. DeAngelo (2022) argues that managers do not have perfect information, rather, they operate in a state of "pea-soup fog", which means they cannot know for sure which financing choice is "optimal". This uncertainty means that a financing and investment policies can differ significantly in firms with similar economic fundamentals. The psychological and behavioural factors influencing management are also examined by Badheka and Pandya (2022). The authors determined that managerial decisions are influenced by emotional and cognitive biases, because management is often overconfident and optimistic. Management's judgment, beliefs about past financing decisions and market timing create a degree of indeterminacy leading to the conclusion that this aspect cannot be addressed by the assumption of perfect managerial knowledge. As the limitations of foundational theories is identified, author proposes a new "baseline model" that incorporates the following six factors, to create an empirically credible framework:

1 The focus should be on funding, not optimisation, as the main issue is reliable access to funding to support investments and other activities and not finding a single "optimal" capital structure.
2 A firm's chosen financial policy relies not uniquely on its economic fundamentals but also on previous experience and judgments.
3 Incentives should be included to establish a connection between debt issuance and investments.
4 The untapped debt capacity and cash balances to meet funding needs should be accounted for in the model.
5 Management decisions are not always based on a firm's economic fundamentals but are impacted by a behavioural component which leads to conclusion that managers can time the market.
6 Entities do not have direct and cost-free access to perfect capital market and most of the firms rely on financial intermediaries to get financing, and this process is not free.

Overall, the research is focused on providing real-world constraints and objectives that guide managers' decisions. It denies that managerial possesses perfect knowledge.

Model “The Four-Factor Model” established by Miglo (2021), determines and analyses the relationship between a firm’s financing (equity/debt) selection and four primary factors that influence these decisions, see table 1.3.

Table 1.3

Primary Factors Influencing Financing Decisions (Four-Factor Model)

Factor	Category	Description	Impact on Financing Selection
Asymmetric Information	Information	The difference in information availability to stakeholders, management, and external investors.	It affects how the market is signaled when debt or equity is issued.
Taxes	Economic	Corporate income tax and legislation regarding the tax shield related to debt.	To reduce the taxable income base, higher tax rates usually encourage the use of debt.
Bankruptcy Costs	Economic	The costs related to financial distress and possible indebtedness.	Restricts how much debt a company may safely take on before value degradation starts.
Decision-Makers' Overconfidence	Behavioural	The behavioural factor of management because it tends to overestimate the project potential earnings.	May result in overestimating investment returns or undesirable over-leveraging

Source: compiled by author according to Miglo, 2021.

The four-factor model different from others (Trade-off, Pecking order) by several factors, mainly on focus and solution type. It combines behavioural (overconfidence), economic (taxes, costs) and information (asymmetry) factors compared with other theories, which primary focus on just one or two factors. The model shows a negative correlation between debt and profitability, meaning that more profitable firms use less debt. Besides this, a behavioural bias is addressed by this new model, as old theories fail to account for it. Lastly, the model provides a closed-form solution for a firm’s specific case by incorporating all those factors.

As capital structure theories define the logics behind factors impacting the cost of capital and a company's value, it is crucial to understand the methodologies for how the optimal capital structure is calculated in the real world. One of the key methods is a weighted average cost of capital (WACC), as can be identified from the title, in simple terms it is a formula to calculate average cost of capital financing, please see figure 1.3 (CFI Team, n.d.).

Figure 1.3

WACC formula

$$\text{WACC} = \left(\frac{E}{V} \times Re\right) + \left(\frac{D}{V} \times Rd \times (1 - Tc)\right)$$

where:

$E = \text{Market value of the firm's equity}$

$D = \text{Market value of the firm's debt}$

$V = E + D$

$Re = \text{Cost of equity}$

$Rd = \text{Cost of debt}$

$Tc = \text{Corporate tax rate}$

Source: (Hargrave, 2025)

The formula includes various components that constrain the formula. E and D variables are calculated by using publicly available information. The V component is the total firm value. The cost of equity and debt calculation includes variables that are difficult to assume for both investors and management. Cost of equity can be calculated by two ways – dividend discount model (DDM), capital asset pricing model (CAPM) (Kenton, 2025). Both formulas require significant estimates, in DDM model, it is necessary to determine dividends per share for the next year and the dividend growth rate. In CAPM model analysts need to an assume beta that represents stock volatility compared to the whole market. Also, the market return and risk-free rate should be evaluated. Overall, all these assumptions are estimated using past data or similar data, thus different analysts can have distinct outcomes. Hence, the WACC is not totally perfect model, and it has limitations due to complexity, static nature and assumptions made on specific variables. The research by author Bruner et al., (1998) discovered that WACC is widely used by all the parties - corporations, financial institutions, analysts, and so forth. This method is still used to this day because there are not many of well-established models.

However, academics are always looking forward to new models' creation that would address specific limitations of WACC. Rodríguez (2024) introduced upgraded WACC version (the duration-adjusted asset return model), arguing that incorporating debt and cashflows duration will provide a more accurate rate for valuing long-term assets. The study derives new analytical expressions of capital cost by addressing WACC limitations because it can be applied to any kind of debt or capital structure, and not just perpetual debt or permanent capital structure, unlike the traditional WACC. Debt and cashflow duration are incorporated in the WACC through calculating the weight modifier for debt and using it for adjusting debt and equity weights. The model is more accurate due to its ability not to outweigh the cheaper debt component compared with traditional WACC, otherwise, it would result in a WACC that is lower than the correct discount rate, leading to the overvaluation of the asset and a lower actual Internal Rate of Return (IRR). Moreover, it was validated through real case studies, which provided significantly closer true asset value. Hence, this model enhances the old one by mitigating the overvaluation risk, however, it is not widely used in practice and the old WACC model is still dominating.

Kontuš et al. (2023) developed linear programming mode that is primarily focused on calculation of overall cost of capital. The innovative model was designed to help companies determine their optimal capital structure and its uniqueness lies in ability to provide firm-specific recommendations. It aims to determine the ideal mix of debt and equity that will minimise a company's overall cost of capital and maximise corporate value. The new model suggests using the effective cost of existing and new equity and debt to calculate the overall capital costs, please see 1.4 Figure.

Figure 1.4

Linear programming overall capital cost formula

$$OCC_{real} = k_{e1}x\ u_1 + k_{e2}x\ w_{e1} + k_p x\ u_2 + k_{d1}x\ u_3 + k_{d2}x\ w_{d2}$$

Source: (Kontuš et al., 2023)

Where:

- ke1 and ke2: The effective costs of existing and new equity, respectively.
- kp: The effective cost of preferred stock (a type of equity).
- kd1 and kd2: The effective costs of existing and new long-term debt, respectively.

- u1, u2, and u3: The weights or proportions of existing equity, preferred stock, and long-term debt in the capital structure (these are constants).
- we1 and wd2: The weights or proportions of new equity and new long-term debt (these are the decision variables the model solves for).

Diving more deeply in the calculations, the main differentiation from foundational capital structure theories, for example the CAPM, is that equity cost is represented by the effective cost of new common stock, which includes agency costs and flotation costs. The debt cost is defined by the effective cost of long-term debt, which incorporates opportunity costs, discounts, premiums, etc. As per literature analysis, this formula is theoretically more accurate than the WACC, but the estimation of certain variables requires very difficult assumptions, which impact the model's reliability. Additionally, this model has not been studied by other academics, and it is quite new and not widely used in practice.

It is important to note, that as Artificial Intelligence (A.I.) development is gaining momentum, it impacts various fields, including finance, where academics are testing it for various estimations. The authors, Eliasy and Przychodzen (2020) investigated the potential of A.I. in equity cost estimation. The application of recurrent neural networks with long short-term memory was explored by comparing traditional CAPM ratios with two methods enhanced by A.I.:

1. Using A.I. predicted prices for CAPM calculation.
2. Calculating returns directly from stock prices predicted by A.I.

The findings of the research revealed that A.I. is more accurate in estimating equity cost by over 60% compared to the traditional CAPM method. Moreover, the deep learning model presented a strong ability to predict future stock prices, which increased the accuracy of estimating expected returns by 18%. These results were obtained by comparing A.I. generated stock prices with historical prices. Hence, the scientific paper provides clear evidence on A.I. potential to replace or drastically enhance traditional methods of equity cost estimation in the near future. A more accurate cost of capital is crucial for a firm's management to make more precise decisions regarding the selection of optimal investment and the maximisation of firm value.

To summarise, Modigliani-Miller is foundational capital structure theory by introducing the null hypothesis. Following capital structures models were built on it, by relying on identified factors that impact the cost of capital. Hence, famous theories such as Trade-off and Pecking Order theories were created that prompted further development of more approachable capital structure models. New capital theories are emerging in 21-st century by challenging assumptions used in

older models. A firm's lifetime span, variable income, tax payment frequency, payment of debt body, imperfect managerial knowledge and access to funding were ignored previously. New methods of calculating optimal capital structure were analysed, including a review of new and old methods - WACC, duration-adjusted WACC, the linear programming model and A.I. based method for calculating the cost of equity.

1.3 The Impact of Capital Structure on Firm Value – Theoretical Basis

The most popular enterprise valuation models that are used worldwide by companies and investors are market capitalization, times revenue method, earnings multiplier, discounted cash flow (DCF) method, book value and liquidation value. Outlined methods are dedicated to gaining understanding about general value of company but not always accurate (Hayes, 2025). However, it is critical to determine most accurate value of enterprise in case of audit (as it is required by accounting standards) and an acquisition (as companies interested in gaining maximum value). In both cases, the entity value is determined by analysts and auditors using the most logical ways which are outlined in the IFRS13 standard to determine fair value (of anything):

1. Level 1: The most accurate ways to determine fair value relying on active markets and quoted prices (least applicable to valuing the entities).
2. Level 2: Relying on observable and similar prices, i.e., if there were similar acquisitions, analysts should account for similar value (applicable to business valuation through comparable company analysis and precedent transaction analysis).
3. Level 3: Unobservable inputs for the asset or liability (lowest reliability which requires a great deal of judgement but is often widely used for firm valuation using DCF analysis) (International Accounting Standards Board, 2011).

Hence, DCF model can be presumed as the most accurate and widely used valuation method by both analysts and auditors if there is nothing else on which to rely. The following model incorporates WACC by estimating future cashflows and discounting them by cost of capital (Fernando, 2025). A lower WACC leads to higher firm valuation as the cashflows are discounted by lower percentage (Hargrave, 2025). Hence, the capital structure and the cost of capital have a significant impact on firm value determination due to the incorporation of the WACC ratio in widely used business valuation models.

To understand the drivers behind enterprise value, one can rely on the same theories analysed in 1.2 part, since it is known that lower cost of capital increases business value. The table was constructed by synthesising those factors, please see table 1.4 below.

Table 1.4

Theories by value drivers

Factor/Theory	Mechanism Affecting Firm Value	Net Effect
Taxation (Trade-Off)	Deduction of interest payments creates a tax shield.	Increase value by making debt cheaper.
Financial distress (Trade-Off)	The risk of bankruptcy, legal fees, and lost customers introduces the costs of financial distress.	Decrease value once the debt exceeds the optimal point.
Information asymmetry (Signaling Theory)	If the company uses debt issuance, it shows a positive signal regarding the company's future cashflows.	Increase value as it minimises information asymmetry between managers and investors.
Agency conflicts (Agency Cost)	Debt acts as a disciplinary factor for managers as it requires the use of capital only on value adding projects.	Increases value by improving investment efficiency.
Managerial overconfidence (Four factor model)	The managerial illusion of knowing all the information leads to the overestimation of investments.	Decreases value as the investments are overestimated.

