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Impact of the Capital Structure Choice on Firm Performance: A Quantitative Study of the Biggest Healthcare and Energy Companies in the USA

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Abstract

Title	Impact of the Capital Structure Choice on Firm Performance: A Quantitative Study of the Biggest Healthcare and Energy Companies in the USA
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Keywords	Capital Structure, Firm Performance, Standard & Poor's 500, Healthcare industry, Energy Industry, Optimal Capital Structure
Purpose	The aim of this research paper is to provide valuable insights to existing theoretical foundation of choice of capital structure, and exploring the relationship between capital structure and firm performance through testing whether capital structure affects firm performance in the USA listed healthcare and energy companies.
Theoretical perspective	The presented theories cover different views on the preferred choice of capital structure and academics views on its effect on firm performance. The theoretical framework also discusses the determinants of capital structure and industry differences between healthcare and energy firms
Methodology	A quantitative study with a deductive approach was conducted. The empirical material in the form of variables was collected from a Bloomberg terminal on a sample of publicly traded S&P500 firms in healthcare and energy industry.
Empirical foundation	The empirical material is based on chosen metrics from secondary financial statement data that authors used as proxies for analysing capital structure and firm performance.
Conclusion	The performed analysis on the healthcare and energy industry companies has found evidence of the applicability of Modigliani-Miller theory for analysing the effect that capital structure has on firm performance and thus firm value.

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Finally, it is the authors' sincere hope that the reader will find their thesis to be engaging and informative, and that the research findings will provide valuable insights and knowledge.

Sincerely,

Hardy Keller, Jaroslavs Grigoluns & Marco Zanoni

Lund, 23 May

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1. Introduction

According to the Financial Times (2022), the capital structure and the cost of capital play a crucial role in determining the success and survival of firms. The end of an era of ultra-low interest rates and quantitative easing with the arrival of high inflation is estimated to pose a new challenge for business managers, as the difficulty for obtaining capital increases and capital structure decisions become more salient (Financial Times, 2022). The capital structure, which refers to the mix of debt and equity financing used by a company, is a critical strategic decision that impacts various aspects of the firm's operations, such as its ability to fund investments, manage risk, and generate returns for shareholders. In this new competitive market, the importance of managers to showcase their ability in efficiently managing capital structure becomes more important, as the competition for receiving funds has grown (Financial times, 2022).

In their efforts to seek funding, managers need to be able to prove to creditors and shareholders that their company is worth investing into. One of the most important metrics in contemporary finance theories for deciding on whether a company is worth investing into is firm performance (Alam, Uddin, Yazdifar, Shafique & Lartey, 2020). In this paper, the authors explore the empirical evidence on the relationship between capital structure and firm performance, drawing on a wide range of capital structure theories. The aim of this research paper is to identify the key factors that affect the capital structure and analyse the effect that capital structure has on firm performance.

The role of capital structure in corporate finance has been a topic of enduring interest, sparking numerous theories exploring its connection to firm performance. Capital structure theories started evolving in the 1950s, as scholars explored the link between a firm's equity-debt blend and its overall cost of capital. Modigliani and Miller (1958) asserted that

the capital structure of a company doesn't influence its value in a perfect market, while Durand (1952) contradicted this view, arguing that according to the Net Income approach, capital composition was integral to firm valuation.

The 1960s saw the integration of real-world factors such as taxes and bankruptcy costs into these theories. Robichek and Myers (1965) proposed the trade-off theory, suggesting firms balanced the tax perks of debt financing against bankruptcy risks. The pecking order theory by Myers and Majluf (1984) outlined a hierarchy of financing sources, with internal financing prioritised over external sources. Agency theory, focused on the conflicts between managers, shareholders, creditors and its effect on capital structure decisions gained traction in the late 20th century (Jensen & Meckling, 1976). The dawn of the 21st century saw the incorporation of psychological and behavioural economic insights into capital structure theory (Baker & Wurgler, 2002). This ongoing evolution of theories underscores the complexity of linking a firm's financing decisions to its value.

The authors discovered that there is a limited number of contemporary quantitative studies about capital structure effects on firm performance on the sample of the USA healthcare and energy industries. Cole, Yan and Hemley (2015) conducted an empirical study on American energy, healthcare and industrial sector companies, but the data was collected from 2004 to 2013, which makes it a point of interest to conduct a similar study for more recent data and use different variables for testing to expand on the results. The conducted study will further make a contribution to the current literature by adding to the global literature focusing on capital structures effect on firm performance in healthcare companies. Similar research has been conducted globally by Echekoba and Ananwude (2016) where the focus area was Nigerian agricultural and healthcare sector and Lim and Naysary (2022) who focused on listed Malaysian healthcare companies.

The aim of this research paper is to identify the key factors that affect capital structure and analyse the effect that capital structure has on firm performance in USA firms. Understanding the relationship between capital structure and firm performance is crucial for firms seeking to finance investments and grow their businesses, and for investors seeking to assess the risk and return of different investment opportunities (Baker & Martin, 2011). Through highlighting the key effects on how capital structure influences firm performance, this study aims to contribute to a deeper understanding of the fundamental principles of corporate finance and to inform debates on the optimal financing strategies for firms in the USA healthcare and energy companies, thus shedding light on the possibility for companies to reach optimal capital structure.

The study's parameters are set to analyse the relationship between capital structure and firm performance from a global theoretical and empirical literature standpoint, with a focus on the USA. The study's empirical analysis is concentrated on the largest publicly traded healthcare and energy companies in the USA, examining how capital structure influences their firm performance. Secondary financial data from a sample of 87 firms forms the basis of this research.

Supporting the research background, problematization, purpose and scope, the authors seek to explore the effects that different capital structure combinations can have on firm performance by testing three hypotheses to answer the following research question.

Research Question: *How do the different capital structure combinations affect firm performance in the S&P 500 Healthcare and Energy sector firms?*

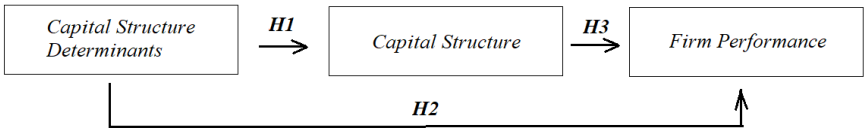

Figure 1. Constructed model for answering research question

2. Theory and Hypotheses

2.1 Capital structure

2.1.1 The Modigliani Miller Theory

One of the earliest mentions of the term “capital structure” was proposed by Modigliani and Miller (1958), when they coined the Modigliani-Miller theorem (M&M), which states that the market value of a company is correctly calculated as the present value of its future earnings and its underlying assets, and is independent of its capital structure. The original theorem assumes absence of taxes, bankruptcy costs, agency costs and asymmetric information in an efficient market (Modigliani & Miller, 1958).

A salient consideration regarding the M&M approach in real world analysis is the weakness of their assumptions, as it assumes a perfectly efficient market without taxes and financing costs (Modigliani and Miller, 1958). Modigliani and Miller (1963) revised their approach with the consideration of tax benefits and capital cost into their theorem. Creating a more sound explanatory theory on real world observations, the revised M&M approach concludes that capital structure does affect firm value, as the lowered cost of debt relative to equity lowers the overall cost of capital; thereby firms are incentivized to optimise costs via selecting debt financing over equity to as large a degree as possible (Modigliani & Miller, 1963). Naturally, as firm performance is an indicator of firm value via stock appraisal, there exists a relationship between firm value, capital structure, and firm performance.

According to Brusov, Filatova and Orekhova (2022) M&M theories make numerous critical assumptions that decrease the validity of the model. They state the biggest assumptions being that the investors are rational and behave instantaneously thus removing arbitration, transaction costs are small and inversely proportional to the magnitude of

investment, there are no corporate taxes, there is no possibility of bankruptcy and that firms exist in perpetuity (Brusov, Filatova & Orekhova, 2022). The final assumption from M&M is that companies have only two types of asset - risk-free debt and risky equity capital, while in reality there exists more alternatives for financing (Brusov, Filatova & Orekhova, 2022).

2.1.2 Net Income Approach

Contrary to the original Modigliani and Miller proposition, the Net Income (NI) approach presented by Durand (1952) argues that the capital structure of a firm has a relationship to its value; and thereby, altering the capital structure will result in changes in the value of a firm. A noteworthy consideration regarding capital structure from the NI approach is the notion of leverage versus equity cost and value; Durand argues that if assumed that debt has lower risk and thereby holds a lower interest rate and cost relative to equity, it would be a preferable financing alternative (Durand, 1952). This proposition is similar to the revised M&M consideration presented by Modigliani and Miller (1963), especially considering the value of a firm being altered by a lowered cost of capital. A lowered proportion of equity hence yields lower overall cost thus increasing firm value (Modigliani & Miller, 1963). It is also noteworthy to consider Durand's NI because of his reference to tax shields and the tax benefits of debt. Interest payments, unlike dividends, are tax-deductible thus there exists a tax shield when preferring debt over equity (Durand, 1952).

