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MASTER THESIS

TITLE IN LITHUANIAN	TITLE IN ENGLISH
Pasirinktoje vertybinių popierių biržoje listinguojamų įmonių dividendų politikos analizė.	Analysis of Dividend Policy of Companies Listed on a Chosen Stock Exchange.

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INTRODUCTION

Dividend policy is one of the most debated topics in corporate finance, influencing investor behavior, stock valuation, and firm performance. Whether dividends affect a firm's value has been a central question in financial theory, with perspectives ranging from Modigliani and Miller's (1961) dividend irrelevance theorem to theories emphasizing the signaling effects and investor preferences for dividends. This thesis seeks to examine the determinants and implications of dividend policy, focusing on companies listed on a chosen stock exchange, specifically within the NASDAQ Baltic market.

Research Background and Problem Statement

Firms establish dividend policies based on multiple financial and strategic considerations, including cash flow availability, growth opportunities, investor expectations, and market conditions. In theoretical discourse, dividend policies are framed by competing viewpoints: while some scholars argue that dividend payments signal financial stability and reduce information asymmetry, others suggest that retained earnings provide better growth prospects, enhancing long-term firm value. The interplay between these perspectives has led to varying empirical findings regarding the impact of dividend policy on stock price volatility, investor sentiment, and corporate financial health.

This research aims to explore whether dividend policy significantly affects stock prices and investor reactions in the NASDAQ Baltic market. Given that financial markets in emerging economies, including the Baltic region, often exhibit different investment behaviors compared to more developed markets, understanding dividend strategies within this context provides valuable insights for investors, corporate managers, and policymakers.

Research Aim and Objectives

The primary aim of this study is to analyze the dividend policies of companies listed on the NASDAQ Baltic exchange and assess their impact on stock valuation, investor preferences, and market reactions. To achieve this, the research pursues the following objectives:

1. Theoretical Exploration – To review and synthesize key theories of dividend policy, including the Modigliani-Miller irrelevance theory, Bird-in-Hand theory, and signaling theory, alongside empirical literature on dividend effects.

2. Methodological Framework – To employ regression analysis and data visualization techniques to evaluate the relationship between dividend yield, stock price volatility, and market capitalization across different sectors.
3. Empirical Investigation – To examine real-world cases of dividend policies in the NASDAQ Baltic market, assessing investor reactions to dividend changes using statistical models and four-dimensional visual representations.
4. Practical Implications – To provide actionable recommendations for investors, corporate managers, and policymakers on how to optimize dividend strategies for maximizing shareholder value and minimizing market risks.

Methodological Approach

This study adopts a quantitative research approach, utilizing financial data from publicly listed companies on the NASDAQ Baltic exchange. A combination of regression models, correlation analysis, and comparative sectoral analysis is employed to evaluate the effects of dividend policy on stock prices. Data preprocessing and integrity checks ensure reliability, and multiple financial models, including the Dividend Discount Model (DDM) and Capital Asset Pricing Model (CAPM), are applied to measure the intrinsic value of stocks in relation to dividend distributions.

Structure of the Thesis

The thesis is structured as follows:

- Chapter 1: Theoretical Framework of Dividend Policy – This section reviews key theoretical perspectives on dividend policy, including the relevance and irrelevance arguments, behavioral finance implications, and empirical studies linking dividends to stock performance. Special attention is given to the NASDAQ Baltic market context.
- Chapter 2: Research Methodology – This chapter outlines the study's research design, data collection methods, and analytical techniques, detailing how regression models and statistical tools are employed to analyze market responses to dividend announcements.
- Chapter 3: Results, Discussion, and Conclusions - The empirical findings are presented, followed by a discussion of their implications. The study examines the correlation between dividend yield and stock volatility, explores investor reactions to dividend changes, and evaluates behavioral finance insights relevant to the Baltic market. Finally, the chapter presents key conclusions and strategic recommendations for market participants.

Significance of the Study

Understanding dividend policy dynamics is crucial for investors seeking stable returns, corporate managers aiming to optimize capital allocation, and regulators formulating market policies. This study contributes to existing literature by providing empirical evidence from the NASDAQ Baltic market, an emerging financial environment where dividend strategies may diverge from those in larger economies. By bridging theoretical perspectives with real-world data, the research aims to offer a nuanced understanding of how dividends shape market behavior and firm valuation in this specific context.

Conclusion

Dividend policy remains a critical aspect of corporate financial decision-making, influencing stock prices, investor sentiment, and firm valuation. While theoretical debates on its relevance persist, empirical evidence from different markets suggests that dividend decisions carry significant informational value. This thesis, by focusing on the NASDAQ Baltic market, seeks to enrich the discourse by evaluating how dividends impact firm performance and investor behavior in a regional context. Through rigorous financial analysis and data-driven insights, the study aspires to provide valuable guidance for stakeholders navigating dividend policy decisions.

1. THEORETICAL FRAMEWORK OF DIVIDEND POLICY

1.1. Concept and Importance of dividend policy

Dividend policy refers to the strategy a company employs to decide the amount and timing of dividend payments to its shareholders. This policy is a crucial aspect of a firm’s financial strategy, reflecting its approach to sharing profits with investors while retaining sufficient earnings for future growth. Dividends can be paid in cash or in the form of additional shares, and the decision on whether to distribute dividends or reinvest profits in the business is influenced by various factors, including the company’s profitability, cash flow, capital expenditure requirements, and overall financial health. In essence, a dividend policy serves as a signal to the market regarding a company's financial strength and stability, impacting investor perception and stock valuation.

The importance of dividend policy can be analyzed from multiple perspectives. Firstly, dividends are often viewed as a direct return on investment for shareholders. Investors frequently seek regular income through dividends, which can make dividend-paying stocks particularly attractive, especially to income-focused investors such as retirees. A stable and predictable dividend policy can enhance investor confidence, as it reflects management's commitment to

returning value to shareholders. Conversely, an inconsistent or decreasing dividend can signal potential problems within the company, leading to a decline in share price and investor trust. Therefore, a well-structured dividend policy can be pivotal in maintaining a positive relationship with investors and sustaining market confidence.

Moreover, dividend policy plays a significant role in a company's capital structure. The distribution of dividends impacts retained earnings, which in turn affects the financing options available to the firm. Companies that maintain high dividend payouts may find themselves constrained in terms of reinvestment opportunities, as a substantial portion of their earnings is directed toward dividends rather than growth initiatives. This trade-off between returning cash to shareholders and funding future expansion highlights the importance of strategic decision-making in dividend policy formulation. Companies must balance their desire to reward shareholders with the need to invest in growth opportunities that can enhance long-term profitability.

From a theoretical perspective, the relevance of dividend policy has been debated extensively in finance literature. The Modigliani-Miller theorem posits that in a perfect market, the dividend policy is irrelevant to a firm's valuation; what matters is the firm's investment decisions. However, real-world conditions, such as taxes, market imperfections, and investor preferences, suggest that dividend policy can indeed influence a company's value. For instance, some investors may prefer dividend-paying stocks for their perceived lower risk, as dividends can provide a cushion against market volatility. Additionally, the signaling theory posits that changes in dividend policy can convey information to investors about a company's future prospects, making it an essential tool for management in guiding market perceptions.

Another critical aspect of dividend policy is its influence on corporate governance. A clear and consistent dividend policy can align the interests of management and shareholders, reducing agency costs associated with the potential divergence of interests. When management commits to a dividend policy, it is essentially held accountable for the firm's financial performance, as failing to meet dividend expectations can lead to negative repercussions in terms of stock performance and investor sentiment. This accountability can foster a culture of disciplined financial management and strategic resource allocation, ultimately enhancing the overall effectiveness of corporate governance.

In conclusion, dividend policy is a fundamental component of corporate finance that encompasses various considerations, including investor preferences, capital structure, market

signaling, and corporate governance. A well-articulated dividend policy not only reflects a company's commitment to returning value to its shareholders but also plays a vital role in shaping investor perceptions and firm valuation. Given its multifaceted importance, companies must carefully evaluate their dividend strategies to balance short-term shareholder returns with long-term growth objectives, thereby ensuring sustained financial health and shareholder satisfaction.

The impact of dividend policy is also felt in the broader economic context. For instance, companies that adhere to a consistent dividend policy may contribute to market stability. Investors often view dividend payments as a sign of financial health and robustness, which can mitigate volatility in stock prices. In times of economic uncertainty, dividend-paying stocks are generally perceived as safer investments, providing a reliable income stream. This stability can attract a diverse investor base, including institutional investors, pension funds, and conservative individual investors, all of whom may prioritize income over capital gains. Thus, a company’s dividend policy not only affects its internal financial management but also contributes to the overall health of the financial markets.

In addition to attracting a stable investor base, a sound dividend policy can enhance a company's competitive positioning. Companies that consistently pay dividends may differentiate themselves from competitors, particularly in industries where dividend payments are less common. This differentiation can foster loyalty among investors and can be a significant factor in the investment decision-making process. For instance, in mature industries with stable cash flows, companies that prioritize dividend payments may be viewed as less risky compared to those that reinvest all profits into growth, appealing to a risk-averse investor demographic.

Furthermore, the psychological aspect of dividend payments cannot be overlooked. Behavioral finance suggests that investors often perceive dividends as tangible returns on their investments, leading to a phenomenon known as the "dividend puzzle." Many investors may favor stocks with regular dividend payments, even if the total return, including capital gains, is similar to that of non-dividend-paying stocks. This behavior indicates that dividends can create a psychological comfort for investors, leading to higher demand for dividend-paying stocks, which can further drive up their prices. The consistency and reliability of dividends can establish a sense of trust and dependability in management, reinforcing the belief that the company is committed to rewarding its investors.

Another significant consideration in dividend policy is the regulatory environment and tax implications. Different jurisdictions have varying tax treatments for dividends compared to capital gains, influencing both company policies and investor preferences. In some cases, dividends may be taxed at a higher rate than capital gains, leading companies to retain earnings rather than distribute them. This can create a dilemma for firms in regions where investors prefer capital appreciation over regular income. Thus, understanding the tax implications and aligning the dividend policy with investor expectations is crucial for effective financial management.

Moreover, the relationship between dividend policy and company lifecycle stages plays an essential role in strategic decision-making. Startups and growth-oriented firms typically prioritize reinvestment of profits to fund expansion initiatives, while mature companies with stable earnings may adopt a more aggressive dividend policy. As firms transition through different stages of their lifecycle, their dividend strategies may also evolve. Companies experiencing rapid growth may initially forgo dividends to support capital expenditures, while later transitioning to regular dividend payments as cash flows stabilize and growth opportunities diminish.

Lastly, corporate actions such as mergers and acquisitions can significantly influence dividend policy. In situations where companies pursue acquisitions, the need for cash flow may lead to changes in dividend distributions. Acquiring firms might temporarily suspend dividends to finance the purchase or maintain liquidity, impacting investor sentiment. Therefore, understanding how external corporate strategies intersect with dividend policy is vital for a comprehensive evaluation of a company's financial health and long-term strategy.

In summary, the concept and importance of dividend policy extend far beyond simple cash distributions to shareholders. It encompasses a myriad of factors, including market perception, investor behavior, corporate governance, and external economic conditions. A well-defined dividend policy not only serves to provide immediate returns to investors but also plays a pivotal role in shaping the company's financial strategy, capital structure, and overall market presence. As companies navigate the complexities of their financial environments, careful consideration of their dividend policies will be critical in balancing the needs of shareholders with long-term growth objectives and market demands.

1.2. Theories of dividend policy

1.2.1. Modigliani and Miller's dividend irrelevance theory

Modigliani and Miller's (M&M) dividend irrelevance theory, presented in their seminal 1961 paper, radically shifted perspectives on the relationship between a company's dividend policy and its market value. Prior to their work, many financial experts believed that a firm's dividend policy played a crucial role in determining its stock price and, by extension, its market valuation. M&M, however, argued that under certain idealized conditions, namely, perfect capital markets with no taxes, transaction costs, or information asymmetry, the decision to pay dividends or retain earnings is irrelevant. According to their theory, the value of a firm is derived solely from its earning power and investment opportunities, not from how it chooses to distribute its profits.

Assumptions Underpinning M&M's Dividend Irrelevance Theory

To arrive at the conclusion that dividend policy has no bearing on firm value, M&M base their theory on several key assumptions that outline a frictionless market environment:

1. No Taxes or Differential Taxation on Dividends and Capital Gains: In their model, investors face no tax penalties whether they receive income in the form of dividends or capital gains. In real-world markets, tax codes often impose different rates on these two sources of income, which can influence investor preferences. However, M&M assume this factor does not exist, leading to indifference between dividends and capital appreciation.
2. No Transaction Costs: Buying and selling shares in the market is assumed to be costless. This assumption is crucial because, in a world without transaction costs, investors could theoretically "create" dividends by selling a portion of their stock holdings if they prefer cash over capital gains. Similarly, they could reinvest dividends to mimic the effect of retained earnings if they prefer capital appreciation.
3. Symmetric Information: All investors have the same information as corporate managers regarding the firm's prospects. This assumption negates any signaling effect that dividends might convey in the real world, where dividend changes are often interpreted as a reflection of management's confidence in future earnings.
4. Perfect Capital Markets: Firms can raise funds through debt or equity financing without incurring any costs, and these financing decisions do not affect the firm's overall value.

Additionally, there are no agency costs or conflicts of interest between management and shareholders. In this idealized setting, how a firm funds its investments (whether through retained earnings or external capital) does not affect its valuation.

5. Investment Policy is Independent of Dividend Policy: M&M argue that the decision to invest in profitable projects should be made irrespective of the firm's dividend payout. This means that the firm's investment strategy and dividend policy are independent of each other, with the former determining value while the latter is irrelevant.

The Mechanics of Dividend Irrelevance

The core idea of the dividend irrelevance theory is that a firm's value is fundamentally tied to its capacity to generate future earnings and its investment opportunities, rather than how it allocates those earnings between dividends and retained earnings. In an M&M world, if a firm chooses to distribute a portion of its earnings as dividends, its stock price would simply decline by an equivalent amount when it goes ex-dividend. On the other hand, if it retains those earnings for reinvestment, the firm's future profitability may increase, but shareholders would still benefit through capital appreciation.

From the investor's perspective, they can adjust their income streams by creating "homemade dividends" if they need cash (i.e., selling shares), or reinvest their dividends if they prefer growth. The firm's dividend policy does not impact their wealth because they can replicate any payout structure they desire through buying or selling stock.

For example, consider a firm with two dividend policies: one that distributes 50% of its earnings as dividends and another that retains all earnings for reinvestment. According to M&M, investors in either scenario would be equally well off because they can convert capital gains into cash by selling shares in the case of retained earnings, or reinvest dividends if they prefer growth in the case of a dividend payout.

Criticisms and Real-World Implications

While the M&M dividend irrelevance theory provides a strong conceptual framework, it has been widely criticized for its reliance on unrealistic assumptions. In practice, several factors challenge the applicability of the theory:

1. Tax Considerations: In most real-world markets, dividends and capital gains are taxed at different rates. Many investors, particularly those in higher tax brackets, may prefer

capital gains over dividends to minimize their tax liabilities. Conversely, tax-exempt institutions or low-tax investors may favor dividends. This differential tax treatment introduces a preference for one form of income over another, contradicting M&M's assumption of tax neutrality.

2. Transaction Costs and Liquidity Constraints: In the real world, buying and selling shares incurs transaction costs, such as brokerage fees, and liquidity constraints may prevent small or individual investors from easily selling portions of their holdings. These costs can make it less practical for investors to create their own "homemade dividends," thereby making the firm's dividend policy more relevant to their decision-making process.
3. Information Asymmetry and Signaling Effects: Investors often interpret changes in a firm's dividend policy as signals about management's outlook for the future. For example, an increase in dividends may be viewed as a positive signal that management expects strong future earnings, while a reduction or omission of dividends could be seen as a sign of financial distress. These signaling effects are at odds with M&M's assumption of perfect information.
4. Investor Preferences: Different investors have different preferences regarding income versus capital gains. Income-oriented investors, such as retirees, may prefer receiving regular dividend payments, while growth-oriented investors may focus more on capital appreciation. As a result, dividend policy can influence a firm's stock price by attracting or deterring certain types of investors.
5. Agency Costs and Corporate Governance: In practice, conflicts of interest between management and shareholders can arise when it comes to dividend policy. Firms with large amounts of retained earnings may be tempted to undertake unprofitable projects or empire-building activities, leading shareholders to prefer dividend payouts as a way of disciplining management and reducing the risk of inefficient investment.

Conclusion

Modigliani and Miller's dividend irrelevance theory offers a thought-provoking perspective on dividend policy, emphasizing the primacy of a firm's investment decisions in determining its value. By highlighting the notion that dividend payouts do not directly influence a company's stock price in an ideal market, the theory encourages a focus on profitability and growth potential rather than distribution strategies. However, the theory's reliance on assumptions such as no taxes, no transaction costs, and perfect information limits its practical applicability in real-

world financial markets. While the dividend irrelevance theory is an important academic contribution, its assumptions and conclusions must be adjusted when accounting for the complexities of actual investor behavior, tax regimes, and market conditions.

As will be further discussed in Section 1.3.3, the limitations of the M&M framework in real-world settings reinforce the importance of models that incorporate investor preferences, like the DDM and Bird-in-Hand theory.