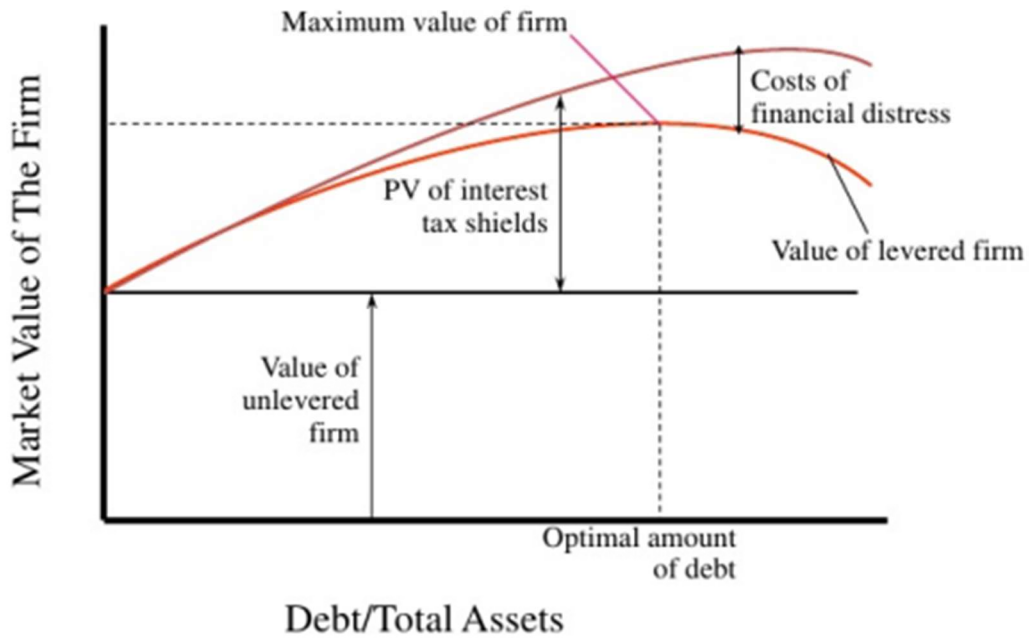
Source: compiled by author according to Khan et al., 2021; Miglo, 2021.

The table above outlines the main factors affecting a firm's value through cost of capital. It shows several insights. Debt has two roles, i.e., at the same time it has positive and negative effects through taxation benefits and financial distress risks. Furthermore, firm value is driven not only by rational factors, but is also highly impacted by psychological factors, including managers' overconfidence and bad management. Moreover, recent literature provides strong empirical support for the theoretical drivers listed in Table 1.3. A thorough meta-analysis by Dao and Ta (2020), which synthesised 340 papers, finds that debt decisions are typically negatively correlated with firm success. This result suggests that the costs of economic distress and agency conflicts frequently outweigh the advantages of tax shields in practice, which is consistent with the Trade-off and Agency theories covered above.

To elaborate further on the impact of debt on firm value, the relationship is most effectively illustrated by the principles of Trade-Off Theory. The optimal amount of debt is reached at the point where the marginal benefit of the interest tax shield is balanced against the costs of financial distress, see figure 1.4.

Figure 1.4

The Static Trade-Off Theory



Source: Kumah-Ababio, 2018.

As illustrated in the chart above, the value of the levered firm initially increases from its unlevered state as it incorporates debt, primarily due to the present value of interest tax shields. However, beyond the optimal amount of debt, the escalating costs of financial distress and managerial biases begin to outweigh these tax advantages. Consequently, at this point of excessive leverage, the firm's total market value begins to diminish.

The dynamic and multi-factor optimisation problem requires balancing economic and behavioural factors to reach an optimal capital structure for the highest valuation. Hence, the maximum firm valuation cannot be reached without the balance of all those factors.

Bui, Nguyen, and Pham (2023) analysed different kinds of debt, and their influence on enterprise value (in Vietnamese market). It was found that “good debt” (all liabilities, e.g.

receivables, accrued expenses, etc.) helps grow the value of the business. “Bad debt” (bank loans, bonds) generally hurts a company’s value as the risk of bankruptcy increases. Lastly, the long-term debt had no significant effect on enterprise value, meaning that it does not affect a firm’s value. Afinindy et al. (2021) analysed several factors (Profitability, Firm Size, Liquidity, and Sales Growth) affecting firm value. The strong relationship was found between the business value and its profitability, capital structure (more debt leads to higher valuation) and liquidity. However, no significant relationship determined between profitability, firm size and sales growth on capital structure, hence none of these factors affect capital structure.

Overall, the capital structure affects a firm’s value through two well-established channels: the cost of capital channel (where lower WACC leads to higher value) and the managerial channel (where efficiency and rationality of management lead to higher value). To reach the maximum value of an enterprise information asymmetry, managerial efficiency, tax shield, financial distress should be balanced together.

1.4 Current Trends and Determinants in Capital Structure and Cost

Capital structure tendencies are inclined to change over time, as they are determined by numerous factors, including market moods, economic climate, and so forth. It is important to understand the determinants and trends in today’s market through a vast quantity of research to form a sense on important factors that could determine the direction of capital structure. During the last decade the focus on capital structure research has grown, indicating that companies are increasingly interested in this topic. The trends that are dominating and mostly explored in capital structure topic are related to environmental, social, and governance (ESG) and female inclusion (Gupta & Khanna, 2022).

The authors, Tawfiq et al. (2024) analysed the relationship between ESG disclosures and capital structure. It was discovered that among the factors that make a positive impact, there is a negative relationship between an entity’s ESG disclosure score and its leverage ratio, i.e., companies with higher ESG scores tend to use less debt and rely more on equity financing. Secondly, a negative relationship was found between sustainability and a firm’s WACC, which implies that a strong ESG rating can help lower the cost of capital. Nevertheless, the relationship was measured for each individual ESG component, and it was determined that environmental and social factors have a more significant influence on leverage and WACC compared to governance factors, suggesting that investors are more conscious about the E and S factors at

the time of investment. Lastly, it is important to mention that the research was performed with 25 firms of Fortune500, hence, the results should not be generalised across the whole market (Tawfiq et al., 2024). Overall, the findings provide compelling evidence on sustainability impact to capital cost and structure of capital. The main reason for this causality is the growing emphasis on sustainability; thus, it supports the fact that it is no longer a social concern, but rather a material financial factor.

On the other hand, researchers Kling et al. (2021) analyse whether climate vulnerability can affect a firm's capital cost and structure indirectly. It was discovered that entities operating in a country with unpredictable climate conditions (with floods, earthquakes, etc.) have heavier debt compared to countries with stable climate and natural phenomena. Credit institutions evaluate these companies as riskier, hence, to balance it, the interest rates are applied higher, which leads to higher cost of debt. As per the research, it was found that the cost of debt increases by over 0.63% on average in those countries with climate vulnerability, on a high-stake loan the cost rises tremendously. Furthermore, not only does the cost of debt rise but the access to debt decreases as well, which leads to slower growth, financial distress, and an inability to compete in the global economy. This can be supported by statistics presented by Ferrazzi et al. (2025) in which the most climate vulnerable regions can be seen – Africa, the Middle East, and the Caribbean. Consequently, it can be observed that there are few firms from these regions that compete globally. Interestingly, the asymmetric impact emerges on financing sources, because climate vulnerability has a limited impact on equity cost. This suggests that it cannot be adequately captured by CAPM model beta coefficient or shareholders in these markets are pricing other factors. Overall, the scientific paper provides insights into climate vulnerable countries have hidden costs that affect a firm's activities.

For a firm, it is important to not only promote itself through ESG disclosures but to take real actions and show an example of sustainability. Cerón et al. (2024) in their scientific paper highlighted that firms with poor environmental records face higher costs for both debt and equity. Negatives actions towards the climate (high carbon emissions, other kinds of pollution) result in a higher debt cost, respectively, through penalties from financial institutions. Furthermore, the results indicate that the cost of capital is influenced by climate risk, e.g., negative media coverage can lead to stricter bank loan conditions. Lastly, academics determined that higher capital costs disproportionately affect decarbonisation pathways in developing economies leading to a slower shift to carbon neutrality.

Overall, it can be observed that the main regulators (EU, central banks and other crucial institutions) are dictating the directions of trends by policies, regulations that are applied to financial institutions on business financing. Hence, financial institutions take responsibility and contributes to climate change via business financing. However, this established order has weaknesses in its reliability by paradoxical situations. Businesses in climate vulnerable and developing countries cannot access cheaper capital since they're operating in specific region. This issue slowing down the reach of climate goals which were set by major economies; hence the financing policies should be directed to stimulate sustainability in this kind of countries by decreasing cost of debt.

Moving on, new emerging tendencies and studies are rising among topic related with females as a director, e.g. research's exploring how female impacts company's financial results, balancing capital structure, etc. The authors García and Herrero (2021) analysed EU companies' financial data from 2002 to 2019 and found that having more female directors on a firm's board of directors (BOD) is a key factor in financial decisions which leads to improved financial condition. The results show that females on BOD leads to less indebtedness and makes cost of capital cheaper, which influences other financial aspects in domino effect. The research supports the idea that behavioural differences between women and men directly affects financial distress and a firm's capital structure. The authors Aji and Setiawan (2022) also discovered that the presence of a female on BOD influences positive impact on financial stability and cost of debt. Results have shown that there is a negative and significant relationship between the presence of women on the board and the risk of company bankruptcy (using Altman Z-score). Moreover, the study reveals that a firm with women on BOD has lower debt financing, which subsequently reduces their cost of debt. This finding is supported by the Trade-Off theory, which posits that companies with gender diverse boards maintain an optimal, and lower, debt-to-asset ratio. However, the research did not find significant relationship between the presence of female on the BOD and capital leverage and debt maturity.

The authors Huang et al. (2024) analysed how the gender influences a firm's capital structure (specifically debt) when in a CEO role. The main insights were completely different compared to previous research. Firstly, it was found out that there is no significant difference in overall leverage of debt, challenging the assumption that female's executives are more risk averse. Results were even slightly contrary, because powerful female CEOs tend to use more debt than male CEOs, reversing the common narrative regarding risk acceptance between genders. This finding was supported by the fact that powerful females CEOs initiate less frequent

board meetings. Moreover, in the research it was monitored the capital structure changes during transition from male-to-female CEO, hence, it provided evidence that debt tends to grow. To conclude, these factors depend on the markets, the periods analysed, and the entities' structures; hence, there is no universal answer, i.e. what works for certain companies may not work for others.

To summarise, determinants of capital structure and its cost are highly based on few factors, i.e., whether a firm disclose ESG, whether it operates in vulnerable climate and whether it takes real action towards sustainability. A firm that discloses ESG, operates in a region without a rough climate achieves lower cost of capital because of different policies. However, it is not clear whether gender diversity and female inclusion in BOD have any effect on capital structure and its cost.

2. REGRESSION MODEL ARCHITECTURE TO DETERMINE CAPITAL STRUCTURE IMPACT ON COST OF CAPITAL AND FIRM VALUE

As the theoretical basis was obtained from synthesizing and analysing a vast quantity of studies, the second part of the thesis is dedicated for research and analysis on factual Nasdaq Baltic firms' data and determining the impact of capital structure on the cost of capital and firm value. The method, sample, data sources, number of observations and other important information related to the research will be outlined below.

Type of analysis. Panel data regression was chosen for this research due to its compatibility with research approach and obtained data. Panel data is set up to variables across different entities over a certain amount of time. It is possible to test and analyse more complex datasets by organising data in panels. Panel data can be balanced or unbalanced based on observations, e.g. if there are full 5 years observation of company A and B, the data is balanced. If there are 4-year observation of company A and 5-year observation of company B the data is unbalanced (Hsiao, 2022). Balanced panel data was selected for this research. This type of analysis will be applied to this research by analysing different company's financial ratios during different periods of time.

Model selection. The main panel data pros are that it enables the control of unique company effect, which differs between based on company but remain stable during set of time. Overall, there are two models – fixed effects (FE) and random effects (RE). The main difference of which model should be chosen determines heterogeneity level, e.g. it is level of dissimilarity on same effects in a predetermined population (Hsiao, 2022). FE model removes unchanging in time subject heterogeneity impact with condition that it correlates with independent variables (X), please see figure 2.1.

Figure 2.1

Fixed effect model form

$$y_{it} = \alpha_i + \beta' x_{it} + \epsilon_{it}$$

Source: compiled by author according to Hsiao, 2022.

Where:

Y – dependent variable.

i – individual observation.

t – time.

αi – fixed effect.