It is crucial to note that the assumptions of the NI approach are more relaxed compared to M&M theory, and therefore provide a stronger analysis for this study. Assumptions to note for the NI approach are the following: higher debt does not impact investor confidence level, the only financing sources are debt and equity, markets are perfectly efficient, there is no limitation for the amount of equity, and there are no flotation, transaction, or corporate dividend tax costs (Durand, 1952).

2.1.3 Net Operating Income Approach

The Net Operating Income Approach (NOI), similar to the original Modigliani and Miller approach, postulates that the value of the firm remains uniform regardless of the proportion of liability to stock and vice versa (Durand, 1952). The NOI approach argues that the total investment value, the aggregate of equity and liability, remains the same thus adding any volume of debt or equity to the financing of a firm will add to the total value (Durand, 1952). The primary assumption regarding the relationship between debt and equity holds the following to be true: the benefit derived from the lowered cost of debt is mirrored by the increase in required rate of return from equity shareholders (Durand, 1952). Notably, the NOI approach holds certain assumptions which weaken its practical reliability, specifically the NOI assumes that given no taxes the weighted average cost of capital remains constant.

2.1.4 Agency theory

Agency theory is an organizational and economic theory that explains the relationship between a principal and agent. Jensen and Meckling (1976) defined agency relationships as contractual agreements in which one or more individuals - principals - enlist the services of the agent to carry out a task on their behalf which involves granting the agent some level of decision-making power. Jensen and Meckling (1976) argue that since both parties behave with self-interest and gain maximisation to their own utility, agent objectives are unlikely to align consistently with principal intentions. The authors state that mitigation of risks by the principal can be carried out by the implementation of suitable incentives for the agent and increasing monitoring expenses to prevent the agent from engaging in undesirable activities (Jensen & Meckling, 1976).

A noteworthy consideration for Agency theory is the application of it to capital structure, explaining the different forces at play when managers undertake decisions on the

choice of capital structure (Jensen & Meckling 1976). According to Jensen and Meckling (1976), the theory explains the two conflicts of interest that business managers face - the cost of equity agency caused by conflicts of interest between managers and shareholders and the cost of debt agency caused by the conflicts of interest between managers and creditors. According to the assumptions of the agency theory, the agent, with their activities, tends to maximise both their objectives and economic objectives of the principal. In a corporation context, the owner is the principal, and the manager is the agent. The greater information asymmetry the more likely the agent's opportunistic behaviour is. Lynch (n.d.) posits that efficient agency contracts align the objectives of agents and principals, and thereby the objectives of managers may not necessarily be for the firm's optimal performance but rather for the stockholder value and profit - a notion similar to the Friedmanistic approach presented (Friedman, 1970).

2.1.5 Trade-off theory

An important theory explaining the choice of capital structure is the trade-off theory which focuses on uncovering the correct balance of debt and equity in financing company operations. The trade-off, or traditional trade-off theory grew out of Modigliani and Miller's 1963 revision to their indifference theory, considering the role of corporate tax in capital structure (Modigliani & Miller, 1963). Arguing that debt and the associated interest payments create a tax shield allowing the firm to minimise the tax cost (Modigliani & Miller, 1963).

Robichek and Myers (1965) built upon the foundation for the theory by noting that the optimization of capital structure involves a tradeoff between the present value of the tax rebate associated with a marginal increase in leverage and the present value of the marginal cost of the disadvantages of leverage. The authors state that there is a possibility for gaining an advantage by financing with debt, when the tax benefits of the debt are bigger than the

different costs associated with financing with debt like bankruptcy costs and non-bankruptcy costs of debt (Robichek & Myers, 1965). Similar ideas have been presented by Kraus and Litzenberger (1973) who followed a similar reasoning of managers being faced with trade-offs when making capital choice decisions, by stating that there exists a trade-off effect between the dead-weight costs of bankruptcy and the tax-saving benefits of debt.

The empirical relevance of the theory has often been questioned and its findings are set under criticism. Miller (1977) criticised the relevance of the model due to its tendency to underestimate the size of taxes and overestimate the possibility of bankruptcy. He also stated that the firms' debt levels in reality are not aligned with the advised debt levels of the model (Miller 1977). Welch (2004) has taken a similar stance with Miller (1977) by criticising the trade-off theory by arguing that firms do not cope with the impact of stock price shocks in a way that they should follow the trade-off theory, and thus states that change in asset prices explains the variation in capital structure.

The Trade-Off Theory is relevant as it expands upon the assumptions and findings of multiple capital structure theories. For instance, the NI approach holding the assumption of debt preference over equity is questioned, as Berglund and Parsonage (2017) clarify; the implication of 100 per cent debt financing as optimal - as follows from the tax shield and lowered interest rate assumptions - is clearly against intuition. Furthermore, the consideration for an optimal level of leverage opens up the notion of different optimal leverages dependent upon how variables are interpreted and measured, as such allowing for more critical and valuable interpretation of capital structure phenomena.

2.1.6 Pecking order theory

Donaldson (1961) was one of the pioneers in suggesting that companies preference towards debt is higher than equity in determining their capital structure. The ideas of

Donaldson (1961) were modified and popularised by Myers and Majluf (1984) who argued that companies will use the three ways of financing in certain order, starting with internal financing, then moving on to debt financing and finally relying on equity financing. The authors argue that the means of financing is asynchronous and the managers move to a next type of available financing when the current method is depleted (Myers & Majluf, 1984). As discussed by Myers and Majluf (1984), the explanation for the choice of different types of financing is connected to the levels of asymmetric information that different types of financing possess, which is why internal financing is a preferred method due to the lowest level of asymmetric information between managers and financers.

The pecking order theory has received mixed reactions from scholars, with some having found the theory to have some applicability in limited scenarios while others have criticised it, namely due to its failure of being of first-order importance in determining a firm's capital structure (Zeidan, Galil & Shapir, 2018; Myers & Shyam-Sunder, 1999; Frank & Goyal, 2018). The proponents of the theory Myers and Shyam-Sunder (1999) find that pecking-order theory is a better predictor of capital structure than trade-off theory presented by Robichek and Myers (1965), and Zeidan et al. (2018) showed that pecking order theory is proven to be an effective predictor of capital structure choice by private firms in Brazil.

Opponents of pecking-order theory led by Frank and Goyal (2018) showed in their research that in small firms where information asymmetry is probably an important problem and pecking-order should hold, it fails to predict the preferred choice of internal financing in capital structure. Frank and Goyal (2003) observe, regarding pecking-order theory application in firms between 1971-1998, that internal financing is insufficient in covering firm investments on average, and rather firms rely on external financing to a large degree. They also note that in terms of magnitude, equity financing surpassed the proportion of debt financing in publicly traded firms (Frank and Goyal, 2003). Their observations seem to

invalidate the pragmatic application of pecking-order theory, raising questions to its validity, by stating that net equity issues trackthe financing deficit quite closely, while net debt does not do so. The current portion of long-term debt is not treated as part of the financing deficit. These facts are surprising from the perspective of the pecking order theory (Frank & Goyal, 2003).

2.1.7 Market timing theory

Some scholars have stressed the importance of using market timing hypotheses to explain the preference of the managers to choose either equity or debt financing instruments. The theory was investigated by Baker and Wurgler (2002), where they found the primary factor determining the specific amount of debt and equity used in corporations capital structure being market timing. The authors argue that companies are not particularly concerned with whether they finance their operations with debt or equity, but instead opt for the type of financing that appears more favourable to the financial markets at a given time (Baker & Wurgler, 2002).

The empirical evidence for the market timing hypothesis is mixed and there is no consensus between academics on how big of an effect do the different market climates like hot equity periods or hot debt periods have on the choice of capital structure (Alti, 2006; Huang & Ritter, 2005). There is evidence within publicly traded U.S. firms funding a considerably larger proportion of their financing deficit with net external equity when the expected equity risk premium is lower, the first-day returns of initial public offering are higher, and prior realisations of the Fama-French value factors are lower (Huang & Ritter, 2005). Alti (2006) on the other hand found that hot-market initial public offering (IPO) firms tend to issue significantly more equity and reduce their leverage ratios more than cold-market firms. However, shortly after going public, hot-market firms increase their leverage ratios by

issuing more debt and less equity than cold-market firms (Alti, 2006). Alti (2006) concludes that by the end of the second year following the IPO, the influence of market timing on leverage disappears completely.

2.2 Optimal capital structure

Optimal capital structure refers to the best mix of debt and equity financing that a company can have. The "best" in the context of a firm is wholly dependent upon the objectives of a firm, and the actors therein with firm control. Friedman (1970) argues that the sole responsibility of a firm is that of profit maximisation and shareholder wealth maximisation while other doctrines suggest further social responsibilities dependent upon moral frameworks (Prevos and Watson, 2009). For the purposes of the study, it is assumed that the Friedmanistic doctrine applies as a default foundational principle for the behaviour of firms to pursue, thus it can be derived that optimal capital structure is the specific mix of equity and leverage that maximises firm performance and value.