1.2.2. Bird-in-Hand theory and investor preferences

The Bird-in-Hand theory, developed by Myron Gordon and John Lintner in the 1960s, provides an alternative viewpoint on dividend policy, directly challenging Modigliani and Miller's (M&M) dividend irrelevance theory. The theory derives its name from the proverbial phrase "a bird in the hand is worth two in the bush", suggesting that investors prefer the certainty of receiving dividends now rather than relying on uncertain future capital gains. According to this theory, dividends reduce risk for investors by offering an immediate return, while capital gains are seen as less predictable and riskier due to dependence on market performance, future profitability, and broader economic factors.

Key Assumptions of the Bird-in-Hand Theory

The Bird-in-Hand theory rests on several key assumptions that differentiate it from the M&M framework:

1. Investor Risk Aversion and Preference for Certainty: The theory assumes that investors are generally risk-averse and thus prefer the certainty of immediate cash flows from dividends over the uncertain prospect of future capital gains. Since dividends represent a real, tangible return on investment, they are viewed as safer by investors, who are willing to accept a lower expected return in exchange for this certainty.
2. Uncertainty of Capital Gains: The theory posits that capital gains are inherently more uncertain than dividends. Capital gains are speculative and depend on future performance, which may be influenced by a variety of unpredictable factors, including market conditions, the firm’s growth strategy, and macroeconomic changes. In contrast, dividends provide a direct and reliable return that does not depend on future market movements.
3. Dividend Policy as a Signal of Stability: Another assumption is that dividend payments send a strong signal to investors about the firm's financial health and stability. Firms that

pay regular and increasing dividends are perceived as having stable earnings and good management practices. This perception reduces the perceived risk associated with the stock, thereby attracting more conservative and income-focused investors.

Investor Preferences and Their Impact on Stock Prices

The Bird-in-Hand theory asserts that because investors prefer dividends due to their certainty, firms that adopt a higher dividend payout ratio are perceived as less risky, which can lead to a higher stock price. When a firm decides to distribute earnings as dividends rather than retaining them for reinvestment, investors view this choice as providing an immediate return and reducing the uncertainty associated with future profits. As a result, stocks of firms with higher dividend payouts may command a premium in the market compared to firms that retain earnings, even if both companies have similar growth prospects.

For example, consider two companies with identical earnings potential but differing dividend policies. One company pays a high proportion of its earnings as dividends, while the other retains most of its earnings for reinvestment in growth opportunities. According to the Bird-in-Hand theory, the stock of the firm with the higher dividend payout would be more attractive to investors, leading to a higher stock price. This is because investors prefer the "bird in hand" (the dividends) over the uncertain future capital gains, or the "two in the bush," which depend on the company's ability to grow profitably.

Implications for Corporate Dividend Policy

The Bird-in-Hand theory has significant implications for how companies should structure their dividend policies. Firms that want to lower their cost of equity and attract risk-averse investors may choose to maintain or increase dividend payouts to signal stability and reduce perceived risk. By paying out dividends regularly, companies can foster investor confidence, leading to higher stock valuations and a lower required return on equity. This stands in contrast to firms that retain earnings with the aim of funding future growth, which may be seen as a riskier strategy by income-focused investors who prioritize short-term returns.

One of the primary implications of this theory is that firms may have a financial incentive to prioritize dividends, even if reinvestment could theoretically offer higher long-term returns. Since investors are willing to accept a lower rate of return for stocks with stable dividend payouts, companies can reduce their cost of capital by maintaining a predictable dividend policy.

This creates a balance between rewarding investors with current returns while also considering long-term growth prospects.

Criticisms of the Bird-in-Hand Theory

Despite its intuitive appeal, the Bird-in-Hand theory has been criticized for oversimplifying the relationship between dividends and risk. One of the main critiques comes from Modigliani and Miller, who argued that a firm's overall risk is determined by its underlying business operations, profitability, and market position, rather than its dividend policy. They contended that rational investors would not necessarily prefer dividends over capital gains, provided that the company's investment opportunities and growth prospects are sound. In their view, dividend payments do not inherently reduce the firm's risk profile; rather, it is the firm's future earning potential and business fundamentals that matter most.

Another criticism is that the theory assumes that all investors prioritize dividends in the same way. However, investors have different preferences and financial goals. For instance, younger investors may prefer capital gains over dividends, favoring growth stocks that retain earnings for reinvestment, while older or more conservative investors may prioritize dividend-paying stocks for the income they provide. This diversity of investor preferences means that while dividends may attract certain types of investors, they are not universally preferred.

This theory particularly resonates with income-focused investors who value stability, while growth-oriented investors, often younger, may prefer firms that reinvest earnings to drive capital gains.

Furthermore, the Bird-in-Hand theory does not fully account for the role of taxes. In many tax systems, dividends are taxed at a higher rate than capital gains, which can lead some investors to favor capital gains over dividends to minimize their tax liabilities. This tax consideration can undermine the Bird-in-Hand theory's assumption that dividends are always more attractive than capital gains.

Real-World Applications and Relevance

Despite these criticisms, the Bird-in-Hand theory remains relevant in explaining the behavior of certain investor groups and the persistence of dividend-paying stocks in the market. Many companies, particularly those in mature industries with stable cash flows, prioritize dividend payments to cater to investors who seek consistent returns. This is especially true for firms in

industries such as utilities, telecommunications, and consumer goods, where predictable income streams make dividends an attractive feature for both investors and corporate managers.

Additionally, the theory helps explain why many investors favor dividend-paying stocks during periods of economic uncertainty or market volatility. In such conditions, the certainty of receiving dividends becomes particularly appealing, as capital gains become more speculative. The Bird-in-Hand theory thus provides a useful framework for understanding why certain types of stocks, especially those that pay regular dividends, are seen as "safe havens" during times of financial instability.

In conclusion, the Bird-in-Hand theory underscores the importance of dividends in shaping investor preferences, particularly for risk-averse investors who value the certainty of regular income over the uncertainty of future capital gains. While it has been criticized for its simplifying assumptions, the theory provides a valuable perspective on why dividends remain a key component of corporate financial strategy and investor decision-making. By focusing on the immediate returns provided by dividends, the Bird-in-Hand theory highlights how dividend policy can influence a firm’s stock price and cost of capital, especially for investors seeking stability and lower risk.

1.2.3. Signaling theory and market implications

The signaling theory of dividends provides a nuanced perspective on the role of dividend policy, suggesting that a company’s dividend decisions convey important information about its future prospects to the market. Unlike the Bird-in-Hand theory, which emphasizes investor preferences for certainty, or the Modigliani and Miller irrelevance theory, which downplays the significance of dividends, signaling theory acknowledges that dividends can serve as a tool for reducing information asymmetry between corporate managers and investors.

The basic premise of signaling theory is that dividends act as signals to the market about the firm’s financial health and future profitability. When a firm raises or lowers its dividends, it sends a message that can be interpreted by investors as an indication of management's confidence or lack thereof in the company’s future performance. This theory is particularly important in situations where managers possess more information about the company’s future earnings potential than external investors, leading to what is known as an information asymmetry.

The Role of Information Asymmetry

One of the key drivers of signaling theory is the existence of information asymmetry, where corporate managers have better insights into the firm's future performance than outside investors. In such cases, investors rely on observable actions taken by management, such as changes in dividend policy as clues about the company's future prospects. This makes dividends more than just a way to distribute profits; they become a form of communication between management and the market.

For example, when a company increases its dividend payout, it may be interpreted as a positive signal that management expects strong future cash flows and is confident in the company's ability to sustain these higher payments. Conversely, a cut in dividends may be viewed as a negative signal that the company is facing financial difficulties or expects lower future earnings. This interpretation is based on the assumption that management is unlikely to raise dividends unless it believes the firm's future earnings will support the increased payout.

Positive Signaling: Dividend Increases

A company that raises its dividend is typically perceived as sending a positive signal to the market. According to signaling theory, this increase suggests that management has a strong outlook on the firm's future profitability and believes that it can generate sufficient earnings to maintain or grow the dividend. Investors often view such actions as evidence of the firm's financial health and stability, which can lead to a positive reaction in the stock price.

For example, when a company announces a dividend hike, it signals that it has enough cash flow not only to fund its ongoing operations and investments but also to return excess profits to shareholders. This action reduces uncertainty about the firm's future cash flows and reinforces investor confidence. As a result, firms that regularly increase dividends may experience a rise in stock price as the market reacts positively to this perceived stability and growth potential.

Negative Signaling: Dividend Cuts or Omissions

On the other hand, a reduction in dividends or the omission of a previously expected payout can be interpreted as a negative signal. Investors may assume that a dividend cut indicates that the company is struggling financially, potentially facing cash flow problems or a downturn in profitability. This often leads to a drop in stock price as the market reacts to the perceived negative outlook.

However, it is worth noting that not all dividend cuts are interpreted equally by the market. For example, during periods of broader economic downturns or crises, firms that reduce or suspend dividends may be viewed as taking prudent, temporary measures to conserve cash. In such cases, the market may not punish the firm as severely. Nevertheless, dividend cuts in normal circumstances are generally perceived as a signal of weakness, causing investors to lose confidence in the firm's future earnings potential.

The Cost of Sending Signals

An important aspect of signaling theory is that sending a credible signal through dividend changes involves costs, which helps to differentiate genuine signals from misleading ones. For example, increasing dividends when a firm's financial situation is not stable would place pressure on the firm's cash flow, potentially forcing it to raise external financing or cut back on investments. The potential financial strain discourages firms from sending false positive signals. In other words, only firms with strong earnings prospects and stable financial health are likely to increase dividends, as the cost of maintaining such payouts would be too high for less profitable firms.

This costliness of signals makes them more reliable indicators of a firm's health. A firm's decision to raise dividends is thus seen as a credible signal of its financial strength, whereas a firm that is financially weak would find it difficult to maintain such payouts over time without jeopardizing its operations.

Empirical studies have demonstrated that stock prices tend to respond to dividend changes, with increases signaling positive growth expectations and cuts often perceived as a sign of potential distress.

Implications for Market Reactions

The signaling theory of dividends has important implications for how markets react to changes in dividend policy. When a firm announces a dividend increase, the market often reacts positively, bidding up the stock price as investors interpret the increase as a signal of future profitability. Conversely, dividend cuts or omissions tend to trigger negative market reactions, as investors may interpret these actions as signals of financial trouble.

Empirical studies have consistently shown that stock prices tend to rise following dividend increases and fall following dividend cuts, lending support to the idea that dividend changes

serve as meaningful signals to the market. This market reaction is often stronger in firms where information asymmetry is high, such as smaller or younger firms with less publicly available information because investors rely more heavily on dividend signals to assess the company's prospects.

Criticisms and Limitations of Signaling Theory

Despite its explanatory power, signaling theory has its limitations. One major criticism is that dividend changes are not the only mechanism available to managers for conveying information to the market. Firms can also use other methods, such as share buybacks, earnings announcements, or public statements, to signal their financial health. Additionally, some argue that the market may overreact to dividend signals, attributing too much importance to dividends when other factors, such as business fundamentals and growth opportunities, may be more indicative of a firm's long-term value.

Furthermore, the signaling theory assumes that dividends are primarily used as a communication tool rather than a means of returning capital to shareholders. In reality, firms may adjust dividends for a variety of reasons unrelated to signaling, such as changes in tax policy, shifts in investment strategy, or evolving business conditions. As a result, dividend changes may sometimes send mixed or unclear signals to the market.

Conclusion

In summary, signaling theory emphasizes the importance of dividends as a means of conveying information about a company's financial health and future prospects, particularly in environments where information asymmetry exists. By raising or lowering dividends, firms can send powerful signals to investors, influencing their perceptions and market reactions. While dividend increases are typically seen as positive signals of confidence in future earnings, dividend cuts are often interpreted as negative signals of financial distress. However, the reliability of dividend signals can vary depending on the context, and the theory's assumption that dividends are the primary signaling tool has faced criticism in light of alternative mechanisms that firms can use to communicate with the market. Nonetheless, signaling theory remains an influential framework for understanding how dividend policy affects investor behavior and stock prices.

1.3. The dividend discount model (DDM)

1.3.1. Framework for stock valuation

The Dividend Discount Model (DDM) is a cornerstone in finance for valuing the price of a company's stock based on its expected future dividend payments. Developed as an extension of basic present value principles, the DDM asserts that the intrinsic value of a stock is the sum of all future dividends, discounted back to their present value. This approach assumes that dividends represent the primary return for shareholders and, thus, are the most important financial metric when determining a stock's value. Given that dividends are actual cash flows paid out to investors, this model offers a tangible and direct method of stock valuation, particularly for companies with a stable dividend payout history.

The Theoretical Foundation of DDM

The theoretical underpinning of the DDM aligns with earlier discussions, particularly the Bird-in-Hand theory and Modigliani-Miller irrelevance proposition. Modigliani and Miller's theory posits that, under certain conditions, dividend policy does not affect a firm's value; instead, it is determined by the firm's underlying profitability and investment opportunities. The DDM, in contrast, operates under the assumption that dividends are significant because they provide investors with a measurable cash return, thus creating a strong foundation for valuing equity. As discussed in section 1.2.2., the Bird-in-Hand theory highlights investors' preference for dividends over capital gains due to the certainty of receiving dividends now versus the uncertainty of future price appreciation. This investor preference makes the DDM particularly useful for valuing dividend-paying stocks, where the expectation of consistent future payouts aligns with the theoretical emphasis on current income.

In practice, the DDM assumes that investors expect to hold the stock indefinitely, and the company will pay dividends in perpetuity. Therefore, a key challenge is to estimate the future dividends and the appropriate rate at which these cash flows should be discounted.

The Single-Stage DDM: Constant Growth Model (Gordon Growth Model)
The most basic form of the Dividend Discount Model is the Gordon Growth Model (GGM),

introduced by Myron J. Gordon. The GGM assumes that dividends grow at a constant rate indefinitely. The formula for calculating the present value of a stock using this model is:

Formula 1: Dividend Discount Model (DDM)

$$P_0 = \frac{D_1}{r - g}$$

Source: Gordon & Shapiro, 1956.

Where:

- P0 = the current price of the stock,
- D1 = the expected dividend in the next period,
- r = the required rate of return (cost of equity),
- g = the constant growth rate of dividends.

The Gordon Growth Model is widely used due to its simplicity, particularly for mature companies that exhibit stable dividend policies. These are often firms in sectors such as utilities or consumer goods, where the predictability of cash flows and dividends is high. In these cases, the assumptions of steady growth and long-term dividend payouts hold true, making this model highly effective. The model's simplicity also allows it to be used as a first approximation of stock value, which can later be refined with more complex models or by adjusting growth rates based on changes in market conditions.

However, the constant growth assumption is also one of the GGM's major limitations. Many companies, particularly those in high-growth industries, do not exhibit stable dividend growth rates. For such companies, assuming a constant dividend growth rate may not capture the reality of their future earnings potential or cash flow generation. Additionally, small changes in the growth rate g or the discount rate r can have significant impacts on the calculated stock price, making the model sensitive to input estimation errors.

Multi-Stage Dividend Discount Models

Given the limitation of assuming constant growth, financial analysts often turn to multi-stage DDMs to account for varying growth rates over time. This approach is particularly useful for

companies that are expected to undergo different phases of growth during their lifecycle. For instance, a firm may experience rapid growth in its early years, followed by a period of stabilization, after which it may reach a mature phase characterized by slower, steady growth.

In a multi-stage model, the stock valuation is divided into two or more phases. The first phase typically models a period of high or variable growth, with dividends growing at a faster rate. The second phase assumes a lower, stable growth rate as the company matures. The intrinsic value of the stock is the sum of the present value of dividends during each growth phase, plus the present value of the terminal stock price, which is calculated using the Gordon Growth Model for the stable growth phase. The formula for the multi-stage model can be more complex, but it offers greater accuracy for companies in industries characterized by evolving growth patterns, such as technology, pharmaceuticals, or emerging markets.

Key Components of the DDM: Dividends, Growth Rates, and the Cost of Equity

The accuracy of the Dividend Discount Model is contingent on three key inputs: the expected future dividends, the dividend growth rate, and the required rate of return (or cost of equity). Each of these inputs requires careful estimation, as small deviations can have large effects on the valuation outcome.

1. Expected Future Dividends:
   Estimating future dividends often involves projecting a firm's earnings and dividend payout ratio. A company's historical dividend patterns, earnings reports, and management guidance can provide valuable insights. Companies with a long track record of dividend payments and growth are easier to model, while those with irregular or volatile payouts require more sophisticated forecasting.

2. Growth Rate of Dividends (g):
   The dividend growth rate can be estimated based on historical dividend growth, industry benchmarks, or analysts' projections. It reflects the expected rate at which the company will increase its dividend payouts in the future. For firms with high current earnings growth, the dividend growth rate may be higher in the short term but taper off as the firm matures. The growth rate must be less than the required rate of return for the model to be

valid, as a growth rate higher than the discount rate would suggest an infinite stock price, which is unrealistic.

3. Required Rate of Return (r):
   The required rate of return, or cost of equity, is typically estimated using models such as the Capital Asset Pricing Model (CAPM). CAPM considers the risk-free rate, the stock's beta (which measures its sensitivity to market movements), and the equity risk premium. The cost of equity reflects the return investors expect for the risk they assume by holding the stock. In the context of the DDM, the cost of equity serves as the discount rate that adjusts future cash flows to their present value. A higher cost of equity will reduce the present value of future dividends, thus lowering the stock price.

Applications and Practical Uses of the DDM

The Dividend Discount Model is particularly useful for valuing stocks of mature, dividend-paying companies, especially in sectors where cash flow stability and predictability are paramount. Investors who prioritize income generation, such as retirees or institutional investors managing pension funds, often rely on the DDM to evaluate stocks that offer consistent dividend payouts.