β – coefficient.

x – independent variable.

ε – error.

RE is almost the same as FE model, however, it does not assume that heterogeneity correlates with (X), so the model looks different, please see figure 2.2.

Figure 2.2

Random effect model form

$$y_{it} = \alpha + \beta' x_{it} + \mu_i + \epsilon_{it}$$

Source: compiled by author according to Hsiao, 2022.

Where:

α – general intercept.

μ - random effect.

Overall, there was revealed only basic principles of possible panel data models without diving too deep into details. The selection of model is determined by Hausman test, which will be explained and performed in the next part of the research.

Statistical software. EViews will be used for whole panel data model analysis, data manipulation and regression model testing. Based on the needs, Excel „Data analysis" package will be used as well.

Regression model specification. Our analysis objective is to determine whether structure of capital affects cost of capital and company value. As to objective there will be two dependent variables – cost of capital (as WACC) and company value (as Tobin Q). Accordingly, it is necessary to build two regression models, each one for dependant variables.

Sample. The analysis will be performed using target population of all companies listed on the Nasdaq Baltic Stock Exchange, as the research is performed within Baltic States, respectively, the relevance of this topic is high due to great interest in it and low quantity of research about Baltics market. In total, there was selected 28 listed entities (banks were excluded from the sample as they're affected by different factors). Observation period will be 5 years because of the data availability. Additionally, 5 entities were excluded from data sets due to data availability, e.g. selected enterprises were listed publicly later then 2020, hence there is not enough data. Finally, only 24 entities were selected and analysed, please see Annex 1.

Data sources. Research will rely on company's audited financial information that are posted in Nasdaq (Share list — Nasdaq Baltic). The financial data was used from consolidated financial statements because it is providing clear view on group performance, including all activities, rather than parent company. Especially, as some of the parent companies receive only dividends/interests or management fee from other group entities, hence it cannot be appropriately analysed. National France Bank data was used by obtaining data on German government 10-years bond yields (Germany - 10 year Government Bond), this data will be used as a risk-free rate of return. Professor Aswath Damodaran's data sets will be used on credit spreads and entities' betas (Useful Data Sets). Market rate of return will be calculated based on Nasdaq Baltic OMX Baltic Benchmark (Baltic market indexes — Nasdaq Baltic). The data sources will be cited next to the introduction of these calculations.

Number of Observations. There will be analysed 24 entities and 5 years data will be used, i.e., 2020, 2021, 2022, 2023 and 2024 years for each of the entity. Hence, in total there will be 120 observations.

Dependent Variables. As a dependent variable it will be used well-established WACC formula (see 1.3 figure) for cost of capital determination. The second variable will be Tobin's Q value (see 2.3 figure). This ratio was chosen due to its simplicity and accuracy over a firm's value. Moreover, it was chosen the ratio over raw number, such as market capitalisation, because it is more comparable between different size of a firm's and for regression model is necessary to use values to within the same scale cuts.

Figure 2.3

Tobin's Q ratio

$$\text{Tobin's Q} = \frac{\text{Total Market Value of Firm}}{\text{Total Asset Value of Firm}}$$

Source: (Hayes, 2025).

To determine the WACC of selected firms, it is important to do it step by step, i.e., calculate cost of debt, cost of equity and lastly calculate WACC. Cost of debt is calculated by formula below, see figure 2.4.

Figure 2.4

Cost of debt

$$\text{ATCD} = (\text{RFRR} + \text{CS}) \times (1 - \text{Tax Rate})$$

Source: (Hayes, 2025)

Where:

- ATCD – after-tax cost of debt
- RFRR – risk-free rate of return. It is theoretical benchmark which represents the expected return on investment with no risk of financial loss, in practice is associated with highly secure government securities because the likelihood of country default is low (Hayes, 2025). For this variable it was decided to use 10-year Germany government bonds yield average (Banque de France, 2025). For all 5 years the RFRR was used different based on that year average bond yield.
- CS – credit spread. Credit spread can be defined by company's credit rating, however there are no firms in Nasdaq Baltics that would have credit rating established by well-known organisations, such as Moody's, the Fitch Group or S&P Global Ratings. Hence, it was decided to rely on Professor Aswath Damodaran's data provided on public website (https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datahistory.html). To calculate credit spread it was taken adjusted default spread for each Baltic state and credit spread was calculated for each firm by using interest coverage ratio as a benchmark. Credit spread of country and entity rating was calculated differently for each year because

it changes due to numerous factors. Interest coverage ratio is calculated with formula below, see figure 2.5.

Figure 2.5

Interest coverage ratio

$$\text{Interest Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest Expense}}$$

Source: (Hayes, 2025)

Based on the ratio of the company, the credit spread will be determined.

- Tax rate – rate for each country and year was taken differently from Tax Foundation internet article (2024 Corporate Income Tax Rates in Europe | Tax Foundation) (Enache, 2024).

Secondly, to determine company's WACC is important to calculate another part of capital which is cost of equity. There are two methods to calculate it, as it was outlined in 1.1. part – using dividend capitalisation model or capital asset pricing method. As the DCM model requires company pay dividend, it was decided for this research rely only on CAPM, because there are no such requirements and not all listed companies in the Baltic states pay dividends, see figure 2.6.

Figure 2.6

CAPM formula

$$\text{CoE} = \text{RFRR} + B \times (\text{MRR} - \text{RFRR})$$

Source: (Kenton, 2025).

Where:

CoE – cost of equity.

RFRR – risk-free rate of return. Will be used the same percentage as in cost of debt, i.e., 10-years Germany government bonds yield average.

B – beta. Is a measure of risk, the higher volatility of company's stock price, the higher the beta will be (meaning the investment is riskier and the greater return is required by investors), and it is calculated by regression on the entity's share price (Kenton, 2025). As it requires

numerous calculations and data, it was decided to use Professor Aswath Damodaran's data which can be found on public website (https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datacurrent.html). In the data sheet, its global data from 47 810 different companies (the betas are categorised by industry in the data set).

MRR – market rate of return. In simple terms, it is the average market rate of return. It was calculated using Nasdaq Baltic OMX Baltic Benchmark GI data for period from 2014 December 31 to 2024 December 31, see figure 2.7.

Figure 2.7

Nasdaq Baltic OMX Baltic Benchmark GI

Source: (Nasdaq, 2025).

MRR was calculated by using compound annual growth rate, please see figure 2.8.

Figure 2.8

Compound annual growth rate (CAGR) formula

$$CAGR = \left(\left(\frac{EV}{BV} \right)^{\frac{1}{n}} - 1 \right) \times 100$$

Source: (Fernando, 2025).

Hence, the market rate of return is 10.0067%.

Independent Variables. D/E ratio was chosen as an independent variable to represent company's capital structure, i.e., balance of debt and equity. This variable is critical to research as the main purpose is to determine whether capital structure makes impact on cost of capital and company value or not. The linear relationship makes it possible to evaluate the debt's core. More detailed explanations will be given further on interpretation and limitation of this approach.

Control Variables. These variables help to prevent omitted variable bias. This bias is caused by having too few (X) variables that affects (Y), i.e., not only capital structure affects cost of capital and value of company but other factors as well. By not including additional variables to regression, it can falsely attribute other variable effect to the main variable (X). Therefore, it is necessary to include in this analysis a control variable as it will prevent this bias and will increase reliability of models. There were selected profitability, firm size, and firm growth as control variables due to these metrics' importance over cost of capital and company value. In model there will be used ROA which will represent the profitability (net profit/assets). A firm's size will represent current balance of assets in entity. The balance of asset will be expressed through a natural logarithm because the data needs to be aligned and in the same brackets over different companies, also, it helps to avoid heteroscedasticity. Lastly, a firm's growth will be represented by sales growth percentage from last year.

Research limitations. Research results are limited due to several factors. It will be limited only to a five-year period (from 2020 to 2024). Secondly, used calculations for WACC are inclined to be limited due to used calculations for this variable. There exist different methods and assumptions to calculate both cost of debt and cost of capital, hence the obtained WACC highly relies on method used. Lastly, research results depend on certain data used for calculations. Although, data of firm's financial position is accurate (based on audited FS), but variables and estimates used for RFRR, Beta, CS and MRR are difficult to estimate, and various approaches

can be used. The table below provides a comprehensive summary of the variables selected for the empirical regression analysis, please see table 2.1.

Table 2.1

Summary of regression variables

Variable	Title of the variable	Expressed variable via formula	Elements of formula	Data used
Y	Cost of capital	WACC	RFRR (risk-free rate of return)	German government 10 years bond yields.
			B (beta)	Publicly shared database on betas through sectors.
			CS (credit spread)	Publicly shared database on company's credit spreads based on interest coverage ratio.
			Tax rate	Baltic states tax rate.
			Company financial data	Audited consolidated financial statements.
			MRR (market rate of return)	Nasdaq Baltic OMX Baltic Benchmark return for 10-year period.
Y	Company value	Tobin Q	Company financial data	Audited consolidated financial statements.
X	Capital structure	D/E ratio	Company financial data	Audited consolidated financial statements.
X	Profitability	ROA	Company financial data	Audited consolidated financial statements.
X	Firm size	Ln (Assets)	Company financial data	Audited consolidated financial statements.
X	Growth	Percentage of revenue growth	Company financial data	Audited consolidated financial statements.

Source: compiled by author.

All data and calculations were gathered and synthesised in MS “Excel” due to high quantity of calculations; the data was not added to annexes as it would not be possible to fit it.

More importantly, there was concluded raised hypothesis table which presents expected relationship and its direction. Firstly, it is applied null hypothesis ($\beta = 0$) to all independent and control variables, which means independent variables has no effect on WACC and Tobin Q. This hypothesis is required till the research results does not prove otherwise. The alternative hypothesis, on the other hand, predicts a directional (positive or negative) influence and matches the study's theoretical predictions. It will be relied on the capital structure theories to understand which theory principles are most applicable and are true to Baltic-listed firms, please see table 2.2.

Table 2.2

Alternative hypotheses list

Nr.	Hypothesis	Theoretical Basis	Expectation on WACC	Expectation on Tobin's Q
H1	Debt should decrease WACC and increase Tobin Q due cheaper debt (tax shield)	Net Income Theory	D/E $\beta < 0$;	D/E $\beta > 0$;
H2	Profitability decreasing WACC and increasing Tobin Q	Pecking Order Theory	ROA $\beta < 0$	ROA $\beta > 0$
H3	Enterprise size decreases WACC and increases Tobin Q	Classical Finance Theory	Size $\beta < 0$	Size $\beta > 0$
H4	Growth is positively affecting Tobin Q	Signaling Theory	Growth $\beta < 0$	Growth $\beta > 0$

Source: compiled by author.

There were 4 different hypotheses raised for this research. The primary hypothesis remains the same which is related with aim of the work – to determine whether capital structure has effect on cost of capital and firm value. Hypothesis is based on Net Income Theory due to assumption that cost of debt is cheaper by tax shield (interest is deductible from profits) rather equity costs. In essence, relying more on debt than equity, it should decrease WACC and Tobin Q.

Although H2, H3 and H4 rely on distinct theories, it is generally expected that an increase in profitability, size and growth would result in a fall within WACC and a rise in the Tobin Q ratio, because investors and stakeholders will be encouraged by positive prospects. Higher profitability generally reduces the cost of capital due to lower risk. Meanwhile, it is expected that larger entities will gain benefits due to stability. Finally, growth is positively viewed by market and increases investors and stakeholders' expectations.