Considering the profit maximising nature of firms, it follows that minimising the weighted average cost of capital is an optimal goal for firms (Lynch, n.d.). Rationally, lower costs are considered optimal for a firm and thereby a judicious mix of various debt and various equity forms are encouraged in order to create a lower overall cost of capital. Insofar as the aforementioned theoretical propositions view on capital structure they can be generally divided into three categories: theories which argue value independence, those which argue debt preference, and those which argue that neither non-debt or equity factors are the drivers for maximised value.

The original M&M proposition and Net Operating Income theory fall into the category of value independence theorems. These propositions suggest that there exists no link between the value of a firm and its capital structure. The revised M&M and the Net Income theorems

adhere to the debt preference segment, arguing that through benefits of debt financing, such financing is encouraged and should be maximised. Lastly, the Trade-Off Theory and revised versions of the debt theories align with the debt category; however, regarding debt optimization as a scale due to the increased risk of over-gearing.

Further considerations when regarding theory and the capital structure of firms include the agency question, asymmetric information, market timing theory, and the pecking order theorem. Given agent contracts are designed to align with principal objectives; managers are incentivized to emphasise shareholder wealth over debt holder positions (Lynch, n.d.). This is notable as the primary managerial consideration under the agency contract assumption is that managers will optimise shareholder value over firm performance in certain circumstances and may therefore alter the capital structure in non-performance optimising manners (Jensen & Meckling, 1976). Agency theory may therefore be a valuable predictor for managerial actions that do not necessarily align with conventional capital structure optimization theorems.

The question of asymmetric information presents another barrier for the optimization of capital structure both in terms of firm performance and shareholder value. Lynch (n.d.) notes that due to the imbalance in information availability between managers/insiders and outside actors, the actions of the former are greatly scrutinized and analyzed by the latter. This poses an interesting dilemma wherein managers cannot act in an efficient manner, regarding firm performance, considering capital structure as the signalling of actions regarding capital structure may alter the actions themselves (Jensen & Meckling, 1976). Lynch (n.d.) makes the example of a stock being under-valued due to a market underappreciation from a lack of insider information, thereby management will be less inclined to issue equity financing due to the perceived loss compared to their noted appropriate value. Such managerial implications may create imperfect capital structures and thereby explain potential deviations from the optimal capital structure.

The pecking order theory popularised by Myers and Majluf (1984) deviates from the aforementioned capital structure theory categories in that it does not advocate for a balanced gearing approach to capital structure rather the theorem suggests using a lowest cost form of financing approach. Using debt and equity only when strictly necessary and not adhering to an optimal structure presentation, the pecking-order theory presents a contrasting view to the value independence and debt preference sub-categories of capital structure theory.

2.3 Determinants of the capital structure

Number of tangible assets acting as a collateral for new debt issuance

According to Grossman and Hart (1982), there are two main views on how the amount of tangible assets possessed by the enterprise influences capital structure preferences of corporate management. The first view argues that there is a positive correlation between leverage and tangible assets, the vast majority of other research papers produced with different data samples and statistical models back this statement (Grossman & Hart, 1982; Shyam-Sunder & Myers, 1999; Hovakimian, Opler & Titman, 2001; Frank & Goyal, 2009; Kayhan & Titman, 2007; Uysal, 2007).

Enterprise bondholders as well as liability creditors feel more secure when a company has a large proportion of physical assets acting as collateral of a large value allowing them to reimburse losses if the debtor fails to meet its obligations in the case of bankruptcy (Grossman & Hart, 1982; Jensen, Solberg & Zorn, 1992). When a company offers secured debt, which is debt that is backed by the value of its fixed assets, the company's equity value may rise due to a positive market response to its financial stability (Grossman & Hart, 1982). Myers and Majluf (1984) argue that when companies issue equity, there may be greater costs due to the information asymmetry between managers and investors. This can lead to a preference for issuing debt instead. Therefore, companies with a higher proportion of tangible

assets are likely to choose to issue secured debt, taking advantage of this opportunity. Myers and Majluf (1984) discuss the tension between shareholders and bondholders regarding the relationship between leverage and tangible assets and advise to address the underinvestment issue with debt, as it can be secured by not only collateral but also contractual clauses. The second group, within the framework of Grossman and Hart (1982) research, has a view that there may be a negative correlation between the proportion of tangible assets and certain types of companies in only one study found and analysed by the authors this statement was empirically backed by the data (Goyal, Lehn & Račič, 2002). Specifically, companies that produce unique or specialised products may have tangible assets that are difficult to sell or have lower liquidity, making them unsuitable for use as collateral. To address this issue and reduce agency costs, these companies may choose to switch to a different form of collateral or rely on internal sources or equity issuance, meaning that debt preference when being an owner of a large stock of tangible assets is not always true (Grossman & Hart, 1982).

Growth

A growing enterprise experiences an increased need for new capital to fund investment projects. According to Jensen and Meckling's (1976) agency theory and the static trade-off theory, the risks of possible unprofitability of the projects may decrease the propensity of the management to issue debt favouring more equity-based sources due to the mandatory nature of debt servicing in comparison to equity and because of the agency problems existing between shareholders and bondholders, almost all existing research confirms this link (Fan, Titman & Twite, 2003; Rajan & Zingales, 1995; Frank & Goyal, 2009; Kayhan & Titman, 2007). Pecking order theory, on the contrary, suggests a positive relation between growth and leverage. Scholars state that internal funds are used first, and when that is depleted, debt is issued, and when it is not sensible to issue any more debt, equity is issued (Myers & Majluf, 1984). Highly profitable firms that generate high earnings and are able to retain them are

expected to use less debt capital than those that are not that profitable. Issuance of short-term debt instead of long-term debt according to Myers and Majluf (1984) can help to solve the agency cost problem, therefore it is important to include measures of both in the analysis to control for the effect.

Size

Static trade-off theory operates with two connected relationships. The first is inverse and is between the size of the enterprise and a probability of bankruptcy paired with negative repercussions of it (the bigger company the higher the probability of bankruptcy and the heavier are its effects). The second is direct, stating that the larger the company is the more leverage it will possess (Frank & Goyal, 2009; Kayhan & Titman, 2007; Fan, Titman & Twite, 2003; Hovakimian, Opler & Titman, 2001). Pecking order theory on the other hand allows for a negative sign of the relationship between the size and leverage as found by Titman and Wessels (1998). It involves the idea that information asymmetry between the management inside of the enterprise and external investors is diminishing as the size of the enterprise is growing. Baker and Martin (2011) state that bigger companies due to their ability to hold larger and better diversified investment portfolios will have lower cost of financial distress and probability of bankruptcy compared to smaller companies. Mugosa (2015) concludes that this means better conditions for borrowing, stronger position in negotiations and easier access to funds. She also brings the point that if the company is listed the overall transparency of its operations due to the requirements of the auditing institutions and law enforcing agencies such as SEC in the USA, will decrease the aforementioned asymmetry as well. Mugosa (2015) adds that lower information asymmetry allows companies to issue equity.

Cash flow volatility

The amplification of cash flow or earnings instability can lead to an escalation in the expense of financial distress or bankruptcy. The significant fluctuations in cash flows necessitate more stringent criteria within the bond or credit market and increased risk premium demanded, resulting in elevated interest rates – increased cost of debt. According to De Angelo and Masulis (1980) strong oscillations additionally complicate the model building and its consequent utilisation by the investors trying to forecast the change in the future earnings growth also resulting in higher risk premium on the corporate debt instruments. Taking into account previously said, a hypothetical decision to be tested regarding the negative correlation between cash flow volatility and debt proportion in capital mobilisation is being done, earlier works by Shyam-Sunder and Myers (1999) and Jensen, Solberg and Zorn (1992) found empirical support for that, although the view was not shared by Kim and Sorensen (1986). Amongst possible explanatory factors Mugosa (2015) mentions information asymmetry costs and overall higher likelihood of financial distress. In accordance with Titman and Wessels (1988) standard deviation of percentage changes of operating income is being selected as a proxy for the underlying parameter.

Taxes (debt and non-debt shields)

Two general tax-related issues relevant to capital structure exist: debt and non-debt tax shields, both have different nature, but similar impact on the financials. By taking into account the existence of corporate tax shield substitutes (depreciation deductions and investment tax credits), Titman and Wessels (1988) adjusted the original differential personal tax model developed by Merton and Miller (1977) into a more realistic one. Conclusive idea is that the same as for the revised Modigliani and Miller theory (1963) – more debt is better because of tax benefits, but with significant notes: default costs are non-zero and positive, each enterprise has a unique interior optimum leverage decision given the market is in

equilibrium (assumption is made by the authors as well). The phenomenon of tax benefits derived from debt issuance considers the deduction of interest payments from revenues, resulting in a decrease in gross income and tax base. Firms may be incentivized to increase borrowing in order to enhance their value, particularly when tax rates are elevated (yielding a positive correlation between debt and tax size). In contrast, based on the propositions outlined by Fama and French (2002), tax savings can also be realised through the utilisation of non-debt tax shields. For instance, companies incurring high amortisation expenses on the PPE or ones having large research and development costs may experience a reduction in tax base in the first place, thereby potentially decreasing their reliance on borrowing. This explains why non-debt tax shields exhibit a negative correlation with leverage, a finding that aligns with the trade-off theory and studies conducted by Fan, Titman and Twite (2003) and Kim and Sorensen (1986).