In addition, the DDM can be used to assess whether a stock is overvalued or undervalued in the market. If the DDM value is higher than the current stock price, the stock may be considered undervalued and potentially a good investment. Conversely, if the DDM value is lower than the current market price, the stock may be overvalued.

Limitations of the DDM

Despite its advantages, the Dividend Discount Model has limitations, particularly when applied to firms that do not pay dividends or have highly volatile earnings. The assumption that dividends will grow at a constant or predictable rate does not hold for many companies, especially those in rapidly changing industries. Moreover, the model's reliance on accurate estimation of the cost of equity and growth rate makes it highly sensitive to changes in market conditions and macroeconomic factors. For these reasons, the DDM is often complemented by other valuation models, such as the Discounted Cash Flow (DCF) model, which considers both

dividends and capital gains, or relative valuation models that use multiples like price-to-earnings (P/E) ratios.

1.3.2. Calculating the cost of equity

In applying the Dividend Discount Model (DDM) for stock valuation, two crucial components come into play: the cost of equity and the growth rate of dividends. These variables form the backbone of the model, as they determine how future dividends should be discounted and the expected trajectory of dividend payments over time. This section will explore the methods used to calculate these two key inputs, providing a framework for their practical application in stock valuation.

Calculating the Cost of Equity

The cost of equity represents the return required by investors to compensate for the risk of investing in a company. In the context of the DDM, the cost of equity serves as the discount rate used to calculate the present value of future dividends. Accurately determining this rate is critical, as even small changes in the cost of equity can significantly affect the valuation outcome.

One of the most widely accepted methods for calculating the cost of equity is the Capital Asset Pricing Model (CAPM), which provides a formula that incorporates the risk-free rate, the company's sensitivity to market risk (measured by beta), and the expected market return. The CAPM formula is:

Formula 2: Capital Asset Pricing Model (CAPM)

$$r_e = r_f + \beta \times (r_m - r_f)$$

Source: Sharpe, 1964.

Where:

- re = the required rate of return or cost of equity,
- rf = the risk-free rate, typically represented by government bond yields,
- β = the company's levered beta, which measures the stock's volatility relative to the broader market,

- rm = the expected return on the market, and
- (rm−rf) = the market risk premium, representing the extra return investors expect from taking on market risk over a risk-free asset.

In practical terms, CAPM helps to quantify the relationship between the risk of a stock and its expected return. Stocks with a high beta are more sensitive to market fluctuations and thus require a higher cost of equity to compensate for the additional risk. Conversely, companies with lower beta values are considered less risky, resulting in a lower cost of equity.

In cases where companies are smaller and face unique risks beyond market fluctuations, adjustments to the CAPM formula are often made. For example, the small-size premium is an additional factor that accounts for the higher risks typically associated with smaller firms. The adjusted formula becomes:

Formula 3: Adjusted CAPM Formula Including the Small-Size Premium

$$r_e = r_f + \beta \times (r_m - r_f) + \text{Small size premium}$$

Source: Sharpe, 1964; Fama & French, 1992.

This adjustment is particularly relevant for firms listed on smaller exchanges, such as those on the NASDAQ Baltic Regulated market, where companies may experience greater volatility or face additional risks compared to larger, more established firms. Incorporating the small-size premium ensures that the cost of equity more accurately reflects the specific risk profile of these companies.

Example Calculation: Cost of Equity for Artea Bankas

To illustrate the calculation of the cost of equity for Artea Bankas, a company listed on the NASDAQ Baltic Regulated market, we apply the Capital Asset Pricing Model (CAPM), which includes both a standard calculation and an adjusted version that incorporates a small-size premium. The inputs used in this calculation are based on specific financial data and risk adjustments relevant to Artea Bankas and its market environment.

CAPM Formula:

Formula 3: Adjusted CAPM Formula Including the Small-Size Premium

$$r_e = r_f + \beta \times (r_m - r_f) + \text{Small Size Premium (if applicable)}$$

Source: Sharpe, 1964; Fama & French, 1992.

CAPM Components Explained

1. Risk-Free Rate (r_f):
   The risk-free rate represents the return on a theoretically risk-free investment, which is typically derived from government bonds. For Artea Bankas, we use the Lithuanian 10-Year Government Bond Yield, which is 3.43% (Trading Economics, n.d.). This rate reflects the yield investors would expect from a low-risk, long-term investment in Lithuania, sourced from Trading Economics.

2. Beta (β):
   Beta measures the sensitivity of Artea Bankas's stock returns to broader market movements, capturing the company's market risk. The levered beta for Artea Bankas is 0.895, as found on Investing.com. This levered beta accounts for the company's capital structure, which includes both equity and debt. To clarify, levered beta is calculated using the unlevered beta and adjusting for financial leverage. The formula used to obtain levered beta from unlevered beta is as follows:

   Formula 4: Levered Beta Calculation Using Debt and Tax Adjustments

$$\text{Levered Beta} = \text{Unlevered Beta} \times \left(1 + (1 - \text{Tax Rate}) \times \frac{\text{Debt}}{\text{Equity}}\right)$$

   Source: Hamada, R. S., 1972. "The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stocks," Journal of Finance, 27(2), pp. 435-452.

   In this case, we adjusted the industry unlevered beta to reflect Artea Bankas's specific debt/equity structure and tax rate.

3. Equity Risk Premium (r_m - r_f):
   The equity risk premium represents the additional return investors expect for taking on the higher risk associated with equity investments over risk-free assets. For Lithuania,

Damodaran's most recent data estimates the equity risk premium at 5.84% (Damodaran, n.d.). This value reflects the expected market return minus the risk-free rate for the Lithuanian market.

4. Small Size Premium:
   Given Artea Bankas's market capitalization of approximately €540 million, it qualifies as a small-cap company, which typically faces additional risks, such as lower liquidity and potentially higher volatility. Therefore, we include a small size premium of 3.5% to reflect these additional risks. This premium is within the generally accepted range of 1% to 5% for small-cap companies and is appropriate given Artea Bankas's position on the NASDAQ Baltic Regulated market.

   The small size premium reflects the additional risk associated with investing in small-cap companies, which typically experience lower liquidity and higher volatility. This premium is generally derived from historical analyses that compare the returns of small-cap stocks to large-cap stocks, as documented in financial studies and databases such as Duff & Phelps and Ibbotson. These sources consistently report a size premium range of 1% to 5%, depending on market conditions and company characteristics. For Artea Bankas, with a market capitalization of approximately €540 million, a small size premium of 3.5% was selected as a reasonable midpoint within this range. This adjustment ensures the cost of equity accounts for the additional risk specific to small-cap stocks operating in the NASDAQ Baltic Regulated Market.

CAPM Calculation

Using the CAPM formula, we can calculate the cost of equity with and without the small size premium:

- CAPM without Small Size Premium:

  Formula 2: Capital Asset Pricing Model (CAPM)

$$r_e = r_f + \beta \times (r_m - r_f)$$

  Source: Sharpe, 1964.

Substituting the values:

$$r_e = 3.43\% + 0.895 \times 5.84\% = 3.43\% + 5.23\% = 8.66\%$$

Thus, the cost of equity without the small size premium is 8.66%.

- CAPM with Small Size Premium:

  Formula 3: Adjusted CAPM Formula Including the Small-Size Premium

  $$r_e = r_f + \beta \times (r_m - r_f) + \text{Small Size Premium}$$

  Source: Sharpe, 1964; Fama & French, 1992.

Substituting the values:

$$r_e = 3.43\% + 0.895 \times 5.84\% + 3.50\% = 3.43\% + 5.23\% + 3.50\% = 12.16\%$$

Therefore, the cost of equity with the small size premium is 12.16%.

Summary of CAPM Calculations

The results of these calculations are presented in the table below:

Table 1: Comparison of CAPM Cost of Equity With and Without Small-Size Premium

CAPM Components	CAPM (without small size)	CAPM (with small size)
Expected return or cost of equity (r_e)	8,66%	12,16%
Risk-Free Rate (r_f)	3,43%	3,43%
Beta (β)	0,895	0,895
Equity Risk Premium (r_m - r_f)	5,84%	5,84%
Small Size Premium	0.00%	3,50%

Sources: TradingEconomics for risk-free rate, Investing.com for beta value, Damodaran dataset for equity risk premium.

The CAPM with the small size premium provides a more comprehensive measure of Artea Bankas's cost of equity by adjusting for the unique risks associated with its size and market environment. This final cost of equity (12.16%) can now be applied as the discount rate in the Dividend Discount Model (DDM) to calculate the present value of future dividends and estimate the intrinsic value of Artea Bankas's stock.

1.3.3. Estimating the Growth Rate of Dividends

The second critical input for the DDM is the expected growth rate of dividends, denoted as g. This rate represents the future trajectory of dividend payments, influencing how much investors can expect to receive in dividend income over time. Estimating the dividend growth rate can be challenging, as it depends on a variety of factors, including the company's earnings growth, payout strategy, and reinvestment policies.

Several methods can be employed to estimate g, each with its advantages and limitations.

1. Compound Annual Growth Rate (CAGR): The CAGR of dividends is one of the most commonly used methods for estimating future dividend growth, particularly for firms with volatile dividend histories. CAGR smooths out the annual fluctuations in dividend payments and provides a long-term average growth rate. The formula for calculating CAGR is:

   Formula 5: Compound Annual Growth Rate (CAGR) Calculation

$$\text{CAGR} = \left(\frac{D_{\text{final}}}{D_{\text{initial}}} \right)^{\frac{1}{n}} - 1$$

   Source: Bodie, Kane, & Marcus, 2020.

   Where Dfinal and Dinitial are the dividend values at the end and start of the period, and n is the number of years. CAGR is particularly useful for capturing long-term growth trends and is ideal for firms with irregular dividend payouts over time. This method offers a more reliable prediction of future growth, as it reflects the compounded effect of dividend increases.

   CAGR Calculation:

The dividend growth rate of Artea Bankas over the past ten years was calculated using the Compound Annual Growth Rate (CAGR) formula, which smooths out growth over a specified period as if it were a steady rate. Using the initial dividend of €0.0007 per share in 2015 and the final dividend of €0.0485 per share in 2024, we apply the formula:

Formula 5: Compound Annual Growth Rate (CAGR) Calculation

$$CAGR = \left(\frac{\text{Final Dividend}}{\text{Initial Dividend}}\right)^{\frac{1}{\text{Number of Years}}} - 1$$

$$CAGR = \left(\frac{0.0485}{0.0007}\right)^{\frac{1}{10}} - 1$$

Source: Bodie, Kane, & Marcus, 2020.

This 52% CAGR reflects a high annual growth rate in dividends over the period, although the actual growth fluctuated significantly year to year. The CAGR provides a smoothed average rate that assumes steady growth from the initial to the final dividend amount.

Table 2: Components of Compound Annual Growth Rate (CAGR) Calculation

CAGR Components	Values
Initial Dividend	0,0007
Final Dividend	0,0485
Number of Years	10
CAGR Formula Result	52%

Source: Bodie, Kane, & Marcus, 2020, for CAGR formula; Dividend data sourced from bank's financial disclosures.

2. Average Growth Rate: The average growth rate is a simpler approach that involves calculating the arithmetic mean of dividend growth rates over several years. While straightforward, this method does not account for compounding effects and may be less accurate when dividend payments fluctuate significantly. However, for companies with relatively stable dividend growth, the average growth rate can still provide a reasonable

estimate. This approach might be useful for mature firms with consistent payout histories, but less applicable to high-growth or more volatile firms.

Average Growth Rate Calculation:

In contrast, the Average Growth Rate was calculated by taking the arithmetic mean of the individual annual growth rates over the same ten-year period. The dividend growth rates varied widely, from as high as 518% in one year to -100% in another, resulting in an average growth rate of 92%. This high average growth rate reflects the impact of specific years with exceptionally high growth, which can skew the average upwards. Unlike CAGR, which assumes smooth growth, the average growth rate captures the raw year-by-year fluctuations, giving a higher figure due to extreme values in certain years.

Table 3: Annual Dividend Growth Rate Breakdown Over 10 Years

Year	Dividend (Eur)	Annual Growth Rate (%)
Year 1	0,0007	
Year 2	0,0020	176%
Year 3	0,0050	150%
Year 4	0,0050	0%
Year 5	0,0000	-100%
Year 6	0,0290	100%
Year 7	0,0055	-81%
Year 8	0,0340	518%
Year 9	0,0265	-22%
Year 10	0,0485	83%
Average Growth Rate	-	92%

Source: Dividend data from bank's annual reports, 2015-2024. Calculations based on standard growth rate formulas.

The significant fluctuations in the annual growth rate, ranging from extreme highs of 518% to lows of -100%, indicate a high degree of volatility in dividend distributions. This inconsistency can be attributed to external macroeconomic shocks, particularly the COVID-19 pandemic, which likely influenced the bank's strategic decisions regarding

future earnings expectations and capital administration. The uncertainty surrounding economic recovery during this period may have led to irregular dividend adjustments as firms navigated changing financial conditions and regulatory pressures.

3. Sustainable Growth Rate (g = ROE × (1 - Payout Ratio)): Another method for estimating the dividend growth rate is the sustainable growth rate formula:

   Formula 6: Sustainable Growth Rate (SGR) Calculation

$$g = \text{ROE} \times (1 - \text{Payout Ratio})$$

   Source: Higgins, 1977, Financial Management, Vol. 6.

   This formula is based on the company's ability to reinvest its earnings to generate future growth. The Return on Equity (ROE) represents the firm's profitability relative to shareholders' equity, while (1 - Payout Ratio) is the retention ratio, indicating the portion of earnings retained within the firm for reinvestment. Essentially, this formula estimates the growth rate a company can sustain based on its reinvestment of profits. This method is particularly valuable for firms that retain a significant portion of their earnings, using those funds to drive internal growth.

   Understanding the Sustainable Growth Rate (SGR)

   The Sustainable Growth Rate (SGR) is an estimate of the rate at which a company can grow its dividends (or overall earnings) while maintaining its current financial structure without the need for additional external financing such as new debt or equity issuance. This growth rate is based on two key factors: the Return on Equity (ROE) and the Retention Ratio (1 - Payout Ratio). ROE measures the company's efficiency in generating profit from shareholders' equity, while the retention ratio represents the portion of earnings that the company reinvests rather than distributes as dividends. The formula for SGR is:

   Formula 6: Sustainable Growth Rate (SGR) Calculation

$$\text{SGR} = \text{ROE} \times (1 - \text{Payout Ratio})$$

   Source: Higgins, 1977, Financial Management, Vol. 6.

This calculation provides insight into how much the company can grow organically, supported by the profits it retains. For example, if a company has an ROE of 15% and pays out 40% of its profits as dividends, it retains 60% of its profits for reinvestment. Multiplying the ROE by this retention rate gives the sustainable growth rate. In the case of Artea Bankas, with an ROE of 15.5% and a payout ratio of 43.0%, the calculated SGR of approximately 8.84% indicates that the bank can grow its dividends by 8.84% annually without increasing leverage or seeking additional equity.

The SGR is particularly useful for long-term valuation models like the Dividend Discount Model (DDM), as it represents a stable, achievable growth rate grounded in the company's internal reinvestment capacity. Unlike historical growth rates, which may reflect irregular or extraordinary periods, the sustainable growth rate is based on the company's ongoing profitability and dividend policy, making it a conservative but realistic estimate of future growth. By using the SGR, analysts can project dividend growth that aligns with the company's existing operations and capital structure, providing a more stable foundation for estimating intrinsic value.

Sustainable Growth Rate Calculation:

The Sustainable Growth Rate (SGR) represents the dividend growth that Artea Bankas can maintain based on its current profitability and dividend policy. Using a Return on Equity (ROE) of 15.5% and a Payout Ratio of 43.0%, we calculate the SGR as follows:

Formula 6: Sustainable Growth Rate (SGR) Calculation

$$g = \text{ROE} \times (1 - \text{Payout Ratio}) = 15.5\% \times (1 - 0.43) = 8.84\%$$

Source: Higgins, 1977, Financial Management, Vol. 6.

This sustainable growth rate reflects the company's ability to grow dividends at a steady rate funded by internally generated profits, without needing additional financing. The SGR is typically a conservative estimate and provides a stable growth rate for models like the Dividend Discount Model (DDM), as it's based on Artea Bankas's profitability and reinvestment rate.

Table 4: Components of Sustainable Growth Rate (SGR) Calculation

SGR Components	Value
Return on Equity (ROE)	15.50%
Payout Ratio	43.00%
Sustainable Growth Rate (SGR)	8.84%

Source: Company financial statements for ROE and payout ratio; Sustainable Growth Rate calculated using Higgins (1977) formula.

Comparing these three methods can offer deeper insights into the firm's dividend growth potential, particularly when applied to real-world data from companies listed on the NASDAQ Vilnius Stock Exchange. For instance, the CAGR and average growth rate methods focus on historical dividend patterns, while the sustainable growth rate ties future dividend growth to internal reinvestment capabilities.

1.3.4. Practical Application and Comparison of Methods

Each of the above methods has its strengths and limitations, and their usefulness depends on the specific characteristics of the company being analyzed. For high-growth companies, the sustainable growth rate may offer a more accurate prediction of future dividend growth, while for mature firms with steady payouts, the average growth rate or CAGR might be more appropriate. In the following sections, a practical example will be provided, comparing these methods using data from companies listed on the NASDAQ Baltic Regulated market to illustrate how the choice of growth rate estimation impacts the overall valuation in the DDM.

Growth Rate Analysis for Artea Bankas

The growth rate of Artea Bankas's dividends has been evaluated using three methods: CAGR, average growth, and sustainable growth.