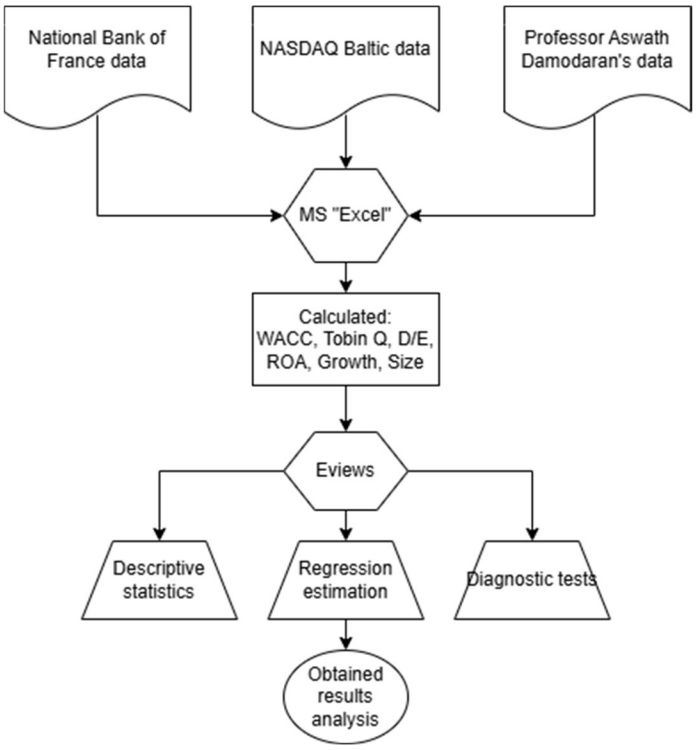
3. CAPITAL STRUCTURE IMPACT ON COST OF CAPITAL AND FIRM VALUE

3.1 Current Trends and Determinants in Capital Structure and Cost

As all the data was obtained and calculated is it necessary to move on to the main regression analysis testing. Before importing the data into EViews analytical programme the data was processed and only raw numbers that are used for model estimation were left, i.e., WACC, Tobin Q ratio, D/E ratio, company size (ln(assets)), company growth (sales growth from previous year), ROA. The data was imported to EViews from Excel file. During the process of importing the structure of data was selected as “Dated Panel” and data was successfully imported. Next, data was processed further via “Proc” and “Work file structure”. The Work file structure selected as previously mentioned. Cross section ID series was selected as “Enterprise” and date series selected as “dateid”. The frequency was chosen as “Annual” because the data is annual. The data was successfully processed and prepared for further analysis. To illustrate whole process of the research and data gathering, the process was prepared, see figure 3.1.

Figure 3.1

Research process



Source: compiled by the author.

Data will be gathered and processed in Microsoft Excel and after that it will be imported in EViews. In EViews there will be performed descriptive statistics, secondly it will be estimated two regression and thirdly it will be performed diagnostic tests.

In academic research it is a good practice to review descriptive statistics to see general tendencies and other important aspects of data that will be used. Important to note that this is not time-series data, so from these statistics cannot be made any conclusions regarding model reliability because one company data is not related with other. However, the data will show outliers, deviations between companies, etc. The simple approach was selected for descriptive statistics without any graphs as there are numerous variables (7 in total) and the table with key values was obtained from EViews, see figure 3.2.

Figure 3.2

Descriptive statistics

	COMPANY_GROWTH	COMPANY_SIZE	D_E_RATIO	PROFITABILITY__ROA_	TOBIN_S_Q	WACC
Mean	0.125384	12.19836	1.385778	0.048469	0.600003	0.073303
Median	0.047931	11.99899	1.052795	0.044028	0.546152	0.064925
Maximum	2.313522	15.55703	17.70735	0.291935	1.892632	0.176929
Minimum	-0.649359	9.652394	0.173548	-0.332067	0.129953	0.032766
Std. Dev.	0.349432	1.262269	1.714436	0.080138	0.364848	0.028630
Skewness	2.941299	0.498661	7.411259	-0.964527	1.361843	1.582712
Kurtosis	16.91349	3.007267	69.87744	7.649446	5.199609	5.058195
Jarque-Bera	1140.950	4.973527	23461.50	126.6930	61.28373	71.28036
Probability	0.000000	0.083179	0.000000	0.000000	0.000000	0.000000
Sum	15.04603	1463.804	166.2933	5.816338	72.00042	8.796301
Sum Sq. Dev.	14.53025	189.6055	349.7756	0.764239	15.84060	0.097540
Observations	120	120	120	120	120	120

Source: EViews.

“Company growth” statistics reveals that Nasdaq Baltic companies grow 12.53% on average over the last few years. Median is 4.79% and there is a big difference from average which indicates positive asymmetry, also the skewness confirms it. In simple, it means that numerous companies are growing on regular or slower rate, however, there are a small part of entities that growing super drastically.

“Company size”, is stable variable as it was transformed with logarithm. So, there are no companies that would drastically differentiate from rest of the sample. However, observing company’s factual assets, there are several companies with significant assets balance compared with other companies.

Analysing D/E ratio, also reveals that capital structure differs in certain company significant from the average. Additionally, it shows that numerous companies operate with high leverages, as the average D/E ratio is almost 2, i.e., it means that entities hold liabilities with balance value 2 times bigger than equity balance. Furthermore, high leverage is observed in certain engineering/construction firms, with highest even at 17 ratios.

“Profitability” indicates that on average whole companies on Nasdaq Baltic was profitable at 4,85% ROA, however, there was certain firms with negative ROA at -33,2%.

Lastly, the dependant variables „WACC“ shows that average cost of capital for listed companies in Nasdaq Baltic was 7,33 % and it is more stable across entities. „Tobin Q“ statistics shows that most of the companies are valued less than book value of the asset, i.e., average is 0,60, it is not varying significant. Tobin Q ratio above 1 shows that firm is valued higher than held assets and it is mean that company is strong and has growth opportunities, if the ratio is equal to 1 it means that company valued equally with assets balance value, and if ratio is below 1, means that entity is valued less than the cost of replacing its assets, it is indicates poor growth prospects or other factors.

As the data was overviewed it can be moved to regression model. General Regression equations were composed that will be used to test whether company capital structure and other control variables affects the cost of capital (WACC) and the company’s value (Tobin Q), see figures 3.3 and 3.4 These regressions are just representation of how it will be entered into EViews. Based on further research the regressions will change due to selection of FE or RE models.

Figure 3.3

Regression equation of D/E on WACC

$$WACC_{i,t} = \beta_0 + \beta_1 \frac{D}{E}_{i,t} + \beta_2 \frac{D^2}{E^2}_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 ROA_{i,t} + \beta_5 GROWTH_{i,t} + \nu_{i,t}$$

Source: compiled by author.

Figure 3.4

Regression equation of D/E on firm value

$$Tobin's\ Q_{i,t} = \beta_0 + \beta_1 \frac{D}{E}_{i,t} + \beta_2 \frac{D^2}{E^2}_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 ROA_{i,t} + \beta_5 GROWTH_{i,t} + \nu_i$$

Source: compiled by author.

Where:

β0 – intercept (expected Tobin's Q in the case of zero independent and control variables).

vi - error (unexplained variation).

Regression models for both dependent variables are identical. The regression equation is defined; hence further research is executed on EViews platform. Via “Quick” the option of “Estimate equation” is selected. The predefined regression is entered into program. The Least Squares (LR and AR) method was used to estimate the regression coefficients. This is a type of mathematical technique designed to find the regression line that best fits the data by minimising the sum of squares (residuals) of the differences between the actual observations and the predictions of the line (Kenton, 2025). This method is most compactible with panel regression as it has both a time and a cross-section dimension.

Additionally, EViews requires to specify “Panel Options” where it can be chosen effects on cross section and period. For both parameters it can be selected whether these effects are random, fixed or there are none. The cross-section effect will be discussed more deeply next to Hausman test as it will determine which regression model should be chosen, i.e., FE or RE. However, EViews allows to use “Period” effects, but it will be not used as it decreases identified variation, i.e., FE on period removes all components that changes in time, so enabling this function can decrease β variability and results will become unreliable.

Furthermore, “Weights” of variables can be also manipulated in EViews by generalised least squares (GLS) different methods, but it is not applicable for this research as it requires to know the structure of mistakes and without it, GLS can create biased and unreliable coefficients (Hsiao, 2022).

EViews generated results on regression will provide key outputs - coefficient and p-value of each variable. Coefficient provides understanding whether independent variable affects

dependant and p-value shows significance of each independent variable per testing null hypothesis, i.e., prob. < 0,05 indicates that variable is significant and affects dependent variable, and prob. >0,05 means that variable insignificant. Some researchers use 0,10 benchmark to measure significance. In simple words, this benchmark can be chosen judgementally, and it shows the accuracy of correct hypothesis, so benchmark of 0,05 shows that it is correct on 95% (Kwak, 2023). In this research it will be used generally accepted benchmark of 0,05, however, if there will results exceeding 0,05 but not more than 0,10 it will be counted as marginally significant result.

Other important metrics will be R-squared, F-statistics and Durbin-Watson statistics. R-squared metric defines whole regression model reliability. It has a range of 0 to 1, with 1 indicating a perfect match between the model and the data (Fernando, 2025). Moreover, model accuracy and reliability are explained via F-statistics and its probability where null-hypothesis is tested where the same test with the same benchmarks are applied as previously (Hsiao, 2022). Durbin-Watson test is needed to determine model autocorrelation. This test determines whether model error variable correlates between time. If the autocorrelation exists in regression, it shows that standard error is biased and whole model is unreliable. Durbin-Watson statistics varies between 0 and 4. No autocorrelation is suggested by a Durbin-Watson value near 2, positive autocorrelation is indicated by values below 2, and negative autocorrelation is indicated by values over 2 (Kenton, 2025).

As it was mentioned in the 2.1 parts, it is crucial to determine which model to select between FE and RE on cross-section effects as it affects coefficients, p-values, etc. The choice can be made only after performing Hausman test, which will provide insights. Hausman test is performed by testing null hypothesis with threshold of 0,05. If prob. < 0,05 it indicates that there are fixed effects in each enterprise that correlates with independent variables. If prob. > 0,05, it indicates that the specific characteristics are random and not related. “Chi-Sq. Statistic” provides the magnitude of the difference between both models (FE and RE), and the larger value means higher difference which leads to null hypothesis rejection (Hsiao, 2022). In essence, this test is performed by comparing β coefficients obtained from both models and if these coefficients are similar, the p-value will be above 0,05, if not, the p-value will be less than 0,05.

Due to EViews program functionality equation needed to be launched on both models and Hausman test was performed afterwards with obtained results from both models. For FE model results see figure 3.5.

Figure 3.5

Fixed effects regression equation of D/E on WACC

Dependent Variable: WACC
Method: Panel Least Squares
Date: 12/04/25 Time: 20:32
Sample: 2020 2024
Periods included: 5
Cross-sections included: 24
Total panel (balanced) observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.239538	0.129142	-1.854839	0.0668
D_E_RATIO	-0.004239	0.001687	-2.513354	0.0137
COMPANY_SIZE	0.027207	0.010651	2.554339	0.0123
PROFITABILITY__ROA_	-0.228298	0.035663	-6.401543	0.0000
COMPANY_GROWTH	-0.016713	0.006038	-2.767775	0.0068

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.633023	Mean dependent var	0.073303
Adjusted R-squared	0.525323	S.D. dependent var	0.028630
S.E. of regression	0.019725	Akaike info criterion	-4.812901
Sum squared resid	0.035795	Schwarz criterion	-4.162486
Log likelihood	316.7740	Hannan-Quinn criter.	-4.548764
F-statistic	5.877659	Durbin-Watson stat	2.281414
Prob(F-statistic)	0.000000		

Source: EViews.

The main results which can be seen in „Prob.“ (p-value) and “Coefficient” column, see figure 2.9. All variables, including D/E, SIZE, ROA and GROWTH is statistically significant in affecting WACC. The D/E coefficient is negative, i.e., meaning that higher leverage on debt minimises cost of capital supporting Net Income approach. Respectively, it supports that tax shield exists in Baltic states listed entity’s and it is used.

Company size is considered as statistically significant; however, the coefficient shows unusual implication – as company grow, the WACC is growing either. This unusual outcome could have been caused due to global circumstances. By observing gathered data the cost of capital is highly leveraged by RFRR (Germany 10 years government bond yield), which was negative in 2020 and 2021 because of global pandemic (the consumption was on very low levels, so to avoid recessions numerous monetary policy measurements was used, including interest rates which were decreased to 0% by central banks) (European Central Bank. (n.d.). Furthermore, from 2022 the inflation and consumptions were started to grow significantly regarding previous monetary

policy, so in response to it, the interest rate was increased, which led bond yield to increase (Benigno, 2024). Therefore, as stable and normal company grows in assets year by year and WACC increased for all companies from 2022, it could be assumed that regression miscalculate this effect. Important to note, that these circumstances, does not affect other variables as profitability, D/E and company growth always fluctuates. Overall, this is controlling variables, so it is impact to the main research is none.