Profitability/stock return

Although one of the objectives of the paper is to look into the influence capital structure has on the profitability of the enterprise overall, debt and equity mix is determined by how well the firm is doing financially. According to Welch (2004) nevertheless corporate net issuing activity explains 60 percent of debt ratio dynamics while the issuing motives of the management are overlooked. In the field of capital structure, he brings forward the market timing theory saying that in the conditions of stock price growth, management will be motivated to sell equity rather than debt (Welch, 2004). It is further concluded that stock returns are possibly the only well-understood determinant of capital structure and that numerous other proxy variables are helping in explanation of the debt and equity mix only because they correlate with omitted dynamics caused by stock price changes (Welch, 2004). Kayhman and Titman (2007) on the other hand argue that the historical development of the stock performance captured by the stock price absolute values and its changes strongly

influences the capital structure decisions of the firm only in the short term. Over longer periods of time financing choices are more consistent with the firm, following target debt ratio as presented by the tradeoff theory (Robichek & Myers, 1965). Based on the previously said, Mugosa (2015) concludes that based on this theory high stock returns are negatively correlated with leverage, numerous existing works confirm that (Frank & Goyal, 2009; Kayhan & Titman, 2007; Uysal, 2007; Fan, Titman & Twite, 2003; Goyal, Lehn & Račič, 2002; Hovakimian, Opler & Titman, 2001; Shyam-Sunder & Myers, 1999).

As for previous determinants, static trade-off theory by Kraus and Litzenberger (1973) suggests the opposite. They state that there will be increased motivation for the managers to increase leverage in two situations. Firstly, even if the stock prices are currently high and secondly, if the equity is relatively cheap and is undervalued, managers still need to increase debt because they need to rebalance the cost of financing distress and the benefits of the tax shield (Kraus & Litzenberger, 1973). Mugosa (2015) implies positive correlation between leverage and stock returns if this theory is to be used, the relationship is further backed by Jensen, Solberg and Zorn (1992).

2.4 Healthcare and Energy industry

The S&P 500 healthcare sector comprises those firms which work in, produce, develop, and supply pharmaceutical, medicinal, and scientific work with the aim to assist and ameliorate the human condition (Investopedia, 2021). The healthcare sector remains one of the larger and more complex sectors of the US economy, the symbiotic relationship between technology/education and the price inelastic nature of the market results in this sector quickly advancing and driving high demand (Investopedia, 2021).

The S&P 500 energy sector comprises those firms which are in the business of producing, exploring, developing, and supplying energy from oil, gas, coal, or renewable

energy sources (Chen, 2022). Firms in this sector are large and have a high dependency on infrastructure networks and capital networks in order to efficiently extract, develop, transport, and sell materials and products related to energy (Chen, 2022).

Though both highly dependent on infrastructure, capital, and labour; the relative proportion of dependency varies between the two sectors to a great extent. The energy sector's requirements for capital and infrastructure far outreach that of the healthcare sector. The energy sector's strong reliance on heavy machinery, technology and infrastructure networks is a defining feature of the sector; while it is true that labour is utilised, the prioritisation of skilled labour rather than manpower further lends itself to the capital intensive characteristics of the sector (IEA, 2022). Additionally, there exists an advanced rate of knowledge and technology development within the energy sector; both for profit maximisation via efficiency but also for social and sustainability reasons. The large focus on development lends itself to the fact that the industry as a whole is highly dependent on large scale planned investments, not only for the capital intensive requirements, but also for the research workforce (IEA, 2022).

Contrastingly, the healthcare sector, though reliant on technology and equipment for the effective running of operations - is far more reliant on skilled labour, manpower, and human capital for development of new technologies (OECD, 2020). This is acutely demonstrated in the levels of investment into capital versus overall healthcare spending in the USA, with a $12,285 per capita spending on overall healthcare and services and a $628 per capita spending on investments in healthcare (CMS, 2022).

The industry effects on capital structure is an important determinant on the overall capital structure that the firms choose. Adding into the equation also the above discussed variables that have an effect on capital structure, it is of interest to see how those determinants differ between industries in order to analyse capital structure differences across

healthcare and energy firms. The authors will analyse, compare, and test for the key factors that influence capital structure. In doing so, the authors will test the following hypothesis:

H1. There is a difference between capital structure determinants in the S&P 500 Healthcare and Energy sector firms

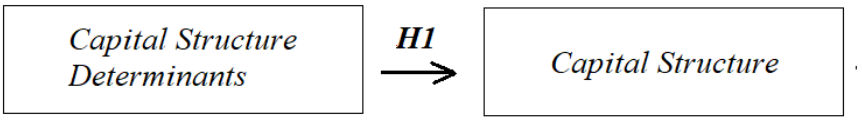

Figure 2. Hypothesis 1

2.5 Firm Performance

2.5.1 Accounting financial statement-based performance measures

The general principles of traditional financial performance measures are based on the idea that a company's financial health can be evaluated based on information contained in its financial statements. These measures are used to evaluate companies' profitability, liquidity, efficiency, and overall financial health based on information from the past. According to Jović and Tomašević (2021), the traditional approach to measuring company performance places emphasis on financial parameters that are expressed quantitatively thus creating the possibility of dynamic observation of performance in continuous time periods. The approach is focused on measuring profitability and efficiency in isolation from the market and the industry in which the enterprise operates and it does not take into account other factors that could affect performance, with the most important one being the company's risk profile (Jović & Tomašević, 2021). Traditional group of measures according to Jović and Tomašević (2021) include accounting profit measures for which the authors use commonly accepted ROE, ROI, ROA as well as Kaldor (1966) suggested – measure that later became known as Tobin's q developed by Tobin and Brainard (1977).

2.5.2 Economic portfolio theory-based performance measures

Modern Portfolio Theory (MPT) is an early framework for portfolio management and asset allocation based on Markowitz (1952) and Markowitz (1959). The general principles of MPT are based on the idea that investors should focus on constructing a portfolio of assets that optimises returns for a given level of risk. The theory assumes that investors are risk-averse and seek to minimise risk while maximising returns. The key to achieving this is diversification - by investing in a variety of assets with different risk and return profiles, investors can reduce their overall risk without sacrificing returns. MPT provides a mathematical framework for selecting and weighing assets in a way that optimises returns for a given level of risk. MPT has limited use in the analysis of individual security performance, which is why Sharpe (1964) with the capital asset pricing model (CAPM) measures abnormal rate of return (alpha) of the security (relative to the market via the single index model (SIM) introduced in Sharpe (1963) or as in the authors case the special benchmark index - Bloomberg US Aggregate Equity Index (AGGE) representing approximately 99% of the US market by capitalization (Bloomberg 2022). The CAPM is a model that describes the relationship between the expected return on an asset and its risk. Within this group of measures, we also include M^2 developed in Modigliani (1997) to counter the abstract nature and interpretational issues brought by the Sharpe ratio. Out of the aforementioned group of performance metrics Jensen's alpha is used by the authors in the empirical analysis as it includes the comparative statics and riskiness of the investment during the performance evaluation.

Contemporary approaches to measuring performance have expanded beyond financial ratios and portfolio theory and therefore are not utilised in the paper for they take into account multiple difficultly quantifiable and enumerable perspectives, including financial,

customer, internal business process, learning and growth such as in the case of the Balanced Scorecard or social, environmental, and financial factors as in the Triple Bottom Line.