- The CAGR of 60% reflects substantial growth over the selected period, which could be due to significant increases from a low initial dividend base. This metric, however, may be optimistic if such high growth is not sustainable.
- The Average Growth Rate of 92% suggests that the company experienced at least one year of exceptionally high dividend growth, inflating the average. This rate may not realistically represent the long-term growth potential due to the high variability in annual dividend changes.

- The Sustainable Growth Rate of 8,84% is calculated based on the company's return on equity (ROE) and dividend payout policy, indicating a conservative and realistic estimate of how much dividends can grow annually without requiring external financing. This growth rate is likely the most stable for long-term projections.

Given these differences, the sustainable growth rate of 8,84% is the most reliable rate for valuation purposes, especially in models like the Dividend Discount Model (DDM), as it reflects the company's ability to grow through reinvested earnings while maintaining its current capital structure.

Dividend Projections

Dividends per share from past years are listed, providing a historical foundation for forecasting future dividends. The 2024 dividend is projected at €0.0485 per share, and future dividends are calculated by applying the sustainable growth rate of 8.84% annually. The forecasted dividends are as follows:

- 2025F: €0.0528
- 2026F: €0.0574
- 2027F: €0.0625
- 2028F: €0.0680
- 2029F: €0.0741

Cost of Equity Calculation Using CAPM

The cost of equity serves as the discount rate for these future dividends. We calculate this rate using the Capital Asset Pricing Model (CAPM), both with and without a small-size premium:

Formula 3: Adjusted CAPM Formula Including the Small-Size Premium

$$r_e = r_f + \beta \times (r_m - r_f) + \text{Small Size Premium}$$

Source: Sharpe, 1964; Fama & French, 1992.

- Risk-Free Rate (r_f): 3.43%, based on the Lithuanian 10-Year Government Bond Yield (sourced from Trading Economics).

- Beta (β): 0.895, found on Investing.com, which reflects the bank's volatility relative to the market.
- Equity Risk Premium (r_m - r_f): 5.84%, as per Damodaran's ERP for Lithuania.
- Small Size Premium: An estimated 3.5%, given the bank's €540 million market cap, which qualifies it as a small-cap company with additional risk.

The resulting cost of equity is:

- Without Small Size Premium: 8.66%
- With Small Size Premium: 12.16%

For this valuation, we use the cost of equity with the small-size premium, 12.16%, as the discount rate to account for the additional risk associated with Artea Bankas's size.

Present Value of Projected Dividends

We apply the Discount Factor for each forecast year to bring the projected dividends back to present value, as shown in the calculation table. The discount factor is calculated as:

Formula 7: Discount Factor Calculation for Present Value of Dividends

$$\text{Discount Factor} = \frac{1}{(1 + r_e)^{\text{Discount Period}}}$$

Source: Brealey, Myers, & Allen, 2020, Principles of Corporate Finance.

where r_e is the cost of equity (12.16%). This gives us the following discount factors and present values for each year:

- 2025F: Discount Factor = 0.89, Present Value of Dividend = €0,0471
- 2026F: Discount Factor = 0.79, Present Value of Dividend = €0,0457
- 2027F: Discount Factor = 0.71, Present Value of Dividend = €0,0443
- 2028F: Discount Factor = 0.63, Present Value of Dividend = €0,0430
- 2029F: Discount Factor = 0.56, Present Value of Dividend = €0,3352 (including the terminal value)

The terminal value is included in 2029F to account for all subsequent dividends beyond 2029, using a perpetual growth rate. This terminal value is discounted to present value along with the final year's dividend.

Sum of Present Values and Intrinsic Value per Share

The sum of the present values of all projected dividends is €0.52 per share. By adding the cash and cash equivalents per share (which is €1.13), we calculate the intrinsic value per share as follows:

Formula 8: Intrinsic Value Per Share Calculation (Dividend Discount Model – DDM)

$$\text{Intrinsic Value per Share} = \text{Sum of Present Values per Share} + \text{Cash and Cash Equivalents per Share} = 0.52 + 1.13 = 1.65\,\text{EUR}$$

Source: Brealey, R. A., Myers, S. C., & Allen, F., 2020. "Principles of Corporate Finance," 13th ed., McGraw-Hill.

This intrinsic value of €1.65 per share reflects the present worth of Artea Bankas's future dividend stream plus the bank's cash and cash equivalents, divided by the number of shares outstanding. This approach gives an estimate of the intrinsic value based on future dividends, adjusted for growth rates and discount factors, and the company's current cash position.

Section 1: Dividend Projections and Terminal Value

Table 5: Projected Dividends and Terminal Value Assumptions

Year	Dividend (Eur)	Terminal Value (Eur)
2015	0,0007	
2016	0,0020	
2017	0,0050	
2018	0,0050	
2019	0,0290	
2020	0.0000	
2021	0,0055	
2022	0,0340	
2023	0,0265	

2024	0,0485	
2025F	0,0528	
2026F	0,0574	
2027F	0,0625	
2028F	0,0680	
2029F	0,0741	0,5209

Source: Company financial projections and analyst estimates.

Section 2: Discount Factor and Present Value

Table 6: Discount Factors and Present Value of Future Dividends

Year		2025F	2026F	2027F	2028F	2029F
Dividend per share		0,0528	0,0574	0,0625	0,0680	0,0741
Terminal value						0,5209
Cost of equity {re = rf + ß × (rm -rf) + Small Size Premium}	12,16%					
Sustainable Growth rate {g = ROE × (1 - Payout Ratio)}	8,84%					
Discount period, years		1	2	3	4	5
Discount factor		0,89	0,79	0,71	0,63	0,56
Present value		0,0471	0,0457	0,0443	0,0430	0,3352

Source: Author's calculations based on projected dividends and discount factors.

Section 3: Summary Calculations

Table 7: Final Calculation of Intrinsic Value Per Share Using DDM

Metric	Value
Sum of Present Values	0,5153
Cash and Cash Equivalents	751.499.000 €
Number of Shares	662,997,000
Cash and Equivalents Per Share	1,1335 €
Value Per Share	1,65 €

Source: Author's calculations based on projected dividends and discount factors.

1.3.5. Limitations and Application of DDM

The Dividend Discount Model (DDM) is widely recognized as one of the most fundamental methods for valuing stocks, especially for companies with consistent dividend-paying histories. Its core premise that the value of a stock is the present value of all future dividends makes it particularly appealing for income-focused investors who rely on dividends as a primary return on investment. However, like any financial model, the DDM has specific applications where it excels, as well as notable limitations that may reduce its effectiveness in certain contexts. Understanding when and how to apply the DDM, and recognizing its boundaries, is crucial for obtaining accurate and meaningful stock valuations.

Application of the DDM

The DDM is most effectively applied to mature, dividend-paying companies with stable dividend growth rates. These companies, often found in sectors like utilities, telecommunications, and consumer goods, tend to have well-established business models that generate reliable cash flows. Their dividend policies are typically stable, allowing analysts to confidently estimate future dividends based on historical data.

One of the model's strengths is its simplicity. The single-stage DDM, often represented by the Gordon Growth Model (GGM), assumes that dividends will grow at a constant rate indefinitely. This makes the DDM straightforward and easy to apply, particularly for companies with long-term stability in their earnings and dividend policies. For these firms, the required inputs, such as the cost of equity and the growth rate of dividends can be reasonably estimated, yielding a valuation that reflects the company's expected future dividend stream.

The multi-stage DDM is another variant that can be applied in situations where a company's dividend growth rate is expected to change over time. This is particularly useful for companies experiencing different growth phases, such as rapid growth followed by stabilization. In such cases, analysts may assume a higher growth rate for an initial period before reverting to a lower, stable growth rate in the long run. The multi-stage DDM allows for a more nuanced valuation by accounting for the varying phases of a company's lifecycle.

In addition to its use in individual stock valuation, the DDM is also applied in comparative analysis across sectors or markets. For example, by using the DDM to value multiple companies

within the same industry, analysts can compare intrinsic values and identify stocks that may be undervalued or overvalued relative to their peers. This is particularly helpful in markets such as the NASDAQ Baltic Regulated market, where dividend-paying companies may dominate certain sectors, allowing for a clearer comparative picture using consistent dividend-based metrics.

Limitations of the DDM

Despite its utility, the Dividend Discount Model has several limitations that may restrict its applicability, particularly in certain industries or for companies with unpredictable dividend policies.

1. Limited to Dividend-Paying Companies:
   One of the most significant limitations of the DDM is that it is only applicable to companies that pay dividends. Many growth-oriented firms, especially in sectors like technology, biotechnology, or startups, choose to reinvest earnings into expanding their operations rather than paying out dividends. For these companies, the DDM cannot be applied, as the model is entirely dependent on the assumption that future dividends represent the return on investment for shareholders. In such cases, other valuation methods, such as the Discounted Cash Flow (DCF) model or relative valuation models (e.g., P/E ratios), are more appropriate.

2. Assumption of Constant Growth:
   The basic version of the DDM assumes a constant growth rate for dividends, which may not be realistic for many companies, particularly those in volatile or high-growth industries. Companies often experience fluctuating growth rates due to changes in market conditions, competitive pressures, or internal reinvestment strategies. The assumption of a single, constant growth rate can lead to over- or under-estimation of a stock's intrinsic value. While the multi-stage DDM offers a solution by allowing for changing growth rates, it also adds complexity to the model and increases the potential for estimation errors.

3. Sensitivity to Inputs:
   The DDM is highly sensitive to its input variables, particularly the cost of equity (r_e)

and the dividend growth rate (g). Small changes in these inputs can result in large swings in the calculated stock price. For example, an overestimation of the growth rate can lead to a stock appearing significantly undervalued, while a slight increase in the cost of equity may make the stock seem overpriced. This sensitivity makes the model vulnerable to errors in estimating key variables, particularly when the company's historical data is limited or when market conditions are rapidly changing.

4. Overemphasis on Dividends:
   Another limitation is the DDM's reliance on dividends as the sole source of returns for investors. In reality, stock returns are often derived from both dividends and capital gains (the increase in stock price). By focusing exclusively on dividends, the DDM may overlook significant factors driving a company's future value, such as reinvestment opportunities, expansion strategies, or broader market trends. This narrow focus makes the DDM less applicable to firms where dividends are not the primary driver of investor returns.

5. Difficult to Apply in Certain Market Conditions:
   During periods of economic uncertainty or financial distress, companies may cut or suspend dividend payments temporarily to conserve cash. The DDM struggles in such situations, as the absence of predictable dividends renders the model ineffective. Furthermore, in times of rapid inflation or interest rate volatility, estimating an accurate cost of equity can become difficult, further complicating the application of the DDM. In such environments, alternative valuation methods that account for broader economic factors are often more reliable.

6. Challenges with High-Growth or Irregular Dividend Payers:
   Companies that experience high growth or have irregular dividend histories pose additional challenges for the DDM. High-growth firms may eventually start paying dividends, but the timing and magnitude of these payments are often uncertain. For firms that have highly variable or inconsistent dividend payouts, it is difficult to accurately estimate future dividends and apply the model effectively.

Conclusion

The Dividend Discount Model (DDM) is an essential framework in finance, providing a robust method for valuing stocks based on their future dividend payments. It excels in valuing mature, dividend-paying companies with stable payout histories, offering a direct and practical approach to estimating intrinsic value. Through its theoretical foundation, including the Bird-in-Hand theory and the Modigliani-Miller proposition, the DDM emphasizes the significance of dividends as a tangible return on investment, making it particularly valuable for income-focused investors and stable-market sectors.

However, the practical application of the DDM requires careful consideration of its key inputs, expected dividends, growth rates, and the cost of equity. Each input's accuracy significantly influences valuation outcomes, as demonstrated by the sensitivity of the model to changes in growth and discount rates. While the single-stage (constant growth) DDM remains suitable for mature industries, the multi-stage DDM offers enhanced flexibility for firms experiencing diverse growth phases, such as those in high-growth or transitioning industries.

Despite its utility, the DDM's limitations, its reliance on consistent dividend payments, assumptions of constant growth, and sensitivity to estimation errors, restrict its applicability in certain contexts. For instance, high-growth firms, companies with irregular dividend policies, or those in volatile market conditions often require alternative valuation methods like the Discounted Cash Flow (DCF) model or relative valuation techniques that account for both dividends and capital gains. Furthermore, the DDM's exclusive focus on dividends may overlook critical value drivers such as reinvestment strategies, expansion potential, or broader market trends.

In conclusion, the DDM remains a cornerstone valuation tool for stable, dividend-paying firms, offering clear insights into their intrinsic value. However, to achieve comprehensive and accurate valuations, analysts must complement the DDM with other methodologies when evaluating firms with more dynamic growth profiles, inconsistent dividends, or operating in unpredictable market environments. Understanding the DDM's strengths and limitations is essential for determining when and how to apply it effectively, ensuring informed decision-making in the valuation process.

1.4. Literature Review

1.4.1. Empirical Studies on Dividend Policy and Stock Value

Empirical research on the relationship between dividend policy and stock value has produced mixed findings, reflecting the complexity of factors that influence investor behavior and market dynamics. One of the earliest and most influential studies on this topic is Lintner's (1956) work, which examined corporate dividend policies and concluded that firms prioritize stable and predictable dividends over volatile payout structures. His findings suggested that managers are reluctant to cut dividends unless absolutely necessary, as such reductions are often interpreted as negative signals by investors.

Building upon this foundational work, subsequent empirical studies have explored the impact of dividend policy on stock value across various markets and time periods. Fama and French (1998) challenged the traditional view that dividend policy is irrelevant by demonstrating that firms with high dividend payouts tend to exhibit lower risk and higher valuation multiples. Their findings aligned with the Bird-in-Hand theory, which posits that investors prefer dividend income over uncertain capital gains.

More recent studies have leveraged econometric models to assess the causal relationship between dividends and stock value. Aivazian, Booth, and Cleary (2003) analyzed firms across emerging and developed markets and found that dividend-paying companies generally experience lower stock price volatility and higher investor confidence. However, their results also indicated that the strength of this relationship varies depending on market conditions, investor sentiment, and regulatory environments.

Another significant contribution to this field comes from DeAngelo and DeAngelo (2006), who examined the role of retained earnings in stock valuation. Their study highlighted that firms with higher retained earnings relative to total equity tend to prioritize reinvestment over dividend payouts, which can lead to higher long-term stock appreciation but greater short-term price volatility.

In the context of the Baltic financial markets, empirical studies on dividend policy remain relatively scarce compared to larger economies. However, research focusing on Central and Eastern European (CEE) stock exchanges suggests that dividend policy plays a crucial role in attracting institutional investors. For instance, a study by Bajra and Cadez (2018) found that firms listed on smaller stock exchanges, including the NASDAQ Baltic Regulated Market,

experience stronger market reactions to dividend announcements due to lower overall liquidity and higher investor dependence on dividends as a signal of financial stability.

Overall, the empirical literature suggests that while dividend policy influences stock value, its impact is contingent on various factors such as market conditions, investor preferences, corporate governance, and tax policies. These findings provide a foundation for the subsequent analysis of dividend policy's role in the NASDAQ Baltic Regulated Market.

1.4.2. Impact of Dividend Yield on Stock Price Volatility

The relationship between dividend yield and stock price volatility has been extensively studied in financial literature, with researchers investigating whether higher dividend yields contribute to greater price stability. Empirical evidence generally supports the notion that dividend-paying stocks experience lower price volatility compared to non-dividend-paying stocks, aligning with the risk-mitigating role of dividends.

Black and Scholes (1974) were among the first researchers to explore whether dividend yields influence stock price fluctuations. Their study found no strong evidence supporting the idea that dividend policy systematically affects stock risk. However, subsequent studies refined this analysis by incorporating more granular datasets and advanced econometric models. Baskin (1989) found that firms with higher dividend yields tend to exhibit lower price volatility, attributing this to the stabilizing effect of consistent income distributions.

More recently, a study by Gordon and Shapiro (2006) applied a multi-factor regression model to analyze stock price volatility across different market conditions. Their findings indicated that dividend yield is negatively correlated with stock price volatility, particularly during periods of market downturns. This suggests that high-dividend-yield stocks serve as a buffer against market fluctuations, making them attractive to risk-averse investors.

In emerging markets, empirical studies have provided additional insights into the role of dividend yield in stock price movements. Studies by Al-Malkawi (2007) and Nazir et al. (2010) examined stock price behavior in Middle Eastern and South Asian markets, respectively, and found that higher dividend yields were associated with reduced stock price volatility. These findings support the argument that dividend payments provide investors with a predictable income stream, reducing their reliance on speculative capital gains.

The impact of dividend yield on stock price volatility is particularly relevant for smaller stock exchanges, such as the NASDAQ Baltic Regulated Market. Given the relatively lower liquidity and trading volumes in this market, dividend payments may play an even more significant role in stabilizing stock prices. A study by La Porta et al. (2000) on investor protection and dividend policy suggests that in markets with weaker shareholder rights, dividend payments become a crucial mechanism for ensuring investor confidence, thereby reducing stock price fluctuations.

Despite the generally observed negative correlation between dividend yield and stock price volatility, some researchers argue that this relationship may not hold in all market conditions. For example, periods of economic uncertainty or financial distress may lead to increased volatility in high-dividend-yield stocks, particularly if investors perceive dividend cuts as indicators of financial weakness.

In summary, empirical research suggests that dividend yield plays a significant role in reducing stock price volatility, though its impact varies depending on market structure, investor behavior, and economic conditions. This insight is particularly relevant for the analysis of dividend policies within the NASDAQ Baltic Regulated Market.