Other metrics shows positive signs, i.e., R-squared is 0,63 meaning that WACC variances are explained by all the independent variables at 63% accuracy. F-statistics probability rejects null hypothesis, so it confirms that model is statistically significant. Lastly, Durbin-Watson stat provides insight that there is no autocorrelation and t-statistics is reliable as test results are close to 2 value (2,28).

Figure 3.6

Random effects regression equation of D/E on WACC

Dependent Variable: WACC
Method: Panel EGLS (Cross-section random effects)
Date: 12/06/25 Time: 18:38
Sample: 2020 2024
Periods included: 5
Cross-sections included: 24
Total panel (balanced) observations: 120
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.162748	0.026396	6.165620	0.0000
D_E_RATIO	-0.001972	0.001461	-1.349703	0.1798
COMPANY_SIZE	-0.006168	0.002136	-2.887641	0.0046
PROFITABILITY__ROA_	-0.203670	0.031984	-6.367931	0.0000
COMPANY_GROWTH	-0.012800	0.005709	-2.241919	0.0269

Effects Specification	S.D.	Rho
Cross-section random	0.009939	0.2025
Idiosyncratic random	0.019725	0.7975

Weighted Statistics

R-squared	0.378570	Mean dependent var	0.048659
Adjusted R-squared	0.356955	S.D. dependent var	0.025910
S.E. of regression	0.020777	Sum squared resid	0.049645
F-statistic	17.51426	Durbin-Watson stat	1.687708
Prob(F-statistic)	0.000000		

Source: EViews.

Obtained results are in a difference format from fixed effects due to change in regression equation, see figure 3.6. RE provides information on cross-section and idiosyncratic standard

deviation, and Rho statistic. Cross-section measures company specific effect and idiosyncratic shows standard error. In essence, these statistics shows whether higher part of unexplained variance determined by company specific effect or standard error.

Results are quite similar with FE model; however, it shows that D/E is not statistically significant rejecting null hypothesis in impacting WACC (p-value=0,1798), see figure 2.10. Additionally, results seem reasonable by obtained coefficients, which indicates that profitability, growth and size decreasing WACC compared to FE model. Model explainability of WACC on independent variables shows that it has low accuracy based on R-squared but from F-statistics show that all variables still are statistically significant and explains WACC variation. Durbin-Watson stat is closer to 1,5 than 2, so it indicates that there is a small positive autocorrelation. It will be more detailed elaborated on model results after Hausman test.

As the results of both equations was obtained it is necessary to launch Hausman test to determine which model should be used, see figure 3.7.

Figure 3.7

Hausman test (Regression equation of D/E on WACC)

Correlated Random Effects - Hausman Test
Equation: WACC_FE
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	16.597303	4	0.0023

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
D_E_RATIO	-0.004239	-0.001972	0.000001	0.0072
COMPANY_SIZE	0.027207	-0.006168	0.000109	0.0014
PROFITABILITY__ROA_	-0.228298	-0.203670	0.000249	0.1185
COMPANY_GROWTH	-0.016713	-0.012800	0.000004	0.0466

Source: EViews.

EViews generated results of Hausman test and attention should be focused on p-value (0,0023) and ”Chi-Sq. Statistic” (16,597). Results proves that there should be used fixed effect model as p-value is less than 0,05, moreover, Chi-Sq. Statistic is high, hence the null hypothesis

should be rejected and FE model selected, as it indicates that other effects are not random but consistent in each company.

Moving on, the next regression was performed with second dependant variable Tobin Q, which represents firm value. Independent variables used for this equation remains the same. The equation was entered into the EViews program and launched with both models, i.e., FE and RE, see figures 3.8 and 3.9.

Figure 3.8

Fixed effects regression equation of D/E on firm value

Dependent Variable: TOBIN_S_Q
Method: Panel Least Squares
Date: 12/06/25 Time: 18:50
Sample: 2020 2024
Periods included: 5
Cross-sections included: 24
Total panel (balanced) observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.679581	1.011926	2.648001	0.0095
D_E_RATIO	0.006284	0.013217	0.475491	0.6356
COMPANY_SIZE	-0.174268	0.083460	-2.088047	0.0396
PROFITABILITY__ROA_	0.697052	0.279445	2.494412	0.0144
COMPANY_GROWTH	0.029560	0.047315	0.624747	0.5337

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.861258	Mean dependent var	0.600003
Adjusted R-squared	0.820540	S.D. dependent var	0.364848
S.E. of regression	0.154560	Akaike info criterion	-0.695512
Sum squared resid	2.197755	Schwarz criterion	-0.045097
Log likelihood	69.73070	Hannan-Quinn criter.	-0.431375
F-statistic	21.15191	Durbin-Watson stat	1.474354
Prob(F-statistic)	0.000000		

Source: EViews.

Fixed effects regression model provides several key insights. It can be observed that almost all independent variables are statistically significant, because the null hypothesis is rejected as p-value < 0,05, except for D/E, see figure 2.12. No marginally significant variables identified. D/E ratio (p-value=0,6356) identified as not statistically significant by not affecting Tobin Q. From gathered results indicates several possible reasons, including that external investors are focused on straightforward benchmarks as profitability, EBIDTA, etc. rather on complex financial

engineering ratios, for example D/E. Other reasons can include lower liquidity existence in Baltic states equity market which impacts external investors valuation.

Furthermore, control variables coefficients indicate valuables insights. Profitability coefficients indicate results as it was assumed, i.e., higher profitability increase Tobin Q. However, the results show, abnormal relationship related with company size and firm value by implying that bigger enterprises have a lower Tobin Q. This trend repeat itself, as it was captured with WACC regression similar anomality. It is observed that bigger companies have a higher WACC and lower Tobin Q. These findings show implications that was caused not only by economic factors, but general investors and stakeholders' attitude toward large companies listed in Baltic states. Main factors that can affect obtained results are ceiling effect, which impacts returns and forecasted growth. Furthermore, it can be determined due to size measurement using assets balance value, because different sectors firms in essence should be measured with distinct ratio's as some companies relies on asset acquisition, other on market shares, etc.

R-squared indicates that Tobin Q is explained at 86% accuracy by independent variables. F-statistic confirms to reject null hypothesis and indicates that regression is statistically reliable. However, Durbin-Watson test shows value of 1,47 indicating that potential small positive autocorrelation exists in errors. The value deviation from acceptable norm is not critical, hence it will not have significant implications on model reliability.

Figure 3.9

Random effects regression equation of D/E on firm value

Dependent Variable: TOBIN_S_Q
Method: Panel EGLS (Cross-section random effects)
Date: 12/06/25 Time: 19:09
Sample: 2020 2024
Periods included: 5
Cross-sections included: 24
Total panel (balanced) observations: 120
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.267771	0.469822	2.698406	0.0080
D_E_RATIO	0.000887	0.012594	0.070400	0.9440
COMPANY_SIZE	-0.058130	0.038397	-1.513916	0.1328
PROFITABILITY__ROA_	0.801596	0.273154	2.934597	0.0040
COMPANY_GROWTH	0.009907	0.046805	0.211658	0.8327

Effects Specification	S.D.	Rho
Cross-section random	0.254890	0.7312
Idiosyncratic random	0.154560	0.2688

Weighted Statistics

R-squared	0.121913	Mean dependent var	0.157037
Adjusted R-squared	0.091371	S.D. dependent var	0.170710
S.E. of regression	0.162725	Sum squared resid	3.045124
F-statistic	3.991629	Durbin-Watson stat	1.056013
Prob(F-statistic)	0.004540		

Source: EViews.

Results of random effects regression on firm value is highly different to fixed effects. In RE model D/E (p-value=0,9440), company size (p-value=0,1328) and company growth (p-value=0,8327) is statistically insignificant. Based on RE model, Tobin Q is explained mainly by profitability and other factors that are not included in regression. Nonetheless, R-squared indicates that only 12% of firm value is explained via independent variables. Model is unreliable as the minimal benchmark should be at least 50%. Durbin-Watson stat show that positive autocorrelation exists as the metric is 1,06. F-statistics shows that the model is still statistically significant, but interpreting these results with other statistics it assumed that RE model is unreliable. Moreover, significant variables and coefficients of these variables remain almost the same (in same direction) as it was in FE model. Hence, Hausman test was launched to confirm over model selection, please see figure 3.10.

Figure 3.10

Hausman test (Regression equation of D/E on firm value)

Correlated Random Effects - Hausman Test
Equation: TOBINQ_FE
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	16.471610	4	0.0024

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
D_E_RATIO	0.006284	0.000887	0.000016	0.1780
COMPANY_SIZE	-0.174268	-0.058130	0.005491	0.1171
PROFITABILITY__ROA_	0.697052	0.801596	0.003477	0.0762
COMPANY_GROWTH	0.029560	0.009907	0.000048	0.0046

Source: EViews.

Hausman test reveals p-value of 0,0024 and ”Chi-Sq. Statistic” of 16,47. Obtained results clearly indicates that fixed effects model should be chosen over random effects, as the null hypothesis is rejected and Chi statistic is high.

In conclusion, descriptive statistics on extracted data from sources revealed that listed companies in Baltic States growing very differently, i.e., one enterprise has exponential growth, other negative. While Tobin Q indicated that most companies are valued below their book value, which shows that investors are conservative on a firm’s valuations. Furthermore, it was used Least Squares method to perform both regressions. The Hausman test was performed between FE and RE models to select appropriate one. The results determined that for both regression models there should be used fixed effects as the null hypothesis was rejected. WACC is impacted by all variables, including D/E by supporting Net Income approach, which states that debt is always increases cost of capital due to deductible interest’s expenses. Other statistics proved that WACC FE model is statistically correct. Although, Tobin Q is exposed to all variables either, except D/E indicating that external investors tend to focus more on profitability and other straightforward ratios. Furthermore, model demonstrates high explanatory power.

3.2 Regression Models Diagnostic Tests

As the FE model was selected on both regressions and β (coefficients) were determined, it is important now to do several diagnostic tests on both regressions to evaluate whether unexplained variation meet the classical assumptions of (OLS) method. Diagnostic tests are needed to identify possible statistics distortions and to assess whether it is necessary to apply robust standard error corrections to ensure highest precision of p-value. Although, in this case, violating these assumptions would not cause a problem due to sufficient number of observations (120) and the application of Central Limit Theorem (CLT) (will be explained further), these tests will be performed to disclose important limitation of the model. It will be explained only the basis and key nuances related with these tests. There are 3 main diagnostic tests:

1. Variance Inflation Factor test – it calculates whether independent variable standard error is affected by correlation with other variables. Multicollinearity does not distort coefficients, but increases the standard errors of those coefficients, hence t-statistics decreases and p-values increases.
2. Jarque-Bera Normality test – it determines whether model residuals have a normal distribution. If the distribution is not normal p-values can be not highly accurate in small populations.
3. Cross section dependence test - determines whether there is a correlation between the residuals of two different companies by testing null hypothesis. Cross section dependence shows that shared factors (e.g. economics of Baltic states) affect all enterprises by impacting t-statistics and p-value.

Firstly, the multicollinearity of independent variables will be tested between each other. If two independent values strongly correlate, it can distort regression results and p-values. The multicollinearity test is addressed via Variance Inflation Factor (VIF) test, see figure 3.11 (The Investopedia Team, 2025).

Figure 3.11

VIF formula

$$\mathrm{VIF}_i = \frac{1}{1 - R_i^2}$$

Source: The Investopedia Team, 2025

Where:

R squared - Regression of the independent variable on the remaining variables using the unadjusted coefficient of determination. For results interpretation, please see table 3.1

Table 3.1

VIF results interpretation

VIF value	***Interpretation***
Less or equal to 1	*Not correlated*
Between 1 and 5	*Moderately correlated*
Greater than 5	*Highly correlated*

Source: compiled by author according to The Investopedia Team, 2025.