Building upon the theory regarding the capital structure determinants and the firm performance measures, the authors will examine the relationship between these two phenomena in order to draw conclusions about industry differences. The following hypothesis will be tested:

> *H2. Determining factors of capital structure affect firm performance in a similar way between S&P 500 listed Healthcare and Energy companies.*

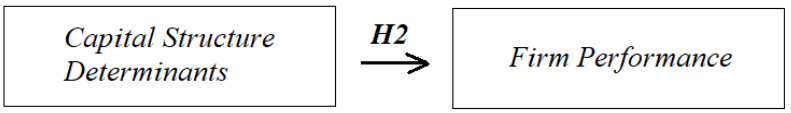

Figure 3. Hypothesis 2

Lastly, given the development of the aforementioned capital structure determinants and the firm performance measures the authors will present a link to the capital structure theory. Given the opposing viewpoints regarding the optimal balance of debt to equity, the authors will test the third and final hypothesis to test whether higher or lower debt levels will yield higher firm performance:

> *H3. Firms from the S&P 500 Healthcare and Energy sector with higher debt will have better firm performance.*

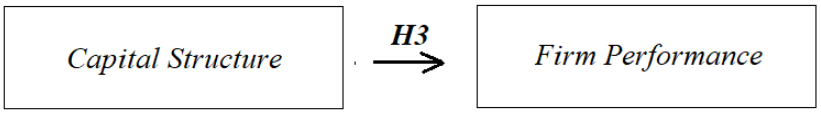

Figure 4. Hypothesis 3

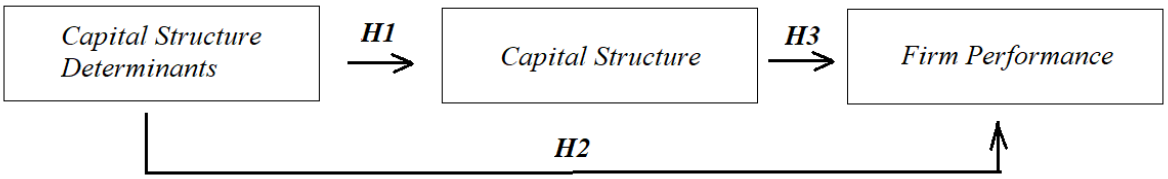

Figure 5. Summarization of stated hypothesis

3. Methodology

3.1. Research Design

The research was carried out with a deductive approach attempting to explain observed variables and data with existing theories. To answer the research question and the set of hypotheses stated in the introductory part of the thesis a quantitative approach involving a statistical analysis of the secondary financial statement data on the sample of publicly traded S&P 500 firms in the healthcare and energy sectors during the time period between 01.01.2000 and 01.01.2020 was used.

Due to the quantitative nature of the research question, primary data collection methods such as interviews, surveys, questionnaires, and observation of the focus groups were rejected at the early stage of the work. Negative repercussions to the validity of the work introduced by the absence of qualitative analysis are planned to be supplanted by the profound work with the available numeric data. According to Brooks (2019), amongst the benefits of number-driver research much larger coverage and limited scope due to limited timeframe are emphasised. Analysis of a great number of firms during a longer time period was used to ensure credibility of analysis due to inherent advantages such as statistical power and generalizability of the conclusions (Brooks, 2019).

3.2. Data and sample

The chosen sample on financial research in the United States of America provides several important benefits influencing the quality of the work. Currently the scale and diversity of the US economy, with its wide range of industries, financial markets and companies provide researchers with a large and manifold set of data to study (The World Bank, 2023). Secondly, the USA possesses a strong financial infrastructure in the form of a

highly regulated banking system due to being unified on the federal level and possessing similarity on the state level which makes the results of the analysis more credible (Federal Reserve, 2023). The sample choice was further motivated by US financial legislative apparatuses paired with robust and liquid equity & debt markets operating under the supervision of the single monetary authority - the Federal Reserve System, narrowing the scope of the conducted study (Federal Reserve, 2023).

All of the S&P 500 companies within the industries under scrutiny are large international enterprises with a significant foreign presence, but subjugation to American accounting and tax standards as well as laws, decreasing the variability connected to differences in foreign operations while still studying and driving mindful conclusions about them (S&P Global, 2023). American firms experience almost identical exposure to the same macroeconomic events conditioned by being denominated in the United States Dollar and subject to decisions of the single set of the Federal Government branches: legislative, executive and judicial on all non-financial levels (Federal Reserve, 2023).

Third, the US financial markets generate a vast amount of quantitative data on corporate financial indicators which are available through Bloomberg terminals, accessible to the authors and thereby used for this study. Additionally, the influence of the USA financial markets have a significant impact on the global economy motivating the focus on USA listed companies. Finally, the long history of a highly productive academic atmosphere within scientific advancements in finance, knowledge and discoveries utilised by industry practitioners through the consulting services provides researchers with access to the economy and its agents operating in the conditions of strong form of market efficiency (Prentis, 2012). According to Prentis (2012), this leads to the data analysed to reflect fairly not only publicly available information, but also private insider knowledge which is an important assumption that is vital to the applicability of the theories connected to capital structure (see section 2).

As a secondary source of public financial data on the sample of enterprises from the industries analysed by the authors, Bloomberg terminal was selected due to its capabilities, popularity and ease of access in the field of providing financial and accounting information. The Bloomberg terminal provides timeliness and comprehensive coverage of historical data with frequent and identical increments throughout the whole study period while also being renowned for its accuracy and reliability of presenting reputable financial statement data that underwent auditing and regulatory procedures (Moreale & Zaynutdinova, 2018).

Bloomberg uses standardised and unified corrections in two fields relevant for the analysis. Firstly the balance sheet, income and cash flow statement elements, for example various assets, debt and equity components which are important for the capital structure study are classified according to GAAP and IFRS accounting principles (Bloomberg, 2023). Secondly, the firm performance indicators such as traditional financial statement derived classical return ratios, Tobin's Q, and those used for calculating portfolio-related performance measures, e.g. alpha and Sharpe ratio, are standardised in Bloomberg. All metrics used are adjusted to various corporate events like stock splits, M&As, stock buybacks, and calculations on accounting ratios are performed in a standardised manner allowing authors to rely on the metrics to a higher degree (Bloomberg, 2023).

The characteristics of the corporate target leverage ratio being the ratio of the market value of debt to the total market value of the firm that management seeks to maintain and its relationship with the theory about determinants was estimated by the analysis of panel data of companies in United States of America covering the period from 01.01.2000 to 01.01.2020. Constituents of the S&P 500 index from the healthcare and energy sectors were studied, meaning that according to S&P500 Global (2023) the chosen sample possesses following characteristics that are necessary for being included in the index:

- Market capitalization greater than or equal to US$12.7 billion.
- Annual dollar value traded to float-adjusted market capitalization is greater than 0.75.
- Minimum monthly trading volume of 250,000 shares in each of the six months leading up to the evaluation date.
- Public listing on either the New York Stock Exchange (including NYSE Arca or NYSE American) or NASDAQ (NASDAQ Global Select Market, NASDAQ Select Market or the NASDAQ Capital Market).
- The company must have its primary listing on a U.S. exchange, be subject to U.S. securities laws and derive at least 50% of its revenue in the U.S.

Upon incorporation of the outlined criteria, a sample of 87 companies was reached, from which 65 belong to the healthcare sector and 22 firms belong to the energy sector. Quarterly frequency brought 80 longitudinal time-points for each company, resulting in 6960 company-quarter observations. Subsequent to the data collection the initial processing was conducted predominantly manually in Excel, in addition the programming language R was utilised in all parts of quantitative analysis. A classical linear modelling approach Multiple Linear Regression (MLR) was used for the examination of the relationship between the analysed dependent variable and explanatory variables.

3.3. Variables

Variables' and proxies' selection is based on the work by Baker and Martin (2011) and supported by the frequency of use by other academic researchers (Grossman & Hart, 1982; Shyam-Sunder & Myers, 1999; Hovakimian, Opler & Titman, 2001; Frank & Goyal, 2009; Kayhan & Titman, 2007; Uysal, 2007).

Capital structure - the fundamental capital structure proxy and primary leverage/gearing ratio has been widely used in academic research and by industry practitioners, as it provides insight into the relative proportion of external financing and different types of debt which are utilised by firms to finance their operations vis-à-vis internal capital mobilisation methods - equity funding.

$$Debt\ to\ Equity\ ratio\ = \frac{Total\ Debt}{Total\ Equity}$$

Tangibility - a proxy for corporate total tangibility measure, which is capable of reflecting the extent to which firms rely on physical assets (PPE) in their operations. Using this metric facilitates an evaluation of the risks and opportunities associated with asset specificity, depreciation, and technological obsolescence, which are critical determinants of firm value.

$$Tangibility = \frac{Total\ Tangible\ Assets}{Total\ Assets}$$

Growth - Earnings before Interest, Taxes, Depreciation, and Amortisation (EBITDA) quarterly growth has been utilised as a proxy for overall corporate growth, providing insights into the ability of firms to generate operational cash flows and reinvest in their businesses. This approach enables a multifaceted assessment of the factors driving business growth, such as pricing power, cost efficiency, and market share expansion, which are crucial determinants of long-term viability of the enterprise.

$$Growth\ = \frac{(EBITDA(Quarter\ N) - EBITDA(Quarter\ N-1)}{EBITDA(Quarter\ N-1)}$$

Size - the natural logarithm of total assets has emerged as a widely used proxy for corporate total size, providing a nonlinear measure of the scale of firms. This proxy allows for a better understanding of the effects of size on enterprise capital structure and corporate

performance, which are influenced by the market power, superior resource allocation, and diversification, which are critical drivers of competitive advantage and firm well being suggested by theory.

$$Size = Normal\ logarithm\ of\ Total\ Assets = LN(Total\ Assets)$$

Cash flow volatility - the rolling standard deviation of quarterly free cash flows acting as a proxy for corporate total cash flow volatility, reflecting the degree of variability in firms' ability to generate cash over time. This measure allows for studying the influence of the amount of cash risks associated with operating and financial leverage, liquidity management, and business cycle exposure.

$$Cash\ flow\ volatility = Rolling\ 10\ previous\ quarter\ Standard\ Deviation\ of\ Free\ Cash\ Flow$$

Debt-Based Tax Shield size - the product of total debt, cost of debt, and effective tax rate scaled by the total firm asset divisor has been utilised as a proxy for corporate interest tax shield, which provide insights into the tax benefits associated with firms' use of debt financing.

$$Debt\ Based\ Tax\ Shield = \frac{Total\ debt * Cost\ of\ debt * Effective\ Tax\ rate}{Total\ Assets}$$

Non Debt-based Tax Shield - the product of total depreciation and amortisation with investment tax credit and effective tax rate scaled by the total firm asset divisor - acts as a proxy for corporate non-debt tax shields, due to it ability to reflect the tax benefits associated with firms' use of non-debt financing as well as managing skills of tangible asset with limited life.

$$Non\ Debt\ Based\ Tax\ Shield$$

$$= \frac{(Total\ Depreciation\ and\ Amortization + Investment\ Tax\ Credit) * Effective\ Tax\ rate}{Total\ Assets}$$

Profitability - EBITDA over total assets has been utilised as a proxy for corporate profitability scaled by its size (as the special variable for analysing effect of the size has been separately studied), providing insights into the efficiency with which firms utilise their assets to generate cash flows. This proxy enables to capture complex factors driving profitability affecting the choice between financing methods.