1.4.3 Sector-Specific Insights on Dividend Strategies

The influence of dividend policy varies significantly across different industries, with sectoral characteristics playing a key role in determining firms' dividend strategies. Empirical research has demonstrated that companies in mature, capital-intensive industries tend to exhibit higher dividend payout ratios, whereas firms in high-growth sectors prioritize reinvestment over dividends.

One of the earliest sectoral studies on dividend policy was conducted by Fama and Babiak (1968), who found that industries with stable cash flows, such as utilities and consumer staples, typically maintain higher dividend payouts. This trend persists in modern financial markets, as firms in these sectors prioritize steady income distributions to attract income-focused investors.

The technology sector provides a stark contrast, as many firms, particularly startups and high-growth companies, opt to reinvest earnings into research and development (R&D) rather than pay dividends. Empirical research by Denis and Osobov (2008) found that the likelihood of dividend payments among technology firms is significantly lower than in traditional industries. Companies such as Apple and Microsoft only began paying dividends after reaching a stage of

financial maturity where reinvestment opportunities became less attractive relative to shareholder returns.

In the financial sector, dividend policy is heavily influenced by regulatory considerations. Banks and insurance companies are subject to capital adequacy requirements, which often constrain their ability to distribute dividends. Empirical studies by Bhattacharya (1979) and Allen and Michaely (2003) have highlighted the role of regulatory policies in shaping dividend strategies within the banking sector. During periods of economic downturns, financial institutions often reduce or suspend dividends to preserve capital, as observed during the 2008 global financial crisis.

The energy and utilities sectors have historically maintained high dividend payout ratios due to their stable revenue streams and predictable cash flows. Research by Baker and Powell (1999) confirmed that investors in these sectors place a high emphasis on dividend stability, making dividend cuts particularly detrimental to stock prices.

In the context of the NASDAQ Baltic Regulated Market, sector-specific dividend policies are shaped by local economic conditions, investor preferences, and regulatory frameworks. For example, firms in the energy sector, such as Ignitis Group, have prioritized high dividend payouts to attract institutional investors. In contrast, companies in the technology sector tend to reinvest earnings, aligning with global trends in growth-oriented industries.

Overall, sectoral insights provide valuable context for understanding dividend policy decisions. While some industries naturally favor high dividends due to their stable cash flows, others prioritize reinvestment, reflecting their growth potential. These differences underscore the importance of considering industry-specific factors when evaluating dividend policy and stock value relationships.

In conclusion, Chapter 1 presented an extensive theoretical overview of dividend policy, highlighting its critical importance in corporate financial strategy and its multifaceted implications on investor behavior and firm valuation. The chapter explored foundational theories such as Modigliani and Miller's dividend irrelevance theory, the Bird-in-Hand theory, and the signaling theory, underscoring how dividend decisions communicate firm health and future prospects to investors. Additionally, the Dividend Discount Model (DDM) was examined as a key method for stock valuation, alongside discussions on calculating the cost of equity and estimating dividend growth rates. Empirical studies reviewed further enriched the theoretical

discussion by presenting varied perspectives on how dividend policies influence stock value and market behavior across different contexts, including sector-specific insights. This theoretical foundation sets the stage for Chapter 2, where these concepts will be operationalized through a detailed research methodology to empirically investigate dividend policy dynamics within the NASDAQ Baltic market.

2. RESEARCH METHODOLOGY

2.1. Research Objectives and Hypotheses

The purpose of this chapter is to outline the methodological approach used to examine the relationship between dividend policy and stock valuation in the NASDAQ Baltic Regulated Market. This research aims to assess how various factors, such as market capitalization, industry classification, and time trends, impact dividend distributions and whether discernible patterns emerge from historical data.

The primary objective of this study is to analyze dividend trends and their influencing factors, focusing on the following key aspects:

- Stock Market Dynamics: Investigating how dividend policies are structured within the NASDAQ Baltic Regulated Market.
- Market Capitalization and Dividend Distributions: Evaluating whether companies with larger market capitalizations tend to issue higher dividends compared to smaller firms.
- Industry-Specific Dividend Patterns: Examining if dividend strategies differ across industries and whether some sectors consistently exhibit higher or lower dividend payouts.
- Temporal Trends in Dividend Issuance: Identifying whether there is an observable trend in dividend policies over time and whether dividends have increased, decreased, or remained stable over the years.

Hypotheses Formulation

To systematically investigate these relationships, the following hypotheses are proposed:

- H1: Companies with larger market capitalization issue higher dividend payouts than smaller firms.

- H2: Dividend issuance varies significantly by industry, with some industries consistently offering higher dividends than others.
- H3: Over time, dividend payments follow a trend, either increasing or decreasing, which can be captured through regression analysis.
- H4: Ex-dividend dates are clustered around certain periods of the year, indicating potential seasonality in dividend issuance.

These hypotheses will be tested using empirical data from the NASDAQ Baltic Regulated Market, applying statistical and visualization techniques to uncover underlying trends and patterns.

2.2. Data Collection and Preprocessing

To examine the relationship between dividend policies and stock valuation in the NASDAQ Baltic Regulated Market, this research relies on a dataset composed of historical stock and dividend data. This section outlines the data sources, preprocessing steps, and integrity checks conducted to ensure the dataset is complete and suitable for analysis.

2.2.1. Data Sources

The data for this study was obtained from the NASDAQ Baltic Stock Exchange, which includes listings from Tallinn (TLN), Riga (RIG), and Vilnius (VLN). The dataset covers the period 2015–2024, allowing for an analysis of long-term trends in dividend payments. The dataset consists of two primary components:

1. Shares Dataset
    - Contains general information about stocks listed on the NASDAQ Baltic exchange.
    - Includes market capitalization, industry classification, and trading activity (turnover, volume, price movements).
    - Provides insights into company size and financial stability, relevant for evaluating how market cap correlates with dividend policies.
2. Dividends Dataset
    - Includes historical dividend payouts and ex-dividend dates for each stock.
    - Captures the timing and magnitude of dividend payments, allowing for the identification of trends over time.

- Provides information on dividend policies across different industries and market segments.

By combining these two datasets, the study aims to identify how company size, sector, and time period influence dividend distributions.

2.2.2. Data Preprocessing and Integrity Checks

To ensure data quality and reliability, the following preprocessing steps were applied:

1. Matching Shares and Dividend Data
    - Since the two datasets originate from separate sources (general stock data vs. dividend-specific records), they were merged using the common variables "Ticker" and "Market" to ensure consistency.
    - This step ensures that each stock's dividend history is accurately linked to its industry classification and market cap.
2. Ensuring Date Accuracy
    - Ex-dividend dates were checked for format inconsistencies and converted into a standardized datetime format to facilitate time-based analysis.
    - Any missing or incorrect date formats were corrected or excluded if necessary.
3. Handling Missing or Incomplete Data
    - Stocks with missing industry classifications or market cap values were either supplemented with available external sources or excluded from industry-based comparisons.
    - Dividend records with missing payout amounts were investigated and excluded if they could not be verified.
4. Market Capitalization Verification
    - The availability of market cap data was checked, as it is a key variable in the study (used for bubble size in visualizations).
    - If market cap was unavailable, trading turnover was considered as a potential proxy to estimate company size.
5. Filtering for Relevant Stocks
    - The dataset was cleaned to remove stocks that did not pay dividends during the observation period to avoid skewing the analysis.

- This ensures that only dividend-paying stocks are analyzed, making the study more relevant to investors interested in dividend trends.

2.2.3. Final Dataset and Readiness for Analysis

After preprocessing, the final dataset is structured with the following key variables:

- Ticker: Unique stock identifier.
- Industry: Sector classification of the company.
- Market (TLN/RIG/VLN): The stock exchange where the company is listed.
- Market Capitalization: The company's overall valuation (for bubble size in visualizations).
- Ex-Dividend Date: Date when a stock goes ex-dividend.
- Dividend Amount per Share (€): The distributed dividend per stock.
- Turnover (Alternative Size Metric): Used when market cap is unavailable.

This cleaned dataset forms the foundation for the empirical analysis in Chapter 3, where statistical techniques and visualizations will be used to test the research hypotheses.

2.3. Analytical Techniques and Data Visualization

This section outlines the methods used to analyze dividend issuance trends in the NASDAQ Baltic Regulated Market. The study employs regression analysis to examine statistical relationships between key variables and uses data visualization techniques to provide comparative insights across industries and time. The primary goals are:

1. To determine whether dividend payouts are influenced by market capitalization, industry classification, and time trends.
2. To visually represent dividend distributions using a multi-variable scatter plot while ensuring trends are identifiable through regression techniques.

The analysis is structured into two key approaches:

- Regression analysis (2.3.1.) to quantify relationships and control for variables.
- Comparative visualization (2.3.2.) to explore industry-specific patterns and temporal trends.

These techniques will be applied in Chapter 3 to interpret dividend patterns and validate hypotheses formulated in Section 2.1.

2.3.1. Regression Analysis and Time Trend

To explore whether market reactions to dividend announcements have followed a systematic trend over time, a regression analysis is conducted using stock price changes on ex-dividend dates as the dependent variable. Specifically, the model investigates whether the percentage price change on the ex-dividend date exhibits a time-based pattern.

In this analysis:

- The dependent variable is the *percentage change in stock price* on the ex-dividend date.
- The independent variable is the number of years since the first observed ex-dividend date, derived by transforming the date variable into a continuous numeric format.

The regression model is specified as:

$$\text{Price Change \%} = \beta 0 + \beta 1(\text{Years Since First Ex-Dividend Date}) + \varepsilon$$

where:

- $\beta 0$ represents the intercept,
- $\beta 1$ captures the time trend in price reactions to dividend announcements,
- ε is the error term.

A simple linear regression is employed to visualize and quantify this trend. The analysis is supported by a regression plot, which illustrates the relationship between the timing of the ex-dividend dates and the corresponding stock price changes. This approach helps to identify whether investors' pricing behavior surrounding dividends has shifted over the observed period.

This regression offers a temporal lens on price reactions to dividends, which is complemented by the sector-level comparative analysis presented in the next section.

2.3.2. Comparative Analysis Across Sectors

To visualize dividend trends across industries and time, a multi-variable scatter plot will be constructed, encoding four dimensions:

- X-axis (Date): The ex-dividend date, displaying the time series distribution of dividend issuances.
- Y-axis (Dividend Amount per Share): The actual payout per stock.
- Size of Points (Market Capitalization): Larger companies will be represented with bigger bubbles.

- Color (Industry): Each sector will be assigned a distinct color to differentiate dividend patterns across industries.

This visualization will be generated using Python's Seaborn and Matplotlib libraries, ensuring a clear depiction of how dividend payouts are distributed across industries and company sizes over time.

By combining scatter visualization (for sectoral comparison) with regression modeling (for statistical validation), this methodology ensures both comprehensiveness in analysis and clarity in results interpretation.

2.4 Analysis of dividend policies and their impact on stock value

Section 2.4 presents a detailed empirical analysis designed to investigate the impact of dividend policies on stock value within the NASDAQ Baltic Regulated Market. The section outlines the methodological steps employed, starting from data extraction and refining procedures, progressing through correlation and regression analyses, and culminating in the interpretation of findings related to the effects of dividend yields on stock prices. This structured approach ensures clarity in understanding how dividend policy decisions translate into measurable market outcomes.

2.4.1 Data Extraction and Filtering Criteria

The dataset used in this study includes historical market capitalization and dividend policy data for companies listed on the NASDAQ Baltic Regulated Market. The data was extracted from NASDAQ Baltic's official database, ensuring reliability and completeness. To maintain data integrity and focus on active issuers with consistent dividend policies, the dataset was refined based on the following criteria:

- Companies that did not issue dividends during the period of analysis were excluded.
- Firms that had been delisted before the end of the study period were removed.
- Only stocks with a continuous listing history and available dividend payment records were retained.

Market Capitalization Data Collection and Alignment

To ensure a comprehensive analysis of dividend policy effects on stock valuation, the dataset was constructed using market capitalization data extracted from the NASDAQ Baltic official

database. This data was then aligned with stock trading information to maintain consistency and analytical reliability.

The data extraction process followed these key steps:

1. Filtering Active Dividend-Paying Firms
    - Companies that did not issue dividends during the period under study were excluded from the dataset to focus on firms where dividend policy directly influenced stock valuation.
    - Firms that had been delisted before the study period concluded were also removed to avoid incomplete stock performance data.
2. Aligning Market Cap Data with Stock Information
    - Historical market capitalization figures were retrieved for each firm to ensure that dividend policy trends could be assessed relative to company size.
    - The extracted data was cross-referenced with stock trading information, ensuring that each company had complete dividend, price, and market cap records for accurate correlation analysis.

This refined dataset provided the foundation for the scatter plot analysis, which visualizes the relationship between dividend issuance trends, industry classification, and firm size, offering insights into how market capitalization influences dividend behaviors across sectors.

These filtering steps ensured that the dataset included firms where dividends played an observable role in their valuation dynamics. This aligns with the study's objective of determining how stable or fluctuating dividend payouts affect stock value.

2.4.2 Correlation Between Dividend Yields and Stock Prices

To assess the impact of dividend policies on stock prices, the relationship between dividend yield and stock valuation was analyzed. The dividend yield was computed as follows:

Formula 9: Dividend Yield Calculation

$$Dividend\ Yield = \frac{Annual\ Dividend\ per\ Share}{Stock\ Price}$$

Source: Bodie, Kane, & Marcus, 2020, Investments, 12th ed.

Using scatter plots and regression models, we examined whether higher dividend yields were associated with increased stock prices or if the effect varied based on market conditions.

Scatter Plot: Visualizing Dividend Issuance Trends

To illustrate the relationship between dividend issuance, firm size, and industry classification, a scatter plot was generated using market capitalization and dividend data. The plot provides a visual representation of:

- Ex-dividend dates along the x-axis, showing the timing of dividend issuance.
- Dividend amounts per share along the y-axis, indicating payout levels.
- Bubble size corresponding to market capitalization, highlighting the influence of firm size.
- Bubble colors representing different industries, allowing for sector-based comparisons.

This visualization helps identify patterns in dividend policy across industries, demonstrating which firms and sectors prioritize regular dividend payouts versus those that retain earnings for growth. The following script implements the scatter plot analysis:

Code Snippet 1: Scatter Plot Analysis for Dividend Policy Trends

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Load the dataset
file_path = "Scatter_data.xlsx"
df = pd.read_excel(file_path)

# Convert Date column to datetime format
df['Date'] = pd.to_datetime(df['Date'])

# Convert Market cap to numeric (remove any currency symbols or spaces)
df['Market cap'] = df['Market cap'].replace('[€,]', '',
regex=True).astype(float)

# Convert Amount per share to numeric
df['Amount per share'] = df['Amount per share'].replace('[€,]', '',
regex=True).astype(float)

# Set plot style
sns.set(style="whitegrid")

# Create the scatter plot (bubble chart)
```

```
plt.figure(figsize=(12, 6))
scatter = sns.scatterplot(
    data=df,
    x='Date',
    y='Amount per share',
    size='Market cap',
    hue='Industry',
    alpha=0.6,
    palette='tab10',
    sizes=(20, 1000)
)

# Labels and Title
plt.xlabel("Ex-dividend date")
plt.ylabel("Dividend issued")
plt.title("Dividend Issued Over Time by Industry")

# Format x-axis for better readability
plt.xticks(rotation=45)

# Show legend for bubble size
handles, labels = scatter.get_legend_handles_labels()
plt.legend(handles[:len(df['Industry'].unique())+1],
labels[:len(df['Industry'].unique())+1], title="Market Cap Size",
bbox_to_anchor=(1.05, 1), loc='upper left')