Due to EViews license limitations it cannot be performed via the program, hence it was decided to make regression with all independent variables and from obtained R squared^2 values calculate VIF by formula above for all independent variables. The regression analysis was made with each independent variables – D/E, SIZE, GROWTH, PROFITABILITY. Regression was launched six different times with each one variable as Y (dependent variables), to obtain R squared^2. An Excel table was made with all variables and calculations, additionally for more accurate view it was performed correlation matrix via Excel Analysis tool (as the correlation matrix show whether X's correlates), please see table 3.2 and figure 3.12.

Table 3.2

VIF test and results

X variable	**R squared**	**VIF**	**Results**
D/E ratio	0,350339	1,539264324	Low/Moderately correlated
Company size	0,00598	1,006015976	Low/Moderately correlated
Company growth	0,080003	1,086960066	Low/Moderately correlated
Profitability (ROA)	0,385994	1,62864858	Low/Moderately correlated

Source: compiled by author.

Figure 3.12

Independent variable correlation matrix

	D/E ratio	*Company size*	*Company growth*	*Profitability (ROA)*
D/E ratio	100%			
Company size	2%	100%		
Company growth	1%	2%	100%	
Profitability (ROA)	-57%	-6%	23%	100%

Source: compiled by author.

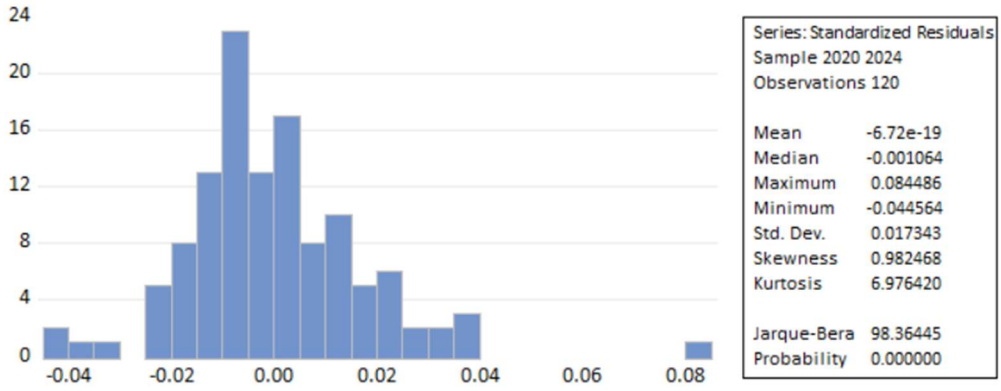
Obtained results show critical limitations of these variables that are used for both regressions as there are no highly correlated variables. Correlation matrix shows that D/E correlates with ROA more highly compared with other variables, however, VIF test results does not indicate any high correlation.

Based on VIF test and correlation matrix these independent variables do not show high correlation between each other. Slightly higher correlation exists between ROA with D/E and company growth; however, it is minimal due to indirectly relationship of these ratios. Overall, there are no multicollinearity problem that could affect regression results, so estimated regression models are statistically reliable.

Secondly, Jarque-Bera test was performed with models as it intended for testing specific regression model residuals. Please see both model normality test results in figure 3.13 and 3.14.

Figure 3.13

WACC FE regression model normality test results

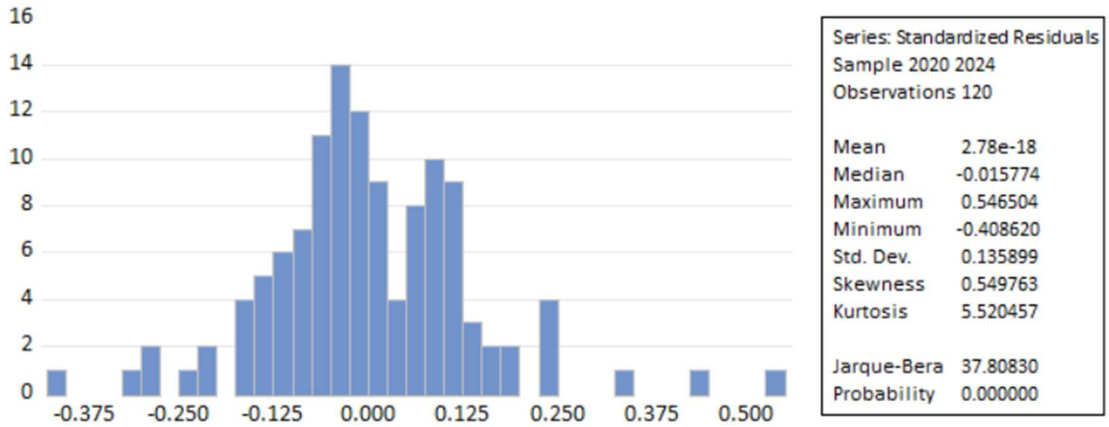


Source: EViews.

Obtained results show Jarque-Bera statistics of 98,36 which confirms high deviation from normality. Null hypothesis is rejected as probability is 0. Skewness shows that there is positive asymmetry.

Figure 3.14

Tobin Q FE regression model normality test results



Source: EViews.

Tobin Q normality test results are almost identical with WACC results (p-value=0, high Jarque-Bera, etc.). Hence, null hypothesis is rejected for both tests, and the statistics implies that residuals are not distributed normally. These results are typically in financial and economic data where extreme values appear. Nevertheless, collected findings are controlled by enough number of observation and CLT. According to the Central Limit Theorem (CLT), the distribution of these sample averages will tend towards a normal distribution and normal coefficients with p-values, regardless of the shape of the original population's distribution (Ganti, 2025). Hence, it is assumed that revealed outcome does not affect the coefficients and p-values of conducted regressions.

One of the most critical tests is cross-section dependence test which will reveal insights and limitations on obtained t-statistics and p-values from regression models. Although, this test does not distort coefficient size and its direction, but it can impact statistics which provides evidence on independent variables significance on regression model. In EViews, this test comprised of other 4 separate test that examine null hypothesis and concludes on general results. It consists of Breusch-Pagan LM, Pesaran scaled LM, Bias-corrected scaled LM and Pesaran CD tests Due to the structure of the data (N=24 cross-sections, T=5 periods), the primary emphasis will be put on Breusch-Pagan LM and Pesaran CD results, because LM test is designed to check for cross-sectional correlation when number of N (companies) across population is large, but the

numbers of time period (T) is small. Pesaran CD test is considered the most robust test and is intended for both scenarios where times period and number of N are large (Pesaran, 2004). In essence, the tests are for the same purpose, i.e., to test whether residuals correlate between companies at the same time, but these tests are designed for different structure populations.

The test was conducted through EViews, and results were obtained for WACC FE and Tobin Q FE regression, please see 3.15 and 3.16 figures.

Figure 3.15

WACC FE regression model cross-section dependence test results

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation) in residuals
Equation: WACC_FE
Periods included: 5
Cross-sections included: 24
Total panel observations: 120
Cross-section effects were removed during estimation

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	346.6348	276	0.0025
Pesaran scaled LM	3.006415		0.0026
Bias-corrected scaled LM	0.006415		0.9949
Pesaran CD	1.737169		0.0824

Source: EViews.

Figure 3.16

Tobin Q FE regression model cross-section dependence test results

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation) in residuals
Equation: TOBINQ_FE
Periods included: 5
Cross-sections included: 24
Total panel observations: 120
Cross-section effects were removed during estimation

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	415.9436	276	0.0000
Pesaran scaled LM	5.956394		0.0000
Bias-corrected scaled LM	2.956394		0.0031
Pesaran CD	5.676021		0.0000

Source: EViews.

In both figures 2.19, 2.20 Breusch-Pagan LM and Pesaran CD tests rejects null hypothesis (p value <0,05), excepts for WACC RE model. Pesaran CD is confirmed within this model. However, it approves that there are cross-section correlation and dependency in both regressions. In theory, it should be applied robust methods to revise these standard errors that should adjust the t-statistic and p-value, however, due to limitations outlined further it was not used as p-values are controlled via other factors (King & Roberts, 2015). This approach is justified by:

- Assumption that cross-section dependence arises due to unobserved but constant company characteristics, hence, applied fixed-effects model control and filters these residuals. The remaining residuals correlations assumed to be minimal and not significant that could affect p-values.
- Additional adjustments of existing regressions by robust methods can cause new statistic problems that can decrease degree of freedom which could make the model unstable.

To summarise, there was executed three main diagnostic tests on FE regression models to review potential deviations from classical regression assumptions. VIF test revealed that there is no multicollinearity issue in independent variables as it does not correlate with each other. The normality results rejected null hypothesis of normally distributed residuals as it usual for financial data due to extreme values. Nevertheless, the results are controlled via high number of observation and central limit theorem which mitigates the risk of affecting p-values. Lastly, cross-section dependence test revealed that in each regression exists cross-section dependence of residuals which, although it does not affect coefficients, but there are possibilities that it can alter p-values. Robust standard errors were not applied due to the risk of making the model less stable and using already fixed effects on both models that controls these errors.

3.3 Economic Interpretation of Research Results

It is determined that WACC FE and Tobin Q FE regression model is correct and accurate by obtained results on Hausman test and diagnostic tests. The coefficients and p-values were obtained for each variable, and the relationship and dependency were established in Listed Baltic States entities. To conclude on findings, it is necessary to test whether raised hypotheses was correct. Moreover, more elaboration is required for interpreting obtained results from an economic perspective to compose clear view about obtained coefficients. In this section of work, these nuances will be addressed and discussed.

To begin with, it will be concluded hypothesis table by factual results, see table 3.3.

Table 3.3

Alternative hypotheses results

Nr.	Expectation on WACC	Expectation on Tobin's Q	Factual results on WACC	Factual results Tobin's Q
H1	D/E β < 0;	D/E β > 0;	D/E β < 0;	D/E β = 0;
H2	ROA β < 0	ROA β > 0	ROA β < 0	ROA β > 0
H3	Size β < 0	Size β > 0	Size β > 0	Size β < 0
H4	Growth β < 0	Growth β > 0	Growth β < 0	Growth β = 0

Source: compiled by author.

Hypothesis H1 is supported with obtained results that financial leverage impacts cost of capital (WACC). Statistically significant negative relationship was found (β=-0,0042, p=0,037), see figure 2.9. This supports the hypothesis that a company's cost of capital will drop as it increases its leverage. From an economic perspective obtained results suggest that every 0,1 unit increase in D/E ratio will decrease WACC by approximately 0,42 percentages, if other variables remain unchanged. Reached findings validates the Net Income approach by indicating that in the Baltic States market, the tax shield reduces significantly the total cost of funding. The debt funding hardship has not outweighed these advantages.

On the other hand, null hypothesis was confirmed for Tobin Q and alternative H1 was rejected due to p-value results which confirms that the variable is statistically insignificant (β=0,0063, p=0,6356), see figure 2.12. It implies that increased leverage is not linearly rewarded with higher valuation in the Baltic States equity market. Although the WACC model shows that debt lowers capital costs, it does not result in a substantial value premium for the company's shares in relation to its assets. There can be numerous reasons, including that there may be no net value creation from leverage alone, or that investors may be indifferent to in capital structure. Considering the low liquidity of the Baltic equity market, it can be argued that investors prioritise actual, variable cash flows and operational efficiency over complex financial engineering as leverage changes (Skrutkowski, 2025). There are only a few options described, but more thorough analysis is needed, which may be found by exploring the subject further.

H2 was based on Pecking Order Theory by relying on principle that higher profitability will decrease risk in firm (as the it will be able to finance itself via retained earnings). Generally, it

should lead to higher profitability (ROA) decreasing WACC and increasing Tobin Q. Regression outcome on ROA revealed significant negative correlation (β=-0,2283, p=0,0000). In ceteris paribus environment, a 1% increase in ROA leads to a 0,23% reduction in WACC, so it is strongly supporting Pecking Order Theory and rejects null hypothesis that ROA do not have an effect on WACC.