Industry specification - the inclusion of a dummy variable in the regression model is a widely used technique to distinguish companies between two studied industries, enabling the

$$Profitability = \frac{EBITDA}{Total\ Assets}$$

investigation of differences that belongingness to the certain field might have on the debt-to-equity financing methods. This measure allows to capture the effect of all

$$0\ for\ Energy\ sector\ companies, 1\ for\ Healthcare\ sector$$

industry-specific factors combined on the dependent variable.

Accounting based performance measure - Tobin's Q ratio has been selected as an accounting/book performance measure, providing insights into the market value of the company relative to its replacement cost of assets. The market value of the firm cannot get abnormally far above its replacement cost for an abnormally long time because, if it did, competitors would enter the market and thus competitive pressure would drive down the market value of all firms until they fell to replacement cost. Theory suggests that for all firms the Tobin's Q ratio tends toward 1 in the long run (Bodie, Kane & Marcus, 2013).

$$Tobin's\ Q = \frac{Equity\ Market\ Value + Liabilities\ Market\ Value}{Equity\ Book\ Value + Liabilities\ Book\ Value}$$

Portfolio based performance measure - Jensen's alpha has emerged as a widely used portfolio-based performance measure, reflecting the risk-adjusted excess returns earned

by firms relative to their expected returns based on the market risk premium. The Alpha or abnormal return is commonly regarded as the measure of the excess return generated as it provides an indication of how well a security has performed relative to a market index or benchmark that is deemed to reflect the overall movement of the market (Bodie, Kane & Marcus, 2013). Using Jensen's alpha enables an assessment of the value added, after accounting for the systematic risk exposure of the market.

$$Jensen's\ alpha = Portfolio\ Return - [Risk\ Free\ Rate +$$

$$Benchmark\ Portfolio\ Beta\ *\ (Market\ Return\ -\ Risk\ Free\ Rate)]$$

3.4 Model

The analysis conducted refers to panel data since such data sets for economic research possess several advantages over conventional cross-sectional or time-series data sets (Brooks, 2019). Therefore, observations in panel data involve at least two dimensions: a cross-sectional dimension, and a time series dimension that increase the overall strength of the obtained results, which is why the authors made a comparison through fundamental indicators observed by 87 companies, in the period of 20 years (Brooks, 2019).

The issue concerning possible variation of debt-to-equity ratios from the perspective of selecting optimal enterprise capital structure has been under scrutiny by researchers (Baker & Martin, 2011). The underlying idea of research in the field of capital structure determinants is constructed around the theoretical assumption that enterprises establish a judicious mixture between debt and equity sources of funds in their total capital mobilisation process based on the costs and benefits of internal and external sources - equity and debt financing - while maximising the market value of the firm.

Academic literature discussed has two main issues connected to the capital structure analysis. Firstly, most of the studies agree on the set of capital structure determining factors, although several possible proxies have been selected by different researchers (see 2.3). Secondly, an appropriate statistical model to be utilised in the analysis is the biggest difference between the studies, numerous mathematical methods of varying complexity have been selected. Following the example of Gansuwan and Önel (2012) and Dumont and Svensson (2014) a numerical analysis of the studied relationship was conducted, leading to the use of multiple linear regression models followed by the careful analysis of regression assumptions.

In the analytical part of the study, OLS regression analysis was employed, since it was concluded to be more appropriate for the static framework providing row by row variable observations devoid of any evolutionary time-changing nature inherent to all time-series data. Given the absence of focus on individual company development over time, all observations were aggregated in a set of large regressions. The utilisation of numerous pooled regression models for each firm would not allow neither the aggregation of knowledge nor the drawing of mindful conclusions in general; thus the decision to not to employ panel regression analysis was taken, despite the panel nature of the data.

In order to numerically study the relationship between the capital structure quantification, its determining factors and later its link to the firm performance - which answers the stated research question - several regressions were created to answer the hypotheses.

***Hypothesis 1 - Regression 1*:** the relationship between dependent variable quantifying the capital structure (making this notion numerically measurable) and independent variables that are thought to be its determinants.

$$Debt\ to\ Equity\ Ratio = \beta 0 + \beta 1 * Tangibility + \beta 2 * Growth + \beta 3 * Size + \beta 4 * Profitability + \beta 5 * Cash\ flow\ volatility + \beta 6 * Debt\ Based\ Tax\ Shield\ size + \beta 7 * Non\ Debt\ based\ Tax\ Shield + \gamma D\ industry + \varepsilon 0$$

Hypothesis 2 - Regression 2: the relationship between the dependent variable (accounting-based performance measure) and independent variables (capital structure determinants).

$$Tobin's\ Q = \beta 0 + \beta 1 * Tangibility + \beta 2 * Growth + \beta 3 * Size + \beta 4 * Profitability + \beta 5 * Cash\ flow\ volatility + \beta 6 * Debt\ Based\ Tax\ Shield + \beta 7 * Non\ Debt\ based\ Tax\ Shield + \gamma D\ industry + \varepsilon 0$$

Hypothesis 2 - Regression 3: the relationship between the dependent variable (portfolio-based performance measure) and independent variables (capital structure determinants).

$$Jensen's\ Alpha = \beta 0 + \beta 1 * Tangibility + \beta 2 * Growth + \beta 3 * Size + \beta 4 * Profitability + \beta 5 * Cash\ flow\ volatility + \beta 6 * Debt\ Based\ Tax\ Shield + \beta 7 * Non\ Debt\ based\ Tax\ Shield + \gamma D\ industry + \varepsilon 0$$

Hypothesis 3 - Regression 4: the relationship between the dependent variables (accounting/book based performance measure) and independent variables (capital structure).

$$Tobin's\ Q = \beta 0 + \beta 1 * Debt\ to\ Equity\ Ratio + \gamma D\ industry + \varepsilon 0$$

Hypothesis 3 - Regression 5: the relationship between the dependent variables (economic portfolio-based performance measure) and independent variables (capital structure).

$$Jensen's\ Alpha\ =\ \beta 0\ +\ \beta 1 *\ Debt\ to\ Equity\ Ratio +\ \gamma D\ industry + \varepsilon 0$$

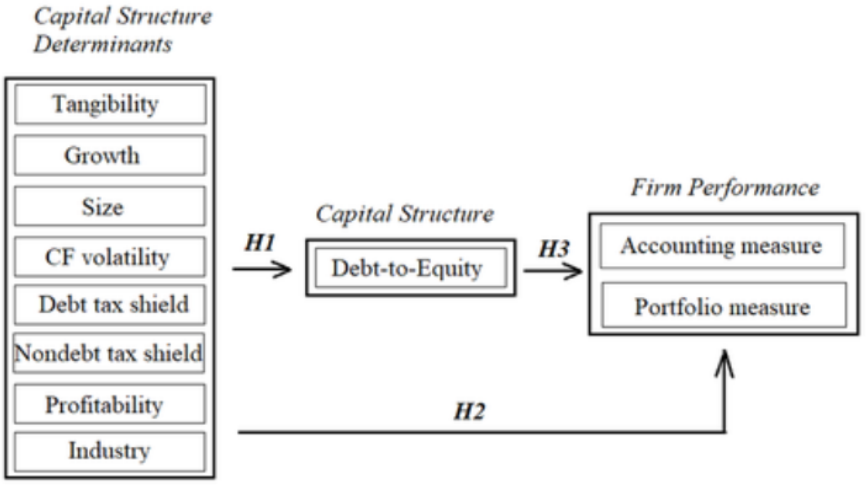

Figure 6. Selected variables for testing hypotheses.