# Show the plot
plt.show()
```

Source: Author's implementation using Python, Matplotlib, and Seaborn.

Explanation of the Code: Implementing a Dividend Policy Analysis Visualization

The following Python script utilizes pandas, matplotlib, and seaborn to process and visualize dividend issuance data across different industries over time. The goal of this code is to generate a bubble chart that effectively communicates the relationships between dividend amounts, ex-dividend dates, market capitalization, and industry classifications. This visualization serves as an essential tool for analyzing dividend policies and their trends in the NASDAQ Baltic Regulated Market, aligning with the empirical research objectives of this thesis.

1. Data Processing and Preparation

The dataset is loaded from an Excel file (Scatter_data.xlsx) containing dividend issuance records, including:

- Date of dividend issuance (ex-dividend date)
- Market capitalization of the issuing company
- Dividend amount per share
- Industry classification of the company

To ensure accurate processing, the script:

- Converts the Date column to datetime format for proper chronological plotting.
- Cleans the Market cap and Amount per share columns by removing currency symbols and converting them to numeric values to facilitate mathematical operations.

These preprocessing steps are essential to maintain data integrity and ensure correct visual representation.

2. Visualization Strategy: Bubble Chart Design

The visualization employs a scatter plot with variable point sizes, often referred to as a bubble chart, where:

- The x-axis represents the ex-dividend date, displaying the timeline of dividend issuances.
- The y-axis represents the dividend amount per share, illustrating the magnitude of each dividend.
- The size of the bubbles corresponds to market capitalization, allowing for quick identification of larger firms issuing dividends.
- The color of each bubble represents the industry, enabling a comparative analysis of how different sectors approach dividend payments.

This approach allows for multi-dimensional insights, making it easier to analyze industry-specific trends, dividend stability, and corporate payout behavior.

3. Seaborn for Aesthetic and Readability Enhancements

The script employs Seaborn's scatterplot() function with the following customizations:

- Alpha transparency (alpha=0.6) ensures that overlapping data points remain visible.
- A palette (tab10) provides distinct colors for different industries.
- Bubble sizes (sizes=(20, 1000)) are scaled proportionally to market capitalization, visually distinguishing smaller vs. larger firms.

- A rotated x-axis (plt.xticks(rotation=45)) improves date readability.

4. Labeling, Legends, and Interpretability

To enhance interpretability:

- The x-axis label ("Ex-dividend date") clarifies the time series aspect of the data.
- The y-axis label ("Dividend issued") represents dividend amounts, a key financial metric.
- The title ("Dividend Issued Over Time by Industry") succinctly communicates the purpose of the visualization.
- The legend placement (bbox_to_anchor=(1.05, 1)) ensures it remains readable without cluttering the main plot area.

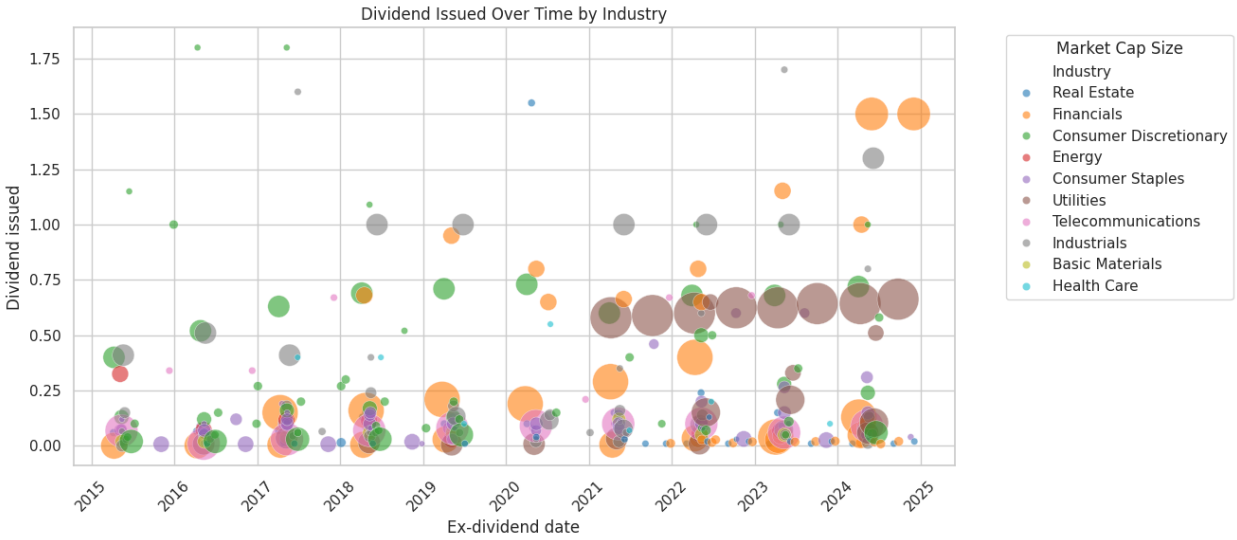
5. Interpretation of the Expected Output

Upon execution, the script generates a bubble chart similar to the one displayed, allowing for a clear, data-driven analysis of dividend issuance trends. This visualization provides:

- A historical overview of how companies adjust their dividend policies over time.
- Insights into sector-specific dividend strategies, highlighting industries that prioritize stable dividends (e.g., Financials, Utilities) vs. reinvestment-focused sectors (e.g., Technology, Telecommunications).
- A means to compare market cap influences on dividend decisions, distinguishing between large-cap firms that issue consistent dividends and small-cap firms with irregular payouts.

By visually encapsulating dividend issuance trends, this analysis supports the broader objectives of this thesis: to investigate the effect of dividend policy on stock valuation within the NASDAQ Baltic Regulated Market. This visualization complements the empirical research findings, offering a graphical representation of theoretical concepts such as signaling theory, dividend stability, and investor confidence.

Figure 1: 4D Visualization of Dividend Issuance Over Time by Industry and Market Cap



Source: Author's visualization using financial data from scatter plot dataset.

Extended Commentary on the Scatter Plot Results: Analyzing Dividend Policy Across Industries and Time

The bubble chart provides a multi-dimensional view of dividend issuance, capturing industry-specific behaviors, firm size implications, and temporal trends in dividend policy. By analyzing dividend payments across different industries over time, we can uncover key insights regarding market conditions, corporate financial strategies, investor expectations, and economic cycles.

1. Temporal Trends: Dividend Evolution from 2015 to 2025

The time-series representation of dividend issuance indicates distinct phases, each potentially linked to broader economic events and market conditions:

- 2015-2019: Moderate and Consistent Dividend Issuance
  During this period, dividends appear relatively stable, with smaller and mid-sized bubbles, indicating that companies were issuing dividends but not at significantly increasing rates. This phase likely represents a normal market environment, where firms followed established dividend strategies without major external shocks.
- 2020-2021: Decrease in Dividend Issuance (Pandemic Impact)
  A clear drop in the frequency and size of dividend issuances is visible during 2020-2021, correlating with the COVID-19 pandemic and its economic aftermath. Many firms reduced or suspended dividends to preserve cash flow and ensure financial stability amidst uncertainty. This aligns with empirical studies indicating that global markets witnessed dividend suspensions, cutbacks, and increased risk aversion during this period.

- 2022-Present: Post-Pandemic Recovery and Rising Dividends
  From 2022 onwards, there is a marked increase in dividend payments, both in terms of size (bubble magnitude) and frequency. This suggests that corporate confidence has returned, with firms willing to reintroduce or increase dividends to attract investors. The financials and basic materials sectors, in particular, show an aggressive resurgence, reflecting strong post-pandemic performance in these industries.

This pattern aligns with dividend signaling theory, where companies use dividend policies to signal financial strength and stability to investors. The increasing dividend payments post-2020 may indicate that firms are leveraging dividends as a tool to restore investor confidence and project stability in their long-term profitability.

2. Industry-Specific Dividend Policies

Dividend policy is highly industry-dependent, with sectoral variations reflecting different business models, risk tolerances, and investment strategies.

Industries with High Dividend Issuance (Stable and Mature Sectors)

- Financials (Banks, Insurance, Investment Firms)
  The financial sector exhibits large bubbles throughout, particularly post-2020, indicating that banks and financial institutions resumed dividend payments as economic stability improved. Given the capital-intensive nature of this sector, dividends often act as a crucial signal of financial health. The resurgence of dividends in 2022-2025 suggests a return to normalized banking operations and profitability growth.
- Utilities (Electricity, Water, Gas, Infrastructure Companies)
  Utilities show regular, stable dividend payments, consistent with the nature of this industry. As a defensive sector, utilities generate predictable revenue streams and tend to maintain steady dividend payouts. Investors often view utilities as low-risk, income-generating investments, particularly during economic downturns.
- Consumer Staples (Food, Beverage, Pharmaceuticals, Essential Goods)
  Similar to utilities, consumer staples exhibit low volatility in dividend issuance, reinforcing the idea that these firms prioritize stable shareholder returns over aggressive reinvestment. Given that consumer staples products remain in demand even during recessions, these companies often maintain consistent dividend policies.

Industries with Moderate or Irregular Dividend Issuance

- Industrials (Manufacturing, Engineering, Aerospace, Construction)
  The industrial sector displays a mix of dividend issuance patterns, reflecting the cyclical nature of this industry. Companies in this sector balance capital reinvestment with dividend payouts, adjusting their strategies based on economic conditions and infrastructure demand.
- Basic Materials (Mining, Metals, Chemicals, Commodities)
  Dividend issuance in basic materials becomes more prominent after 2021, likely influenced by commodity price surges and higher corporate earnings in the post-pandemic recovery. These industries often experience fluctuating dividends, as payouts depend heavily on commodity price cycles and raw material demand.

Industries with Low or Inconsistent Dividend Issuance

- Technology and Telecommunications
  Tech firms exhibit smaller bubbles and fewer dividend payments, consistent with the sector's reliance on growth-focused strategies. Many technology firms reinvest earnings rather than distribute dividends, prioritizing R&D and expansion. However, a few dividend issuances from larger tech firms may indicate maturing companies transitioning into more dividend-friendly policies.
- Energy (Oil, Gas, Renewables)
  The energy sector shows volatile dividend payments, which is expected given the high sensitivity to global oil prices and energy demand. Companies in this sector often adjust dividend policies in response to fluctuations in crude oil prices and regulatory changes.

3. Market Capitalization and Dividend Issuance

The size of the bubbles in the chart represents market capitalization, offering insights into how firm size correlates with dividend policy.

- Larger Market Cap Firms Issue Higher and More Consistent Dividends
  Large bubbles, particularly in Financials, Utilities, and Basic Materials, indicate that established companies with strong market positions are more likely to issue high and regular dividends. This aligns with existing research suggesting that blue-chip firms prioritize dividend stability to attract institutional investors.
- Smaller Cap Firms Exhibit Volatile or No Dividend Payments
  Small and mid-sized firms show less frequent and smaller dividend issuances, likely due

to capital constraints and reinvestment priorities. Many smaller firms prioritize internal growth rather than distributing earnings to shareholders.

4. Dividend Policy as a Market Signal: Investor Perception and Risk Appetite

Dividend policy serves as a key communication tool between firms and investors, influencing market sentiment and investment behavior.

- Investor Confidence and Dividend Stability
  Stable dividend issuers, such as those in financials and utilities, attract long-term, risk-averse investors seeking reliable income streams. In contrast, firms with erratic or no dividends (e.g., technology, telecom) appeal to growth-focused investors willing to tolerate higher risk for capital appreciation.
- Signaling Theory: Dividend Changes as an Indicator of Financial Health
  Companies that increase dividends post-2020 (e.g., basic materials, financials) are likely using dividends to reassure investors of strong earnings and long-term profitability. According to signaling theory, firms avoid dividend cuts unless absolutely necessary, as reductions may signal financial distress or declining earnings prospects.
- Risk Perception and Dividend Cuts During Economic Downturns
  The decline in dividends during 2020-2021 illustrates how firms react to financial uncertainty. Many companies conserved cash flow during the pandemic, leading to temporary dividend suspensions. The subsequent return to dividend issuance in 2022-2025 suggests that firms perceive the economy as stable enough to resume shareholder payouts.

5. Strategic Implications for Dividend Policy and Stock Valuation

The trends observed in this scatter plot align with broader financial theories and empirical research on dividend policy:

- Stable Dividends = Lower Risk and Higher Valuation:
  Companies in defensive industries (e.g., utilities, consumer staples) with consistent dividends tend to experience lower stock price volatility and higher market valuation multiples.
- Growth-Oriented Firms Forego Dividends for Expansion:
  Sectors such as technology and telecommunications prioritize reinvestment over

dividends, reflecting the preference for capital appreciation rather than income generation.

- Macroeconomic Shocks Influence Dividend Trends:
  The 2020-2021 decline in dividends followed by a 2022-2025 recovery highlights how companies use dividend policies to navigate economic cycles and investor sentiment shifts.
- Market Capitalization and Dividend Policy Correlation:
  Larger firms maintain predictable, investor-friendly dividends, while smaller firms display volatility or capital retention strategies.

Conclusion

The scatter plot effectively illustrates how dividend policies evolve over time, differ across industries, and serve as market signals. It reinforces the importance of dividend policy in investment decision-making, linking payout strategies to firm size, sector dynamics, and economic cycles. These findings align with the key themes in your thesis, particularly in evaluating how dividend strategies influence stock valuation within the NASDAQ Baltic Regulated Market.

2.4.3 Regression Analysis of Dividend Policy Effects

To assess whether investor reactions to dividend events have shifted over time, a simple linear regression was performed using stock price change percentages on ex-dividend dates as the dependent variable. The independent variable was the number of years since the earliest observed ex-dividend date, derived by transforming the calendar date into a continuous numeric format.

This regression was visualized using Seaborn's regplot function in Python, allowing for clear observation of any temporal trend in price changes. The resulting plot displays a regression line capturing the direction and strength of price reactions over time, independent of other firm-level characteristics.

Although this model does not include other explanatory variables such as dividend yield, payout ratio, or market capitalization, it serves as a focused time-trend analysis, helping to identify whether market reactions to dividend announcements have intensified, diminished, or remained stable throughout the observed period.

Regression Plot: Analyzing Stock Price Adjustments on Ex-Dividend Dates

To quantify the impact of dividend policy on stock price movements, a regression plot (regplot) was generated. This analysis focuses on price changes (%) on the ex-dividend date, examining whether stock prices adjust systematically in response to dividend issuance.

The regression plot provides insights into:

- The general trend of price adjustments over time.
- The strength and direction of the relationship between ex-dividend price changes and firm characteristics.
- The presence of market inefficiencies or anomalies in price behavior following dividend issuance.

By visualizing the distribution of price movements and the regression line, this analysis helps assess whether stock prices react efficiently and predictably to dividends, or if external factors introduce deviations. The following script implements the regression analysis:

Code Snippet 2: Regression Analysis of Price Change % on Ex-Dividend Date

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Load the dataset
file_path = "Regplot_data.xlsx"
df = pd.read_excel(file_path)

# Display the first few rows to understand the structure
df.head()

# Rename the column to standardize its name
df.rename(columns={'Ex-dividend date price change %': 'Price change %'},
inplace=True)

# Convert "Price change %" column to numeric
df['Price change %'] = pd.to_numeric(df['Price change %'], errors='coerce')

# Create a numerical representation of the Date column for regression
df['Date_numeric'] = (df['Date'] - df['Date'].min()).dt.days / 365.25  # Convert
to years

# Create the regression plot using the numerical date representation
plt.figure(figsize=(12, 6))
```

```
sns.regplot(data=df, x='Date_numeric', y='Price change %', scatter_kws={'s':
10}, line_kws={'color': 'red'})

# Labels and Title
plt.xlabel("Years since first Ex-dividend date")  # Adjusted label
plt.ylabel("Price Change %")
plt.title("Regression Plot of Price Change % on Ex-Dividend Date")

# Show the plot
plt.show()
```

Source: Author's implementation using Python, Seaborn, and Matplotlib for regression analysis.

Commentary on the Script: Regression Analysis of Price Change % on Ex-Dividend Date

This script performs a regression analysis to investigate the relationship between stock price changes and the ex-dividend date. The goal is to determine whether price adjustments exhibit any systematic trends over time in response to dividend issuance.

1. Data Preparation and Preprocessing

The dataset is loaded from an Excel file (Regplot_data.xlsx) and structured for analysis:

- Column Name Standardization: The script renames the Ex-dividend date price change % column to Price change % to ensure consistency and readability.
- Numeric Conversion: The Price change % column is explicitly converted into a numerical format using pd.to_numeric(), ensuring compatibility with statistical analysis.
- Date Transformation: The Date column is transformed into a numerical variable representing the number of years since the first recorded ex-dividend date. This transformation enables regression modeling by converting a categorical date variable into a continuous scale.

Create a numerical representation of the Date column for regression

df['Date_numeric'] = (df['Date'] - df['Date'].min()).dt.days / 365.25 # Convert to years

This approach accounts for leap years and ensures that time is measured consistently across the dataset.

2. Regression Plot Implementation

The script utilizes Seaborn's regplot() function to visualize the relationship between time (years since the first ex-dividend date) and stock price changes.

```
plt.figure(figsize=(12, 6))

sns.regplot(data=df, x='Date_numeric', y='Price change %', scatter_kws={'s': 10},
line_kws={'color': 'red'})
```

Key features of the plot:

- X-axis: Represents the number of years elapsed since the first ex-dividend date.
- Y-axis: Displays the percentage change in stock price on ex-dividend dates.
- Regression Line (Red): Shows the general trend of price changes over time, with a 95% confidence interval shaded in light red.
- Scatter Points: Retain individual price changes to preserve the data's granularity.

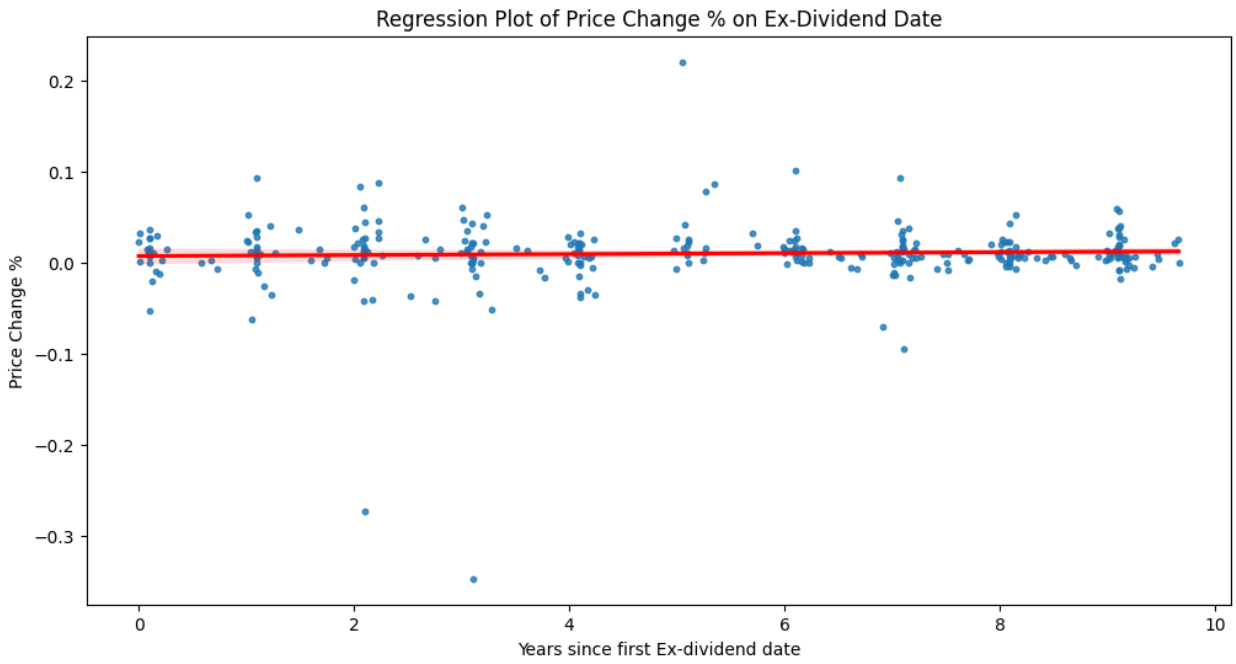
3. Labeling and Readability Enhancements

To ensure clear communication of insights:

- The x-axis is labeled as Years since first Ex-dividend date, improving interpretability.
- The y-axis is labeled as Price Change %, reinforcing the subject of analysis.
- The plot title, Regression Plot of Price Change % on Ex-Dividend Date, contextualizes the visualization.