H2 is confirmed with Tobin Q as well. Significant positive correlation was discovered (β=0,6971, p=0,0144) which confirms that operational efficiency is the most effective method for increasing firm value in Nasdaq Baltic market.

H3 was structured on classical finance theory. Larger entity's general is more stable both financially and operationally which leads to lower WACC and higher Tobin Q. However, the factual results present total opposite outcomes. Contrary to expectations, firm size has a significant positive impact effect on WACC (β=0,0272, p=0,0123). Regressions show that as observed companies grew their assets over 5-year period, their cost of capital grew. It is assumed that these results can be impacted by macro-economic environment (rising interest rates during a firm's growth period). The possible reasons were discussed in 2.2 part of work. Presented scenarios are not confirmed, because it would require in depth analysis research with different aim.

Moreover, Tobin Q findings show significantly negative relationship (β=-0,1743, p=0,0396) which contradicts H1 too. It indicates that market penalises firm growth by lower valuation ratio. This supports weight on the inefficiency, based on it can be stated that as Baltic listed companies expand, they may encounter bureaucratic obstacles or diminishing returns on assets, which investors perceive adversely in contrast to smaller, more agile organisations. Furthermore, these findings can be related with selected measurement of company size which is assets. The firm size can be measured with a different parameter, often it should be used based on company specifics, because some companies highly rely on assets to operate, other companies rely only on staff costs and more accurate measurement should be sales turnovers, etc.

Lastly, H4 was dedicated to determining correlation (measured by sales turnovers increase from last year) on both dependent variables based on Signaling Theory, i.e., presuming that market participants and stakeholders react positively by increasing a firm's valuation and decreasing cost of debt (due to higher creditworthiness) which will lead to lower WACC. Research findings confirmed this hypothesis on WACC by company growth significant negative effect on WACC (β=-0,0167, p=0,0068). In ceteris paribus environment 10% growth decreases WACC by 0,17%. Although, the impact is not big but results clearly implies that high-growth firms are viewed

as more solvent and promising for creditors (incl. financial institutions), allowing them to secure cheaper financing.

On the contrary, alternative H4 on Tobin Q is rejected as it showed statistically insignificant results in regression model (β=0,02956, p=0,5337). This suggests that investors in Nasdaq Baltic market place a higher priority on current profitability (ROA) than top-line growth and that revenue growth alone is insufficient to drive firm value.

It is essential to acknowledge the intrinsic limitations of the linear regression models utilised in this investigation. While the WACC model, specifically for D/E, indicates significant negative relationship, it does not imply that WACC will continuously decrease to 0% as the leverage increase. The WACC should stop decreasing at certain point where cost of debt and equity reaches minimum point. Therefore, this research establishes the impact and direction of WACC and Tobin Q on D/E.

CONCLUSIONS AND RECOMMENDATIONS

1. The comprehensive analysis of capital structure theories confirmed that are plenty of them, however, no single universal model exists to fully explain all corporate financing decisions. In distinct markets and periods strives divergent factors which impels specific approach on capital structure and financing decisions. A firm's value and cost of capital is not affected by capital structure in perfect market based on M&M Theory. Although, market is ineffective due to many factors, it inspired more practical theories development (Trade-off Theory, Pecking Order Theory, etc.). New concepts are focused on existing market specific factors – tax benefits, bankruptcy costs, information asymmetry, etc. Recent developments, including BFO model, A.I. enhanced estimations, further improves the accuracy of perfect capital structure model by incorporating more constrains influencing the model reliability.
2. Empirical finding on Baltic-listed firms over period 2020-2024 using panel data regression analysis proved higher debt leverage negative impact on WACC by confirming tax shield benefit effectively lowers the cost of funding. D/E does not determine a firm's value measured by Tobin Q. Profitability emerged as strongest determinant of capital cost and company value approving Pecking Order Theory. Contrary to expectations, higher size (measured by assets) firms were found to have opposite effect by increasing WACC and decreasing Tobin Q. The reason is assumed to be explained through changing macro-economic factors, although, it requires further analysis behind the reasons. Lastly, higher entity growth drives decrease of WACC (by signaling to creditors positive prospects of firm operations). Tobin Q was not determined by growth supporting irrelevancy of this factor to investors.
3. In combination of theoretical base and gathered results following recommendations are issued to reduce WACC and raise Tobin Q in analysed environment. Prioritizing operational efficiency positively impacts both of variables for Baltic-listed entities. The focus needs to be directed on profit accumulation due to investors critical evaluation towards this indicator. Optimised leverage leads to most efficient engine for value generation, although only linear trend was determined within analysis, the WACC cannot decrease less as certain point reached. Baltic-states listed firms relying on higher leverage (debt) has lower cost of capital compared to low leverage entities.

BIBLIOGRAPHY AND A LIST OF REFERENCES

1. Afinindy, I., Salim, U., & Ratnawati, K. (2021). *The effect of profitability, firm size, liquidity, sales growth on firm value mediated capital structure*. International Journal of Business, Economics and Law, 24(4), 15–20.
2. Aji, F. R. P., & Setiawan, D. (2022). *The impact of women's presence on the board of directors on capital structure and company failure risk.* Jurnal Manajemen dan Pemasaran Jasa, 15(1), 1–12. https://www.researchgate.net/publication/361685005_The_impact_of_women's_presence_on_the_board_of_directors_on_capital_structure_and_company_failure_risk/fulltext/637ec33c54eb5f547cfbd621/The-impact-of-womens-presence-on-the-board-of-directors-on-capital-structure-and-company-failure-risk.pdf
3. Badheka, G. T., & Pandya, K. (2022*). Behavioural capital structure: A systematic literature review on the role of psychological factors in determining the capital structure.* International Journal of Financial Management, 12(3), 01–09. http://publishingindia.com/downloads/7077.pdf
4. Banque de France. (2025). *Germany - 10-year Government Bond* (FM.M.DE.EUR.FR2.BB.DE10YT_RR.YLD). Webstat. Retrieved from Germany - 10 year Government Bond
5. Benigno, G., Hofmann, B., Nuño, G., & Sandri, D. (2024, April 22). *The natural rate of interest after the pandemic.* VoxEU. https://cepr.org/voxeu/columns/natural-rate-interest-after-pandemic
6. British Business Bank. (n.d.). *What is equity finance?* Retrieved August 31, 2025, from https://www.british-business-bank.co.uk/business-guidance/guidance-articles/finance/what-is-equity-finance
7. Bruner, R. F., Eades, K. M., Harris, R. S., & Higgins, R. C. (1998). *Best Practices in Estimating the Cost of Capital: Survey and Synthesis.* Financial Practice and Education, *8*(1), 13-28. fpe81art2.p65
8. Brusov, P., & Filatova, T. (2023). *Capital structure theory: Past, present, future*. Mathematics, 11(3), 616. https://doi.org/10.3390/math11030616
9. Bui, T. N., Nguyen, X. H., & Pham, K. T. (2023). *The effect of capital structure on firm value: A study of companies listed on the Vietnamese stock market*. International Journal of Financial Studies, 11(3), 100. https://doi.org/10.3390/ijfs11030100

10. Cerón, L. A. M., van Klyton, A., Rojas, A., & Muñoz, J. (2024). *Climate risk and its impact on the cost of capital—A systematic literature review.* Sustainability, 16(23), 10727. Climate Risk and Its Impact on the Cost of Capital—A Systematic Literature Review
11. CFI Team. (n.d.). *WACC: What is WACC, its formula, and why it's used in corporate finance*. Corporate Finance Institute. Retrieved from https://corporatefinanceinstitute.com/resources/valuation/what-is-wacc-formula/
12. Chen, J. (2024, September 25). *What is the Modigliani-Miller Theorem?* Investopedia. https://www.investopedia.com/terms/m/modigliani-millertheorem.asp
13. Claire, B. W. (2024, November 22). *What are the different ways corporations can raise capital?* Investopedia. Retrieved August 30, 2025, from https://www.investopedia.com/ask/answers/032515/what-are-different-ways-corporations-can-raise-capital.asp
14. Dao, B. T. T., & Ta, T. D. N. (2020). *A meta-analysis: capital structure and firm performance.* Journal of Economics and Development, *22*(1), 111–129. https://doi.org/10.1108/JED-12-2019-0072
15. DeAngelo, H. (2022). *The Capital Structure Puzzle: What Are We Missing?* Journal of Financial and Quantitative Analysis, 57(2), 413–454. https://doi.org/10.1017/S002210902100079X
16. Defacto. (2025, January 13). *Internal vs. external financing: Understanding the differences and choosing the right strategy*. Retrieved August 29, 2025, from https://www.getdefacto.com/article/internal-vs-external-financing
17. Eliasy, A., & Przychodzen, J. (2020). T*he role of AI in capital structure to enhance corporate funding strategies.* Array, 6, 100017. https://doi.org/10.1016/j.array.2020.100017
18. Enache, C. (2024, January 16). *Corporate income tax rates in Europe, 2024*. Tax Foundation. https://taxfoundation.org/data/corporate-income-tax-rates-europe-2024/
19. European Central Bank. (n.d.). *Our response to the coronavirus pandemic.* Retrieved December 6, 2025, from https://www.ecb.europa.eu/home/search/coronavirus/html/index.en.html
20. Fernando, J. (2024, October 24). *What Is an IPO? How an Initial Public Offering Works*. Investopedia. Retrieved August 30, 2025, from https://www.investopedia.com/terms/i/ipo.asp

21. Fernando, J. (2025, June 10). *Discounted cash flow (DCF) explained with formula and examples*. Investopedia. https://www.investopedia.com/terms/d/dcf.asp
22. Fernando, J. (2025, June 9). *Debt-to-equity (D/E) ratio formula and how to interpret it*. Investopedia. https://www.investopedia.com/terms/d/debtequityratio.asp
23. Fernando, J. (2025, October 2). *R-Squared: Definition, Calculation, and Interpretation*. Investopedia. Retrieved November 30, 2025, from R-Squared: Definition, Calculation, and Interpretation
24. Fernando, J. (2025, September 29). *Compound annual growth rate (CAGR) formula and calculation.* Investopedia. https://www.investopedia.com/terms/c/cagr.asp
25. Ferrazzi, M., Kalantzis, F., & Zwart, S. (2025, July 18). *Uneven vulnerabilities: A global index of climate risk for countries*. CEPR VoxEU. https://cepr.org/voxeu/columns/uneven-vulnerabilities-global-index-climate-risk-countries
26. Ganti, A. (2025, August 17). *Angel Investor: Definition and How It Works.* Investopedia. Retrieved August 30, 2025, from https://www.investopedia.com/terms/a/angelinvestor.asp
27. Ganti, A. (2025, October 9). *What is the central limit theorem (CLT)?* Investopedia. https://www.investopedia.com/terms/c/central_limit_theorem.asp
28. García, C. J., & Herrero, B. (2021). *Female directors, capital structure, and financial distress.* Journal of Business Research, 136, 592–601. https://doi.org/10.1016/j.jbusres.2021.07.061
29. Gratton, P. (2025, March 7). *Capital Structure: Definition, Types, Importance, and Examples*. Investopedia. Retrieved August 28, 2025, from https://www.investopedia.com/terms/c/capitalstructure.asp
30. Gupta, T., & Khanna, K. (2022). *A systematic literature review analysis of the capital structure theories & its determinants: An estimation of the future trends.* Journal of Pharmaceutical Negative Results, 13(Special Issue 7), 7417–7422. https://doi.org/10.47750/pnr.2022.13.S07.893
31. Hargrave, M. (2025, April 01). *Capital: Definition, How It's Used, Structure, and Types in Business*. Investopedia. Retrieved August 28, 2025, from https://www.investopedia.com/terms/c/capital.asp
32. Hargrave, M. (2025, August 17). *Understanding WACC: Definition, Formula, and Calculation Explained*. Investopedia. Retrieved from https://www.investopedia.com/terms/w/wacc.asp