4. Results

Research Question: *How do the different capital structure combinations affect firm performance in the S&P 500 Healthcare and Energy sector firms?*

TABLE 1
Descriptive Statistics and Correlation for Energy Industry

Variables	Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9	10
1 Total Debt to Total Equity	0.94	2.01	0.02	26.52	1.00									
2 Tangibility	0.91	0.14	0.36	1.40	0.03	1.00								
3 Growth	0.39	11.74	-21.99	370.00	-0.02	0.02	1.00							
4 Size	10.43	1.05	8.19	12.82	-0.15***	0.02	-0.01	1.00						
5 CF volatility	502.79	691.60	0.00	3331.05	-0.12***	0.08*	0.03	0.71***	1.00					
6 Debt tax shield	0.35	0.18	0.05	1.19	0.10**	-0.08**	-0.02	-0.28***	-0.33***	1.00				
7 Non-debt tax shield	0.01	0.00	0.00	0.04	0.04	0.39***	-0.01	-0.06*	0.02	-0.12***	1.00			
8 Profitability	0.03	0.04	-0.42	0.22	-0.07*	0.06*	0.05^{s}	-0.02	-0.02	0.01	-0.05	1.00		
9 Accounting Performance	1.60	0.66	0.53	5.45	0.12***	-0.29***	-0.03	-0.38***	-0.21***	0.12***	-0.07*	0.23***	1.00	
10 Portfolio Based Performance	0.00	0.08	-0.27	0.41	-0.08**	0.01	-0.03	-0.17***	-0.13***	0.34***	-0.08**	0.26***	0.27***	1.00

Note:
^{s}p < .10
*p < .05
**p< .01
***p< .001

TABLE 2
Descriptive Statistics and Correlation for Healthcare Industry

Variables	Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9	10
1 Total Debt to Total Equity	2.16	13.02	0.00	316.51	1.00									
2 Tangibility	0.71	0.21	0.13	1.79	0.10***	1.00								
3 Growth	0.07	3.92	-39.34	224.88	0.01	0.02	1.00							
4 Size	8.61	1.75	3.52	12.27	-0.13***	-0.27***	-0.03^{s}	1.00						
5 CF volatility	584.67	2534.94	0.00	24921.07	-0.03s	0.00	0.00	0.29***	1.00					
6 Debt tax shield	0.51	0.34	0.00	4.15	0.32***	0.14***	0.00	-0.12***	-0.09***	1.00				
7 Non-debt tax shield	0.00	0.00	0.00	0.06	0.00	0.04*	-0.01	-0.24***	0.01	0.01	1.00			
8 Profitability	0.03	0.04	-0.38	0.27	-0.19***	-0.13***	0.01	0.27***	0.12***	-0.29***	0.01	1.00		
9 Accounting Performance	2.94	2.53	0.73	29.52	0.03^{s}	0.31***	0.07***	-0.32***	0.00	-0.09***	0.11***	0.03*	1.00	
10 Portfolio Based Performance	0.04	0.09	-1.43	0.66	-0.03	0.08***	-0.02	-0.27***	-0.06***	0.06***	0.12***	0.04*	0.19***	1.00

Note:
^{s}p < .10
*p < .05
**p< .01
***p< .001

Tables 1 and 2 present the descriptive statistics for the Healthcare and Energy sectors zero-order correlations between all variables in our sample. The correlations obtained indicate that the performed regressions are likely to be biassed by multicollinearity, as several variables are having relatively strong (≤0.3) correlation coefficients that are significant at the chosen level of confidence (0.05).

The directions of the relationships between the capital structure determining factors, expressed as the Pearson correlation coefficient, signs are almost identical for energy and healthcare sectors (with an exception of several insignificantly different form the zero ones), which is consistent with the examined literature and previous research on the same and different industries. The magnitudes (relative strengths of the connections) expressed as the coefficient's absolute values are, in contrast, different across studied industries highlighting the dissimilarities caused by the reasons explained in literature review in the discussion. Enterprises belonging to the energy industry are on average approximately 2 times less leveraged (D/E 0.94 against 2.16). Furthermore, the standard deviations of 2.01 for Energy and 13.02 for Healthcare indicate the large dissimilarity in D/E variability. Additionally, the range between the maximum and minimum ratios observed in the Healthcare sector was also wider than the Energy sector, underlying two facts: First, that within industry variation is larger than between them. Second, healthcare is more variable than energy. Both sector distributions are extremely leptokurtic (D/Es are very centred around the mean) as given by the kurtosis values of 119.67 against 210.77, which is magnitudes larger than the accepted value of 3) and both have positive skew values of 10.15 and 12.71 - long right tails meaning that there are much more companies with elevated gearing (appendix table A and B).

4.1 Industry differences

The observed companies have a moderate level of investment opportunities and value creation, this is observed through the mean Tobin's Q ratio, the chosen measure of the accounting well-being of an enterprise. It is equal to 1.60 for energy and 2.94 for healthcare - meaning that the market value is greater than the value of the company's recorded assets for both fields, but with healthcare being ahead. As in the case of the D/E, the energy sector is less volatile in regard to profitability (SD of 0.66 versus 2.53) and more concentrated around the measure of central tendency (kurtosis values of 7.3562 and 22.2108). Positive skewness values of 2.2712 and 3.8529 suggest a tail towards higher Tobin's Q values indicating a more right-skewed (larger Q ratios stretching to the right) healthcare distribution compared to the energy sector.

The Energy sector's mean Jensen's alpha of -0.004 indicates that energy companies, on average, underperform relative to the market with a moderate variability in this regard, considering the standard deviation of 0.08. There is an indication of a moderately peaked around this near-zero distribution due to the 2.20 kurtosis value, together with a atypical (for finance) positive skew value of 0.92 - implying a tail towards positive Jensen's alpha values. For the Healthcare sector the mean Jensen's alpha value is in contrast positive with a value of 0.04, indicating that, on average, healthcare companies have outperformed the market (Bloomberg used benchmark). The standard deviation of 0.091 is very close to that of energy and shows moderate variability in the Jensen's alpha. The kurtosis value of 37.77 indicates a very peaked distribution, with a more common for the finance negative skewness value of -1.41 - tail towards negative Jensen's alpha values. The range of 0.68 (energy) and 2.09 (healthcare) (68 and 209 percent) represents the huge difference between the maximum and

minimum Jensen's alphas - such a large scattering in both industries is not surprising for so many studied companies in such a long time period.

Table 3 presents empirical tests of the hypotheses about the connections existing between to groups of variables: Initially, the capital structure determining factors and capital structure itself (hypothesis 1, main regression 1 (where the industry-specifying dummy variable has been added), and sub-regressions 1.1 and 1.2 for determining coefficients separately for every industry). Lastly, between the capital structure determining factors and the two types of performance measures (hypothesis 2, regressions 2 and 3).

TABLE 3
Regression output for hypotheses 1 & 2

	Hypothesis 1			Hypothesis 2	
Regression	1	1.1	1.2	2	3
Adj. R^2	0.11	0.03	0.12	0.22	0.13
Observations	4928	1105	3822	4928	4928
F-Statistic	80.78***	5.81***	75.85*	179.24***	89.25***
Intercept	1.82	2.92**	1.40	4.25***	0.13***
Tangibility	2.04*	0.48	s1.65	2.47***	4.4*10^-3
Growth	0.012	-2*10^-3	0.04	6..4*10^-3	-1*10^-4*
Size	-0.53***	-0.25**	-0.58***	-0.46***	-0.02**
CF volatility	2*10^-4*	-1.64*10^-5	s1.58*10^-4	1*10^-4***	0.00
Debt tax shield	10.55***	0.79*	11.21***	-0.89***	0.03***
Non-debt tax shield	-52.55	16.51	-98.19	-3.86	0.67
Profitability	-24.65***	-3.91**	-28.62***	5.85***	0.39***
Industry	-1.08*	-	-	1.12***	0.01*

Note: Standard errors in parentheses.
s p < .10
*p < .05
**p< .01
***p< .001 (one-tailed)

Understanding the limitations of a single dummy variable utilisation led to the conducting of a series of single-factor ANOVA procedures to test the difference between the capital structure determining factor across the industries (appendix tables D-J). Sample sizes were not equal, but sufficiently large to consider the results valid (1105 for energy and 3823 for healthcare).

Table 4
Single-factor ANOVA output for hypotheses 2

CS determining factor	F-statistics
Tangibility	913.9103***
Growth	2.075957
Size	1088.509***
CF volatility	1.128525
Debt-tax shield	231.454***
Non-debt-tax shield	870.1994***
Profitability	s 3.684322

Note: Standard errors in parentheses.
s p < .10
*p < .05
**p< .01
***p< .001

H1. There is a difference between capital structure determinants in the S&P 500 Healthcare and Energy sector firms.

Supported: the observation shows a significant dummy in total regression, the difference between the coefficients in two separate regressions and statistically significant difference between the means for tangibility, size, debt and non-debt shield sizes.

H2. Determining factors of capital structure affect firm performance in a similar way between S&P500 listed healthcare and energy companies.

Not supported: the tests show significant dummies for both performance measures (Tobin's Q and Jensen's alpha) signify the notable difference in the way how aforementioned factors influence the firm well-being.