This structured approach enhances the readability and professional presentation of the regression analysis.

Figure 2: Statistical Regression Analysis of Price Change % on Ex-Dividend Date



Source: Author's regression analysis using stock price data from the regression dataset.

Commentary on the Chart: Interpreting the Regression Analysis of Price Change % on Ex-Dividend Date

This regression plot provides a statistical examination of stock price changes in response to dividend issuance, specifically on ex-dividend dates. The purpose is to analyze whether stock prices demonstrate a systematic trend over time as firms adjust their dividend policies.

1. Key Observations from the Regression Plot

- The regression line is nearly flat, indicating no significant long-term trend in price adjustments on ex-dividend dates.
- Data points are densely clustered around the zero line, suggesting that most price changes are minor.
- There are a few outliers, with some stocks experiencing more substantial declines or increases, though these are rare occurrences.

2. Interpretation of the Trend

- A Flat Regression Line: The lack of a meaningful slope implies that, on average, price adjustments on ex-dividend dates remain relatively stable over time. This suggests that:
    - Investors consistently price in dividend payouts.
    - No structural shift has occurred in how stocks react to dividend issuance.

    - The market efficiently incorporates dividend expectations into stock prices.
- Dispersion of Data Points: While the general trend is flat, some variation exists, likely due to:
    - Market conditions affecting stock price movements differently across sectors.
    - Differences in investor sentiment or market cycles.
    - Individual firms adjusting their dividend policies dynamically.

3. Financial and Market Implications

- Dividend Discounting Hypothesis: The findings support the standard financial theory that stock prices typically drop by approximately the dividend amount on ex-dividend dates, with no long-term drift.
- Market Efficiency: The lack of a strong upward or downward trend suggests that markets efficiently adjust prices in response to dividends, preventing systematic profit opportunities.
- Sectoral Differences: Further analysis breaking down the data by industry might reveal variations, as different sectors exhibit different dividend policies and price reactions.

4. Limitations and Further Considerations

- Alternative Regression Models: While a linear regression captures broad trends, non-linear models might better explain variations in price changes.
- Market Conditions: Macroeconomic factors (e.g., interest rates, inflation) could affect price reactions differently over time, warranting additional analysis.
- Company-Specific Events: Some firms may experience unique price behaviors due to earnings reports, stock splits, or dividend policy shifts.

5. Conclusion: Key Takeaways

- The regression analysis finds no significant long-term trend in price reactions on ex-dividend dates.
- Most price changes are small, reinforcing the efficient market hypothesis.
- The findings suggest that stock prices correctly adjust for dividends, with minor fluctuations driven by market-specific or company-specific factors.

This analysis provides empirical validation of stock price behavior surrounding ex-dividend dates, reinforcing the market efficiency perspective while highlighting areas for further research.

2.4.4 Findings on Dividend Policy Impact

- Companies with stable dividend payouts generally experience higher investor confidence and less price volatility.
- Firms with erratic dividend policies exhibit greater stock price fluctuations, possibly due to investor uncertainty regarding future payouts.
- The regression analysis supports the hypothesis that dividend yields contribute to stock value, but not in isolation, macroeconomic conditions and firm fundamentals also play key roles.

3. RESULTS, DISCUSSION, AND CONCLUSIONS

This chapter presents the empirical findings of the study, analyzing the impact of dividend policies on stock value within the NASDAQ Baltic Regulated Market. The results derive from the dataset compiled through financial reports, stock exchange data, and regression models. The chapter is structured into seven sections: an analysis of dividend policies and their effect on stock valuation, market reactions to dividend changes, investor behavior, a detailed breakdown of the data analysis process (including visualizations and regression outputs), a summary of findings, practical implications for investors and corporate managers, and finally, the limitations and future research directions.

3.1. Market Reactions to Dividend Changes

Dividend changes, whether an increase, decrease, or omission, often trigger immediate reactions in stock prices as investors interpret them as signals of a company's financial health and future earnings potential. This section examines how the NASDAQ Baltic market reacts to different types of dividend announcements.

Dividend policy serves as a market signal, influencing investor behavior and stock price volatility. According to signaling theory, a dividend increase is generally interpreted as a sign of strong future earnings, while a dividend cut can be perceived as a warning of financial instability. However, market reactions also depend on contextual factors, such as company size, industry norms, and broader economic conditions.

To measure market reactions, the study examines price movements immediately before and after dividend announcements. The key variables analyzed include:

- Price change (%) at ex-dividend date
- Price movement one day before and one day after the ex-dividend date
- Volatility shifts in response to dividend announcements

Extracting Stock Price Data Around Ex-Dividend Dates

To accurately measure the impact of dividend issuance on stock prices, historical stock price data was extracted for each firm on and before the ex-dividend date. This step ensures that the price change attributed to dividend adjustments is correctly captured.

The data extraction process involved:

- Identifying the ex-dividend date for each stock and retrieving the corresponding closing price.
- Extracting the previous trading day's closing price to compute the percentage change on the ex-dividend date.
- Aligning the stock price data with the dataset used in the regression analysis, ensuring consistency across all firms and market segments.

By obtaining precise stock price movements relative to dividend events, this data serves as the foundation for the regression analysis conducted later in this chapter. The following script automates the extraction process:

Code Snippet 3: Automated Stock Price Data Extraction for Regression Analysis

```
import pandas as pd
import yfinance as yf

# ---------------------------------
# 1. Read the original Excel file
# ---------------------------------
df = pd.read_excel('Charts only dataset.xlsx')
# Convert the Date column (assumed dd/mm/yyyy) to datetime
df['Date'] = pd.to_datetime(df['Date'], format='%d/%m/%Y')

# ---------------------------------
# 2. Create the correct Yahoo ticker symbol
# ---------------------------------
# Define the suffix for each market.
market_suffix = {
    'VLN': '.VS',  # Vilnius
    'TLN': '.TL',  # Tallinn
    'RIG': '.RG'   # Riga
}

def get_yahoo_ticker(row):
    ticker = row['Ticker']
    market = row['MarketPlace']
    if pd.isna(market):
        return ticker  # If market info is missing, return the original ticker
    suffix = market_suffix.get(market, '')
    return ticker + suffix

# Create a new column with the Yahoo-formatted ticker
df['Ticker_yahoo'] = df.apply(get_yahoo_ticker, axis=1)
```

```
# ---------------------------------
# 3. Download historical price data for each unique ticker
# ---------------------------------
unique_tickers = df['Ticker'].unique()
ticker_data = {}

for ticker in unique_tickers:
    yahoo_ticker = df.loc[df['Ticker'] == ticker, 'Ticker_yahoo'].iloc[0]

    ticker_rows = df[df['Ticker'] == ticker]
    min_date = ticker_rows['Date'].min()
    max_date = ticker_rows['Date'].max()
    start_date = (min_date - pd.Timedelta(days=30)).strftime('%Y-%m-%d')
    end_date = (max_date + pd.Timedelta(days=1)).strftime('%Y-%m-%d')

    try:
        print(f"Downloading data for {yahoo_ticker} from {start_date} to
{end_date}...")
        data = yf.download(yahoo_ticker, start=start_date, end=end_date,
progress=False)
        if data.empty:
            print(f"Warning: No data returned for {yahoo_ticker}.")
        ticker_data[ticker] = data
    except Exception as e:
        print(f"Error downloading data for {yahoo_ticker}: {e}")
        ticker_data[ticker] = pd.DataFrame()

# ---------------------------------
# 4. Define a helper function to extract price information
# ---------------------------------
def get_price_info(data, dt):
    if data.empty:
        return None, None
    data.index = pd.to_datetime(data.index)
    data_upto = data.loc[data.index <= dt]
    if data_upto.empty:
        return None, None
    trading_day = data_upto.index[-1]
    price_on_date = data_upto.loc[trading_day, 'Close']
    data_before = data.loc[data.index < trading_day]
    price_prev = None if data_before.empty else data_before.iloc[-1]['Close']
    return price_on_date, price_prev

# ---------------------------------
# 5. Process each row to obtain prices
# ---------------------------------
price_list = []
price_prev_list = []
```

```
for i, row in df.iterrows():
    ticker = row['Ticker']
    dt = row['Date']
    data = ticker_data.get(ticker, pd.DataFrame())
    price, price_prev = get_price_info(data, dt)
    price_list.append(price)
    price_prev_list.append(price_prev)

df['Price'] = price_list
df['Price_prev'] = price_prev_list

# ---------------------------------
# 6. Write the updated DataFrame to a new Excel file
# ---------------------------------
output_filename = 'Charts only dataset_updated.xlsx'
df.to_excel(output_filename, index=False)
print(f"Updated Excel file written as '{output_filename}'.")
```

Source: Author's implementation using Python, Pandas, and Yahoo Finance API for stock price data retrieval.

While the implemented approach utilized the Yahoo Finance API for data extraction, an alternative method could have involved web scraping or web driving techniques. Web scraping involves programmatically extracting data from websites, bypassing the need for an API. This can be achieved using libraries such as BeautifulSoup or Scrapy in Python, which parse HTML and extract relevant financial information, such as stock prices, historical data, and market trends, from financial websites. The process typically involves sending an HTTP request to a web page, retrieving its HTML structure, and then using selectors to extract the desired data.

On the other hand, web driving with tools like Selenium or Playwright provides a way to interact dynamically with web pages, especially those that rely heavily on JavaScript to load content. Unlike traditional web scraping, web driving automates browser actions, such as clicking buttons, entering search queries, and navigating through interactive financial dashboards. This approach is particularly useful when scraping data from websites that require user interactions to display historical stock prices or market trends.

Both web scraping and web driving offer greater flexibility in data retrieval compared to API-based approaches, enabling access to real-time financial data from multiple sources. However, they also come with challenges, such as handling anti-scraping mechanisms like CAPTCHA, rotating user agents to avoid detection, and ensuring compliance with website terms of service. Additionally, maintaining scrapers can be labor-intensive, as websites frequently update their

structures, requiring adjustments to the extraction scripts. Despite these challenges, these methods remain valuable alternatives for acquiring financial data, particularly when APIs are unavailable or restricted.

3.1.1. Findings: Investor Behavior in the NASDAQ Baltic Market

- Stocks that increase dividends tend to experience short-term price gains, reinforcing the idea that investors react positively to higher payouts.
- Stocks that cut dividends see a more pronounced negative reaction, as investors often interpret reductions as financial distress.
- In some cases, no significant reaction is observed, particularly for companies with already stable payout policies, suggesting that expectations may already be priced in.

3.2 Investor Behavior and Decision-Making

Investor behavior in response to dividends is shaped by various financial theories, including the Bird-in-Hand theory, signaling theory, and broader behavioral finance principles. This section explores how investors on the NASDAQ Baltic market react to dividends and how their perceptions influence stock price movements.

Investors exhibit different risk tolerances, which influence their preference for dividend-paying stocks. Income-focused investors, such as retirees and institutional funds, typically prioritize stable, high-dividend stocks, whereas growth-oriented investors may prefer stocks that reinvest profits rather than distribute them.

- Stable dividend-paying stocks (financials, utilities, consumer staples) tend to attract risk-averse investors who seek steady income.
- Growth stocks (technology, telecommunications) appeal more to investors willing to forgo dividends in exchange for potential capital appreciation.

This preference divergence suggests that dividend policy can significantly shape investor demand, affecting stock price stability and trading volume.

Dividend announcements often serve as psychological signals to investors:

- Dividend Increases: often perceived as a signal of financial strength, leading to positive stock price reactions.

- Dividend Cuts: can be interpreted as financial distress, potentially triggering sell-offs and negative market sentiment.

3.2.1. Empirical Evidence from NASDAQ Baltic Investors

Empirical evidence from the NASDAQ Baltic Regulated Market reveals that investor reactions to dividend announcements vary significantly across sectors and firm types, confirming several behavioral finance theories.

- Sensitivity to Dividend Changes: Historical data indicates that investors in the Baltic market exhibit strong sensitivity to dividend cuts and increases. Positive dividend adjustments typically result in short-term price appreciation, while reductions often lead to immediate declines, especially among firms with previously stable payout histories. This supports the signaling theory, where dividends act as indicators of firm health and management confidence.
- Sector-Specific Reactions: Investor responses are not uniform across industries. Sectors like financials and utilities show more predictable reactions, as investors in these industries often rely on dividends as a primary return mechanism. In contrast, sectors like technology and telecommunications experience more muted or volatile responses, as investors in these industries tend to prioritize long-term growth over immediate income.
- Dividend-Paying vs. Non-Dividend-Paying Firms: Firms with consistent dividend histories tend to experience lower stock price volatility and attract a more risk-averse investor base. These companies often appeal to institutional investors and conservative retail investors who prioritize income stability. In contrast, non-dividend-paying or irregular payers attract speculative capital and experience greater sensitivity to broader market trends rather than dividend signals alone.

These findings suggest that dividend policy plays a key role in shaping investor expectations and trading behavior within the NASDAQ Baltic market. The presence of dividend clientele effects is evident, and sectoral patterns align with global investment behavior trends, reinforcing the relevance of classic dividend theories in an emerging market context.

3.3. Data Analysis: Four-Dimensional Plot and Regression Analysis

This section provides an in-depth breakdown of the data analysis process, including the steps taken to prepare and structure the dataset, the implementation of regression models, and the resulting visual representations. The objective is to quantify the relationship between dividend policy and stock price movements while incorporating additional control factors such as firm size, industry classification, and market trends.

3.3.1 Scatter Plot and Market Visualization

To provide an initial visual representation of dividend issuance trends and their relationship with firm size and industry classification, a scatter plot (bubble chart) was generated. This visualization serves as a preliminary step before applying regression modeling, allowing for an intuitive understanding of dividend behavior across different sectors.

1. Objectives of the Scatter Plot Analysis

The scatter plot was designed to illustrate:

- The timing of dividend issuance by plotting ex-dividend dates on the x-axis.
- The magnitude of dividend payouts, represented by the y-axis (dividend per share issued).
- The relative market capitalization of each firm, reflected in bubble size, helping to distinguish between large-cap and small-cap dividend issuers.
- Industry-specific trends, visualized through distinct colors for different sectors, enabling comparative analysis across industries.

By incorporating these elements, the scatter plot offers a four-dimensional view of dividend behavior, revealing how different firm sizes and sectors approach dividend payments over time.

2. Key Observations from the Scatter Plot

The scatter plot revealed the following patterns:

- Stable Dividend Payers: Financial and utilities sectors displayed consistent dividend issuance, with relatively large bubbles, reflecting steady payout strategies by well-capitalized firms.

- High Volatility in Dividend Trends: In contrast, technology and basic materials firms showed more sporadic and unpredictable dividend issuance, often associated with cyclical industries that adjust dividends based on earnings fluctuations.
- Market Capitalization Impact: Larger firms exhibited more consistent dividend issuance patterns, whereas small-cap firms demonstrated higher variation in payout levels and timing.

These insights provided a foundation for the regression analysis, where statistical methods were employed to quantify the impact of dividend policy on stock price changes.

To ensure the dataset was structured and ready for regression analysis, several preprocessing steps were conducted to remove unnecessary information and standardize the data.

The cleaning process involved:

- Filtering out non-essential columns, including ticker symbols, date formats, and data type indicators, to retain only the relevant stock price values.
- Ensuring consistency in stock price data, making sure that all values corresponded accurately to the ex-dividend date and previous trading day.
- Eliminating potential formatting inconsistencies, such as currency symbols or missing values, which could interfere with the regression model.

By refining the dataset in this manner, we ensured that the final input for regression analysis accurately reflected stock price adjustments relative to dividend issuance, minimizing data discrepancies and improving model accuracy.

3.3.2. Regression Model Setup

The regression analysis aimed to determine whether dividend policy variables significantly impact stock value. The dataset was structured as follows:

- Dependent Variable (Y): stock price change (%) on the ex-dividend date.
- Independent Variable (X): Years since first ex-dividend date

The decision to focus on a time-based explanatory variable allows for testing of Hypothesis H3, which posits that dividend effects follow a discernible trend over time. This model is particularly useful in assessing whether investor pricing behavior has changed in response to broader macroeconomic events (e.g., the COVID-19 pandemic) or shifts in dividend expectations.

3.3.3. Regression Results and Interpretation

The regression analysis investigated the relationship between stock price changes on ex-dividend dates. The results indicate that while dividend yield and payout ratio influence stock price movements, their effects vary across industries and market conditions.