33. Hayes, A. (2025, August 24). *Cost of debt: What it means and formulas.* Investopedia. Retrieved August 28, 2025, from https://www.investopedia.com/terms/c/costofdebt.asp
34. Hayes, A. (2025, August 6). *What is the risk-free rate of return, and does it really exist?* Investopedia. Retrieved from https://www.investopedia.com/terms/r/risk-freerate.asp
35. Hayes, A. (2025, October 3). *Business valuation: What it is, why it matters, and how it works*. Investopedia. https://www.investopedia.com/terms/b/business-valuation.asp
36. Hayes, A. (2025, July 8). *Interest coverage ratio: What it is, formula, and what it means f or investors**. Investopedia. https://www.investopedia.com/terms/i/interestcoverageratio.asp
37. Hayes, A. (2024, October 18). *Venture Capital: Definition, Pros, Cons, and How It Works*. Investopedia. Retrieved August 30, 2025, from https://www.investopedia.com/terms/v/venturecapital.asp
38. Hayes, A. (2025, August 29). *Understanding Tobin's Q Ratio: Definition, Formula & Investment Insights.* Investopedia. Retrieved August 30, 2025, from https://www.investopedia.com/terms/q/qratio.asp
39. Hsiao, C. (2022). *Analysis of panel data* (4th ed.). Cambridge University Press. https://doi.org/10.1017/9781009057745
40. Huang, X., Kabir, R., & Thijssen, M. W. P. (2024). *Powerful female CEOs and the capital structure of firms.* Journal of Behavioral and Experimental Finance, 41, 100879. https://doi.org/10.1016/j.jbef.2023.100879
41. International Accounting Standards Board. (2011). *IFRS 13: Fair value measurement*. IFRS Foundation.
42. Kenton, W. (2025, May 07). *Cost of equity: Definition, formula, and example*. Investopedia. Retrieved August 28, 2025, from https://www.investopedia.com/terms/c/costofequity.asp
43. Kenton, W. (2025, May 10). *Least Squares Method: What It Means and How to Use It, With Examples*. Investopedia. https://www.investopedia.com/terms/l/least-squares-method.asp
44. Kenton, W. (2025, October 13). *Durbin Watson Test Explained: Autocorrelation in Regression Analysis*. Investopedia. Durbin Watson Test Explained: Understanding Autocorrelation in Regression Analysis
45. Khan, M. A., Rehan, R., Chhapra, I. U., & Sohail, A. B. (2021). *Capital Structure Theories: A Comprehensive Review*. Revista Geintec-Gestao Inovacao E Tecnologias, 11(3), 1562-1574.

https://www.researchgate.net/publication/353325247_Capital_Structure_Theories_A_Comprehensive_Review

46. King, G., & Roberts, M. E. (2015). *How robust standard errors expose methodological problems they do not fix, and what to do about it.* Political Analysis, 23(1), 159–179. https://gking.harvard.edu/file_url/1021
47. Kling, G., Volz, U., Murinde, V., & Ayas, S. (2021). *The impact of climate vulnerability on firms' cost of capital and access to finance.* World Development, 137, 105131. https://doi.org/10.1016/j.worlddev.2020.105131
48. Kontuš, E., Sorić, K., & Šarlija, N. (2023). *Capital structure optimization: a model of optimal capital structure from the aspect of capital cost and corporate value*. Economic Research-Ekonomska Istraživanja, 36(2), 2147565. https://doi.org/10.1080/1331677X.2022.2147565
49. Kumah-Ababio, C. (2018). *The Effect of Capital Structure on Profitability of Insurance Companies in Ghana.* 10.13140/RG.2.2.33605.29927. https://www.researchgate.net/publication/328771799_The_Effect_of_Capital_Structure_on_Profitability_of_Insurance_Companies_in_Ghana
50. Kwak, S. (2023). *Are Only p-Values Less Than 0.05 Significant? A p-Value Greater Than 0.05 Is Also Significant!* Journal of Lipid and Atherosclerosis, 12(2), 89–95. Are Only p-Values Less Than 0.05 Significant? A p-Value Greater Than 0.05 Is Also Significant! - PMC
51. Mahmoud, M. I., Surwanti, A., & Pribadi, F. (2024). *Bibliometric analysis of trends and patterns in capital structure research*: A decade-long review (2012-2022). Multidisciplinary Reviews, 7(e2024025). https://doi.org/10.31893/multirev.2024025
52. Maverick, J. B. (2024, June 13). *Equity financing vs. debt financing: What's the difference?* Investopedia. Retrieved August 28, 2025, from https://www.investopedia.com/ask/answers/042215/what-are-benefits-company-using-equity-financing-vs-debt-financing.asp
53. Miglo, A. (2021). *A New Capital Structure Theory: The Four-Factor Model*. Munich Personal RePEc Archive. https://mpra.ub.uni-muenchen.de/105102/MPRA_paper_105102.pdf
54. Miller, T., Cao, S., Foth, M., Boyen, X., & Powell, W. (2023). *An asset-backed decentralised finance instrument for food supply chains – A case study from the livestock export industry.* Computers in Industry, 147, 103863. https://doi.org/10.1016/j.compind.2023.103863

55. Moxotó, A. C., Melo, P., & Soukiazis, E. (2021). *Initial Coin Offering (ICO): a systematic review of the literature.* In Proceedings of the 54th Hawaii International Conference on System Sciences. University of Hawaii at Manoa. https://hdl.handle.net/10125/71124 https://scholarspace.manoa.hawaii.edu/server/api/core/bitstreams/879483fb-5ef2-439a-b8d2-26d8443acdfc/content
56. Nasdaq. (2025, December 14). *Baltic market indexes. Nasdaq*. Retrieved from Baltic market indexes — Nasdaq Baltic
57. Pesaran, M. H. (2004). *General diagnostic tests for cross section dependence in panels* (IZA Discussion Paper No. 1240). IZA Institute of Labor Economics. https://repec.iza.org/dp1240.pdf
58. Rodríguez, R. A. (2024). *A novel approach to calculate weighted average cost of capital (WACC) considering debt and firm's cash flow durations*. Managerial and Decision Economics, 45(2), 1154–1179. https://doi.org/10.1002/mde.4042
59. Sharma, R. (2025, August 31). *Understanding Decentralized Finance (DeFi): Basics and Functionality*. Investopedia. Retrieved September 3, 2025, from https://www.investopedia.com/decentralized-finance-defi-5113835
60. Skrutkowski, M. (2025). *Capital markets in the Baltic region: A deep dive*. ESM Briefs*, (04/2025).* https://finmin.lrv.lt/public/canonical/1762413408/25828/Capital%20markets%20in%20the%20baltic%20region%20a%20deep%20dive%20-EB4.pdf
61. Straigis, V. (2018, January 16). *Lietuvių ICO projektas pritraukė 16 mln. eur*. Vz.lt. Retrieved September 4, 2025, from https://www.vz.lt/rinkos/2018/01/16/lietuviu-ico-projektas-pritrauke-16-mln-eur
62. The Investopedia Team. (2025, July 23). *Variance inflation factor (VIF): Definition and formula.* Investopedia. Variance Inflation Factor (VIF): Definition and Formula

ANNEXES

1 Annex

Ticker	Name	ISIN	Market Place	Industry	Supersector	5-year history ?	Comments
AKO1L	Akola group	LT0000128092	VLN	Kasdieninio vartojimo prekės	Maistas, gėrimai ir tabakas	Yes	***Included in analysis***
APG1L	Apranga	LT0000102337	VLN	Diskrecinis vartojimas	Mažmeninė prekyba	Yes	***Included in analysis***
ARC1T	Arco Vara	EE3100034653	TLN	Nekilnojamasis turtas	Nekilnojamasis turtas	Yes	***Included in analysis***
CPA1T	Coop Pank	EE3100007857	TLN	Finansinės paslaugos	Bankai	N/A	***Banks, excluding***
DGR1R	DelfinGroup	LV0000101806	RIG	Finansinės paslaugos	Finansinės paslaugos	No	***IPO was in 2021, not enough data***
EEG1T	Ekspress Grupp	EE3100016965	TLN	Diskrecinis vartojimas	Žiniasklaida	Yes	***Included in analysis***
EFT1T	EfTEN Real Estate Fund	EE3100127242	TLN	Finansinės paslaugos	Finansinės paslaugos	Yes	***Included in analysis***
ELEVR	Eleving Group	LU2818110020	RIG	Finansinės paslaugos	Finansinės paslaugos	No	***IPO was in 2024, not enough data***
GRG1L	Grigeo Group	LT0000102030	VLN	Pagrindinės medžiagos	Pagrindiniai ištekliai	Yes	***Included in analysis***
HAE1T	Harju Elekter Group	EE3100004250	TLN	Pramoniniai gaminiai	Pramoninės prekės ir paslaugos	Yes	***Included in analysis***
HPR1T	Hepsor	EE3100082306	TLN	Nekilnojamasis turtas	Nekilnojamasis turtas	No	***IPO was in 2021, not enough data***
IDX1R	INDEXO	LV0000101863	RIG	Finansinės paslaugos	Finansinės paslaugos	No	***IPO was in 2022, not enough data***
IGN1L	Ignitis grupė	LT0000115768	VLN	Komunalinės paslaugos	Komunalinės paslaugos	Yes	***Included in analysis***
INF1T	Infortar	EE3100149394	TLN	Finansinės paslaugos	Finansinės paslaugos	no	***IPO was in 2023, not enough data***
KNE1L	KN Energies	LT0000111650	VLN	Pramoniniai gaminiai	Pramoninės prekės ir paslaugos	Yes	***Included in analysis***
LHV1T	LHV Group	EE3100102203	TLN	Finansinės paslaugos	Bankai	N/A	***Banks, excluding***
MRK1T	Merko Ehitus	EE3100098328	TLN	Pramoniniai gaminiai	Statyba ir medžiagos	Yes	***Included in analysis***
NCN1T	Nordecon	EE3100039496	TLN	Pramoniniai gaminiai	Statyba ir medžiagos	Yes	***Included in analysis***
NTU1L	Novaturas	LT0000131872	VLN	Diskrecinis vartojimas	Kelionės ir laisvalaikis	Yes	***Included in analysis***
PKG1T	Pro Kapital Grupp	EE3100006040	TLN	Nekilnojamasis turtas	Nekilnojamasis turtas	Yes	***Included in analysis***
PTR1L	PST Group	LT0000101446	VLN	Pramoniniai gaminiai	Statyba ir medžiagos	Yes	***Included in analysis***
PZV1L	Pieno žvaigždės	LT0000111676	VLN	Kasdieninio vartojimo prekės	Maistas, gėrimai ir tabakas	Yes	***Included in analysis***
ROE1L	Artea bankas	LT0000102253	VLN	Finansinės paslaugos	Bankai	N/A	***Banks, excluding***
RSU1L	Rokiškio sūris	LT0000100372	VLN	Kasdieninio vartojimo prekės	Maistas, gėrimai ir tabakas	Yes	***Included in analysis***
SAF1R	SAF Tehnika	LV0000101129	RIG	Telekomunikacijos	Telekomunikacijos	Yes	***Included in analysis***
SFG1T	Silvano Fashion Group	EE3100001751	TLN	Diskrecinis vartojimas	Vartojimo prekės ir paslaugos	Yes	***Included in analysis***
TAL1T	Tallink Grupp	EE3100004466	TLN	Diskrecinis vartojimas	Kelionės ir laisvalaikis	Yes	***Included in analysis***
TEL1L	Telia Lietuva	LT0000123911	VLN	Telekomunikacijos	Telekomunikacijos	Yes	***Included in analysis***
TKM1T	TKM Grupp	EE0000001105	TLN	Diskrecinis vartojimas	Mažmeninė prekyba	Yes	***Included in analysis***
TSM1T	Tallinna Sadam	EE3100021635	TLN	Pramoniniai gaminiai	Pramoninės prekės ir paslaugos	Yes	***Included in analysis***
TVE1T	Tallinna Vesi	EE3100026436	TLN	Komunalinės paslaugos	Komunalinės paslaugos	Yes	***Included in analysis***
VLP1L	Vilkyškių pieninė	LT0000127508	VLN	Kasdieninio vartojimo prekės	Maistas, gėrimai ir tabakas	Yes	***Included in analysis***