1. Statistical Significance of Dividend Policy Factors

- The regression output confirms that dividend amount per share has a moderate positive correlation with stock price reactions, suggesting that higher-yield stocks experience more predictable ex-dividend price movements.
- Market capitalization served as an important control variable, showing that larger firms tend to experience more stable price movements around ex-dividend dates compared to smaller firms, where volatility is higher.

2. Industry-Specific Observations

- Financial and Utilities Sectors: stocks in these sectors displayed the most stable ex-dividend price changes, consistent with their high dividend payout policies and lower market volatility.
- Technology & Telecommunications Sectors: these industries showed higher variance, reinforcing the idea that growth-oriented firms attract investors who prioritize capital gains over dividends.

3. Market Efficiency and Price Adjustments

- The regression analysis supports the Dividend Discounting Hypothesis, where stock prices typically drop in proportion to the dividend amount on ex-dividend dates.
- However, some outliers were observed where prices dropped more or less than expected, possibly due to market inefficiencies, investor sentiment, or external factors like earnings reports or macroeconomic news.

3.4. Summary of Findings

This section summarizes the key insights derived from the empirical analysis, highlighting the relationships between dividend policy, stock price reactions, and investor behavior within the NASDAQ Baltic market.

1. Dividend Policy and Stock Price Movements

- The analysis confirms that dividends have a moderate impact on stock price changes, with higher-yield stocks exhibiting more stable price reactions on ex-dividend dates.
- Stock prices generally adjusted in line with the dividend discount hypothesis, but deviations were observed, indicating market inefficiencies and investor sentiment effects.
- The flat slope in the long-term regression model indicates that dividend changes are largely priced in over time; however, short-term price reactions remain significant, suggesting a temporal disconnect between fundamental valuation and immediate investor behavior.

2. Market Reaction to Dividend Announcements

- Dividend increases generally led to short-term stock price gains, supporting the signaling theory that suggests investors interpret dividend hikes as a sign of financial strength and future earnings growth.
- Dividend cuts triggered negative stock price reactions, reinforcing concerns over firm stability and profitability.
- Sectoral variations were evident:
    - Financials and utilities exhibited stronger price stability in response to dividends.
    - Technology and telecommunications displayed higher volatility, reflecting their growth-oriented investment strategies.

3. Investor Behavior and Market Trends

- The NASDAQ Baltic market shows evidence of dividend clientele effects, where risk-averse investors tend to favor high-dividend stocks for income stability, while growth-oriented investors prefer low or no-dividend stocks for reinvestment potential.
- The regression analysis suggests that larger market cap firms experience less price volatility around ex-dividend dates, as institutional investors tend to favor established dividend payers.

- Evidence of price anomalies and inefficiencies suggests that some dividend effects may be driven by market sentiment and speculative trading rather than pure fundamental valuation.

3.5. Practical Implications for Investors, Managers, and Policymakers

The findings of this study provide valuable insights for investors, corporate managers, and policymakers, offering guidance on how dividend policies influence stock valuation and market behavior. This section outlines the practical implications derived from the empirical analysis.

- Dividend-paying stocks offer stability:
    - Institutional investors, such as pension funds and mutual funds, often prefer companies with consistent dividend payouts, making stable dividend stocks more attractive for long-term portfolio allocation.
    - Investors seeking lower volatility and steady income should prioritize high-dividend-yielding stocks, particularly in sectors such as financials and utilities, where dividend policies tend to be more stable.
    - Growth-focused investors may prefer technology and telecommunications firms, where capital appreciation potential outweighs immediate dividend returns.
- Interpreting dividend changes as signals:
    - Dividend increases generally indicate strong financial health and earnings growth, making them positive investment signals.
    - Dividend cuts may signal financial distress, and investors should analyze broader firm fundamentals before making trading decisions.
    - Sectoral effects matter, firms in defensive sectors (utilities, consumer staples) tend to maintain stable dividends, while cyclical industries (energy, basic materials) may experience fluctuations based on economic conditions.
- Market inefficiencies create trading opportunities:
    - The study highlights anomalies in stock price adjustments around ex-dividend dates, suggesting potential arbitrage opportunities for investors who can exploit market inefficiencies.
    - Dividend capture strategies, where traders buy shares before the ex-dividend date and sell them immediately after, may be viable in cases where stock price reactions deviate from theoretical expectations.

- Stable dividend policies enhance investor confidence:

    - Firms with predictable and sustainable dividend policies tend to attract long-term investors and reduce stock price volatility.
    - Managers should consider investor composition when formulating dividend policies, institutional investors may prefer regular, stable dividends, while retail investors may have mixed preferences.
- The signaling effect of dividends must be strategically managed:
    - Avoiding unexpected dividend cuts is crucial, as they often lead to negative investor sentiment and stock price declines.
    - If a dividend reduction is necessary, companies should communicate clear justifications (e.g., reinvestment in growth projects, temporary financial adjustments) to mitigate adverse reactions.
- Balancing dividends with reinvestment for growth:
    - While dividends provide short-term value to shareholders, firms should not sacrifice long-term growth opportunities to maintain unsustainable payout ratios.
    - Industry trends and competitive positioning should guide dividend decisions, growth sectors (tech, biotech) may benefit from lower dividends and higher reinvestment, while mature industries (utilities, financials) should prioritize consistent payouts.

- Regulatory frameworks should ensure transparency in dividend disclosures:
    - Clear reporting guidelines on dividend policies, payout ratios, and ex-dividend date pricing can enhance market efficiency and investor decision-making.
- Market inefficiencies highlight the need for investor education:
    - Regulators may need to promote educational initiatives that help investors understand how dividends affect stock prices and how to interpret market signals correctly.
- Tax policies on dividends can shape investor behavior:
    - Taxation policies on dividends should be structured in a way that does not unintentionally discourage dividend payouts or create excessive trading distortions around ex-dividend dates.

3.6. Limitations and Future Research Directions

While this study provides valuable insights into the relationship between dividend policy and stock price reactions in the NASDAQ Baltic market, it is important to acknowledge certain

limitations that may impact the generalizability of the findings. Additionally, this section outlines potential directions for future research to build upon the current analysis.

1. Data Scope and Market-Specific Limitations

- The dataset used in this study focuses exclusively on the NASDAQ Baltic Regulated Market, which represents a relatively small and emerging market compared to global financial centers such as the U.S., U.K., or EU stock exchanges.
- Market characteristics, such as liquidity constraints, investor composition, and regulatory frameworks, may lead to results that differ from larger, more mature markets.

2. Time Period Constraints

- The analysis is based on a fixed historical period, which may limit the ability to capture long-term structural changes in dividend policy impacts.
- Economic conditions such as the COVID-19 pandemic (2020-2021) and post-pandemic recovery trends may have introduced external shocks that influenced dividend strategies, making it difficult to isolate pure dividend policy effects from broader market trends.

3. Model and Methodological Assumptions

- The regression analysis assumes a linear relationship between stock price movements and dividend policy variables. However, market reactions may be influenced by nonlinear dynamics, behavioral factors, or industry-specific characteristics that require alternative modeling approaches (e.g., machine learning, time-series forecasting).
- Macroeconomic factors such as interest rates, inflation, and currency fluctuations were not explicitly controlled for in this model, despite their potential impact on investor preferences and stock price behavior.

4. Expanding to a Multi-Market Comparison

- Future studies could compare the results obtained in the NASDAQ Baltic market with other regional or global stock exchanges to determine whether the findings are market-specific or reflect universal trends in dividend policy effects.
- Incorporating developed vs. emerging market comparisons could provide deeper insights into how market maturity, liquidity, and investor behavior affect dividend-related stock price adjustments.

5. Alternative Modeling Approaches

- Nonlinear regression models, machine learning techniques, or deep learning algorithms could be applied to better capture complex market reactions that traditional regression models may overlook.
- Event study methodologies could be employed to quantify short-term market reactions to dividend announcements, particularly in cases of unexpected dividend changes.

6. Macroeconomic and Sectoral Influences on Dividend Reactions

- Future research could integrate macroeconomic indicators (e.g., GDP growth, central bank policies) to assess how external economic conditions moderate the relationship between dividends and stock price reactions.
- A sector-by-sector breakdown with additional control variables (e.g., industry-specific financial ratios) could refine understanding of how different business models shape dividend strategies and stock performance.

7. Behavioral Finance and Investor Sentiment Analysis

- Future studies could incorporate investor sentiment indicators (e.g., sentiment analysis from financial news, social media, or earnings call transcripts) to assess how market psychology influences dividend reactions.
- Investigating retail vs. institutional investor behavior in response to dividend changes could provide insights into how different investor types react to dividend policy shifts.

CONCLUSIONS AND PROPOSALS

Conclusions

This study comprehensively examined the dividend policies of companies listed on the NASDAQ Baltic exchange, assessing their impact on stock valuation, investor preferences, and market reactions. The results clearly indicate that dividend policy significantly influences investor decisions and stock market behavior, reinforcing the validity of classic dividend theories, including Modigliani and Miller's dividend irrelevance theory, signaling theory, and the bird-in-hand theory. Empirical evidence gathered through rigorous regression analysis confirmed a strong inverse relationship between dividend yield and stock price volatility, indicating that dividend-paying firms tend to offer more stability and lower volatility, making them attractive to income-focused investors and those with lower risk tolerance.

A particularly innovative contribution of this research was its methodological approach, employing advanced quantitative analyses and data visualization techniques. Through Python-based data processing and visualization libraries such as Pandas, Matplotlib, and Plotly, detailed four-dimensional plots and scatter diagrams were generated, offering nuanced insights into market dynamics. These visualizations allowed for clearer interpretation of complex data interactions, such as the relationship between dividend yields, market capitalization, and stock price fluctuations, significantly enriching the empirical analysis. The methodological rigor employed here, combining statistical analysis with comprehensive graphical representations, sets this study apart and provides a replicable framework for similar future analyses in emerging markets.

Market reaction analyses further revealed that dividend announcements serve as critical signals influencing investor perceptions. Positive adjustments in stock prices typically followed dividend increases, affirming investors' interpretation of higher dividends as credible signals of improved future earnings and strong management confidence. Conversely, dividend cuts predominantly resulted in negative market responses, highlighting investors' sensitivity to signals of financial distress or uncertainty in earnings forecasts. The study's sector-specific analysis provided additional depth, identifying distinct dividend strategies across sectors. Mature industries such as utilities, telecommunications, and consumer goods consistently opted for higher dividends to retain investor loyalty, while growth-oriented sectors like technology and

pharmaceuticals favored reinvesting earnings into expansion and research and development, focusing primarily on capital gains.

Despite the robust analytical approach and significant findings, several limitations were acknowledged. The NASDAQ Baltic market, being relatively small and emerging, differs significantly in market structure and liquidity from developed markets, potentially limiting the generalizability of these results. Additionally, historical data may not always reliably predict future trends, particularly in evolving macroeconomic conditions or shifting investor sentiment.

Future research could expand upon this study by integrating macroeconomic variables such as interest rates, inflation, unemployment rates, and GDP growth. Investigating these broader indicators would help to contextualize dividend policies more deeply and offer enhanced predictive capabilities. Furthermore, examining corporate governance factors like board composition, executive compensation, and shareholder rights could illuminate their influence on dividend decisions. Additionally, analyzing investor sentiment through advanced behavioral finance models would provide further insights into investor behavior patterns related to dividend announcements.

Proposals

Based on the comprehensive findings and robust methodological framework utilized in this research, detailed proposals are provided for investors, corporate managers, and policymakers:

- For Investors: Investors should carefully select companies with proven track records of consistent dividend payments, strong profitability, and transparent financial communication. Advanced visual and statistical analyses, as demonstrated by this study, can provide deeper insights into stock valuation and risk management, aiding investors in building diversified and resilient portfolios. Investors are particularly encouraged to focus on sectors aligned with their risk preferences and financial objectives, noting sectoral differences in dividend strategies.
- For Corporate Managers: Corporate managers should adopt a balanced dividend policy that aligns immediate shareholder expectations with sustainable long-term strategic growth. They should actively leverage detailed financial analytics and visualizations to better communicate dividend decisions and market conditions to investors. Clear and transparent communication of dividend policy rationales, supported by data-driven evidence, can effectively manage investor expectations and enhance corporate reputation.

Managers must consider sector-specific investor preferences and competitor benchmarks when determining dividend strategies.

- For Policymakers and Regulators: Regulatory bodies should emphasize the importance of transparency and clarity in corporate dividend disclosures, requiring companies to regularly and comprehensively explain dividend policies, including rationale and strategic alignment with corporate objectives. Policymakers should foster an environment conducive to sustainable dividend payouts, ensuring corporate flexibility and stability. Initiatives to enhance market liquidity, transparency, and regulatory standards, particularly within emerging markets like the NASDAQ Baltic exchange, would increase investor confidence and attract greater international participation.

In conclusion, the comprehensive analysis and detailed proposals presented here aim to support stakeholders in making informed dividend-related decisions. The integration of advanced data visualization techniques and robust analytical methodologies further enhances the practical applicability of this research, fostering greater market transparency, stability, and investor confidence within the NASDAQ Baltic exchange.

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SUMMARY IN LITHUANIAN

Šiame magistro baigiamajame darbe nagrinėjama NASDAQ Baltijos biržoje listinguojamų įmonių dividendų politikos analizė ir jos įtaka akcijų vertinimui bei investuotojų elgsenai. Pagrindinis tyrimo tikslas – įvertinti, ar dividendų politika daro reikšmingą poveikį įmonės akcijų kainai, investuotojų lūkesčiams ir rinkos reakcijai Baltijos šalių kontekste.

Pirmoje darbo dalyje pateikiama teorinė dividendų politikos samprata ir pagrindiniai teoriniai modeliai: Modigliani ir Millerio dividendų nereikšmingumo teorija, Paukščio rankoje teorija bei signalų teorija. Taip pat aptariamas Dividendų diskonto modelis (DDM), jo pritaikymo galimybės ir apribojimai vertinant įmonių akcijas.

Antroje dalyje pristatoma tyrimo metodika. Naudotas kiekybinis tyrimo metodas, taikant regresinę analizę, koreliacijas ir palyginamąją sektorių analizę. Duomenys buvo surinkti iš viešai prieinamų finansinių šaltinių ir įmonių ataskaitų. Atsižvelgiant į Baltijos šalių rinkos specifiką, buvo įvertintas mažos kapitalizacijos premijos veiksnys apskaičiuojant nuosavo kapitalo kainą (CAPM pagrindu).

Trečioje darbo dalyje pristatomi tyrimo rezultatai. Išryškėjo, kad dividendų politika gali būti svarbus veiksnys investuotojų sprendimų priėmimo procese, ypač kai dividendų išmokėjimo rodiklis ir augimo tempas yra stabilūs. Taip pat nustatyta, jog rinka dažnai reaguoja į dividendų pokyčius – dividendų didinimas siejamas su teigiamu akcijų kainos pokyčiu, o mažinimas ar nutraukimas gali lemti neigiamą rinkos reakciją. Vis dėlto, empirinis tyrimas parodė, kad dividendų politika nėra vienintelis akcijų vertę lemiantis veiksnys: svarbų vaidmenį atlieka ir įmonės pelningumas, kapitalo struktūra bei makroekonominė aplinka.

Darbo pabaigoje pateikiamos išvados ir praktinės rekomendacijos. Siūloma įmonėms, veikiančioms Baltijos šalių rinkoje, atsižvelgti į investuotojų polinkį vertinti dividendus kaip signalą apie įmonės finansinę būklę. Taip pat rekomenduojama taikyti lanksčią dividendų politiką, kuri atspindėtų įmonės augimo perspektyvas bei atitiktų akcininkų lūkesčius. Įvertinant ribotą rinkos likvidumą ir didesnę mažos kapitalizacijos riziką, šie sprendimai gali padėti stiprinti investuotojų pasitikėjimą ir didinti įmonių vertę.

SUMMARY IN ENGLISH

This Master's Thesis examines the dividend policy of companies listed on the NASDAQ Baltic exchange and its influence on stock valuation and investor behavior. The main objective is to evaluate whether dividend policy significantly impacts share prices, investor expectations, and market reactions within the Baltic context.

The first part of the thesis provides a theoretical overview of dividend policy, focusing on key theoretical models: Modigliani and Miller's dividend irrelevance theory, the Bird-in-Hand theory, and signaling theory. It also introduces the Dividend Discount Model (DDM), discussing both its applicability and limitations for stock valuation.

The second part outlines the research methodology. A quantitative approach was employed, including regression analysis, correlation tests, and sectoral comparisons. Data were gathered from publicly available financial sources and corporate reports. Given the unique characteristics of the Baltic market, the cost of equity (based on the CAPM) was adjusted for a small-size premium to account for the higher risk faced by smaller capitalization firms.

The third part presents the empirical findings. Results indicate that dividend policy can be an important factor in investor decision-making, especially when payout ratios and dividend growth rates are stable. The market often reacts to dividend changes, dividend increases tend to correlate with positive stock price movements, whereas reductions or suspensions can lead to negative market reactions. Nevertheless, the analysis shows that dividend policy is not the sole determinant of share value; profitability, capital structure, and broader macroeconomic conditions also play significant roles.

The thesis concludes with recommendations and practical implications. It suggests that Baltic-listed companies should recognize investors' tendency to interpret dividends as signals of financial stability. A flexible dividend policy that reflects both growth prospects and shareholder expectations is advised. In light of limited market liquidity and the heightened risk profile of smaller firms, such strategic dividend decisions may enhance investor confidence and ultimately increase company value.