TABLE 5
Regression output for hypothesis 3

Hypothesis		
Regression	4	5
Adj. R^2	0.058597	0.033925
Observations	4928	4928
F-Statistic	154.339***	87.507***
Intercept	1.59***	-0.00353
D/E	5.88*10^-5*	-2E-06`
Industry	1.33***	0.040076*

Note: Standard errors in parentheses.
s p < .10
*p < .05
**p< .01
***p< .001

H3. Firms from the S&P 500 Healthcare and Energy sector with higher debt will have better firm performance.

Not supported: firm performance and capital structure is absolutely inelastic (found in our work, our sample and a model), and slope coefficient for the relationship between D/E and Tobin's Q - while still being significant - is near-zero (5.88*-10^5), for D/E and Jensen's alpha the slope is not significantly different from zero at all. Regression lines are horizontal meaning that no matter what the debt to equity mix, performance will stay at the level described by the intercept.

4.2 Regression validity

Performing statistical modelling always involves consequent quality tests and analysis of the possible violations that directly influence the result's robustness and conclusion-making. Correct multiple linear regression modelling is based on the 5 principal assumptions, thus allowing consideration of the model output as valid. It should be noted that empirical analysis can be far from the desired levels due to the fact that real-life data is rarely possessing all necessary characteristics and is not inherently following the theory-suggested laws. Below, theMLR assumption test results are shown, see near multicollinearity overview

in the appendix. General conclusion from this can be derived as the following: model validity is relatively low putting a limitation on the quality of the results.

TABLE 6
Multiple linear regression assumption tests and results

CLRM Assumption	Test utilized	Test results	
Average value of the errors is zero E(ut) = 0	Regression is/is not forced to go through the origin constant term is present=> automatically satisfied.		
Homoscedasticity	Breusch–Pagan test H0: Var(ut) = σ^2 < ∞ Homoscedasticity is present (the residuals are distributed with equal variance) HA: Var(ut) =/= σ^2 < ∞ Heteroscedasticity is present (the residuals are not distributed with equal variance)	Regression 1	p-value < 2.2e-16 H0 rejected
		Regression 2	p-value < 2.2e-16 H0 rejected
		Regression 3	p-value < 2.2e-16 H0 rejected
		Regression 4	p-value = 1.871e-09 H0 rejected
		Regression 5	p-value = 0.4991 H0 failed to be rejected
Autocorrelation	Breusch–Godfrey test H0: cov(ui, uj) = 0 at any order less than or equal to n. HA: cov(ui, uj) =/= 0 at some order less than or equal to n. n=3	Regression 1	p-value < 2.2e-16 H0 rejected
		Regression 2	p-value < 2.2e-16 H0 rejected
		Regression 3	p-value < 2.2e-16 H0 rejected
		Regression 4	p-value < 2.2e-16 H0 rejected
		Regression 5	p-value < 2.2e-16 H0 rejected
Normality	Jarque Bera Test H0: ut ~ N(0, σ2) data is normally distributed HA: ut ~/~ N(0, σ2) data is not normally distributed	Regression 1	p-value < 2.2e-16 H0 rejected
		Regression 2	p-value < 2.2e-16 H0 rejected
		Regression 3	p-value < 2.2e-16 H0 rejected
		Regression 4	p-value < 2.2e-16 H0 rejected
		Regression 5	p-value < 2.2e-16 H0 rejected

5. Discussion

5.1 Hypothesis 1

H1. There is a difference between capital structure determinants for the enterprises from the S&P 500 Healthcare and Energy sectors.

The stated hypothesis seeks to test the relationship between the set of factors assumed to have a significant influence on the capital structure (mix between debt and equity financing for the firm - independent variables) and the capital structure itself (actually observed debt/equity ratio - dependent variable). Two methods have been utilised: First, within the overall regression, amongst other predictor variables, an industry specifying dummy variable was introduced and tested for the significance. 0 was representing the Energy sector companies, and 1 representing the Healthcare sector companies. A negative coefficient of -1.08 with a significant p-value of 0.03 indicates that switching between the industries from Healthcare to Energy will decrease debt to equity ratio by 108.26 percent. Overall, the quality of the model is high as is its ability to explain the relationship, because the F-statistic is high (80.78) and significant (F-significance <0.0000), meaning that a regression model fits the data better than the model with no independent variables - analysing the chosen determinants proves pertinent in explaining the variation of the response variable. Second, since the aforementioned method found the statistically significant difference between capital structure determinants overall as a general measure of all of the factors combined, the authors have run separate single factor ANOVAs testing for the significance of the difference between population means (based on the samples used for the model) for every factor alone. Interesting dissimilarities have been observed: at the level of significance (alpha) equal to 0.05 zero hypothesis of equality of means for such determinants as tangibility, enterprise size,

debt-tax shield size, non-debt tax shield size was rejected. For other determinants, namely: enterprise growth pace, cash flow volatility, and profitability level, H0, in contrast, failed to get rejected, meaning that no significant difference between Energy and Healthcare industries has been found.

In accordance with the theories of collateral value by Plaut (1985) and a lender based theory of collateral as of Inderst and Mueller (2007), an increased proportion of tangible assets to total assets possessed by the company and present in its balance sheet leads to increased leverage expressed in higher debt to equity ratio. Based on the model used, 1% increase of the tangibility ratio will increase D/E ratio by approximately 2% providing support for ideas expressed by early works by Myers and Majluf (1984), Masulis (1976) and more recent by Frank and Goyal (2009), Kayhan and Titman (2007), Uysal (2007), Fan, Titman and Twite (2003), Hovakimian, Opler and Titman (2001), but failing to back Grossman and Hart (1982) suggested inverse relationship seen in Goyal, Lehn and Račič (2002) work as well.

From a purely statistical perspective, as shown in the regression results, the pace of the firm growth captured by EBITDA quarterly change has no connection to the D/E ratio (near zero regression coefficient of 0.0122 with p-value of 0.6052). Thereby there is no support provided by the selected model and the proxy chosen by authors for either of the two dominant theories. Neither the views presented by Jensen and Meckling (1976) and demonstrated by Frank and Goyal (2009), Kayhan and Titman (2007), Fan, Titman and Twite (2003), and the static trade-off theory stating that a growing enterprise will not favour debt due to mandatoriness of its servicing in contrast to more lax equity dividend payments, nor the stance of Myers and Majluf (1984) with a pecking order theory are supported.

Firm size measured by the normal logarithm of total assets has been found to be a statistically significant capital structure determinant (p-value<0.0000). Its negative sign and

0.52 coefficient corresponds to the prediction made by the pecking order theory. According to which firms prioritise internal financing, such as retained earnings, over external financing through debt issuance. As firm size increases, internal funds are often more readily available, reducing the need for external debt financing and leading to lower debt-to-equity ratios. Here the model output obtained by the authors contradicts most of the previous academic research Kayhan and Titman (2007), Uysal (2007), Fan, Titman and Twite (2003), Hovakimian, Opler and Titman (2001), Rajan and Zingales (1995) finding similarity only with the results of Titman and Wessels (1998). Although the argumentation for that amongst other reasons it is based on the agency theory and information asymmetry that was not directly measured or controlled in the work, by the pecking order theory it concluded that increase in the firm size decreases the difference between the knowledge possessed by the management and the market - one of the main arguments for debt financing for smaller enterprises, that are assumed to be able to transform superior knowledge of the firm that they have into higher profits from issuing bonds, than stocks whose fundamentals are poor and will not attract equal funds. Bigger firms, on the other hand, attract more attention and this asymmetry is of lesser use. Although the sample includes the biggest firms in both industries some degree of variability is still present, allowing to reinforce what was concluded by Mugosa (2015).

Although cash flow volatility was found to have a significant effect on D/E ratio (p-value of 0.038) its positive sign technically means that higher instability in free cash flow quarterly figures increases the gearing - an idea not presented in any theory observed, but numerically shared with Jensen, Solberg and Zorn (1992). Near-zero coefficient of 0.0002 is not large enough to provide any valuable contribution as it signifies an almost absent effect that might be easily changed in another sample, proxy or model.

An evident dissimilarity between debt-based and non-debt based debt tax shields is the benefit's size and the effect on the dependent variable - D/E ratio. As predicted by all

theories analysed, the model utilised shows the opposing signs for both tax shield types. A significant (p-value<0.0000) +10.548 regression coefficient signifies a strong and direct relation between the debt-based advantage and the debt amount in the financial statements. The aforementioned can be understood in a twofold manner which limits the deductive possibilities for conclusion making, as both D/E and debt-based tax gain are directly and reciprocally connected (D/E affects the amount of debt, and the amount of debt affects the size of tax gain). In order to capture bankruptcy costs, the authors used the D/E and profitability proxy, showing a statistical significance and direction of the relationship that speaks positively about the model's ability to reflect reality and support the research by Modigliani and Miller's ideas refined by Titman and Wessels, (1988) and Merton and Miller (1977). The non-debt tax shield, while being statistically insignificant (p-value =0.4430, as is probably explainable by miniscule combined values for depreciation, amortisation and capital investment tax benefits relative to taxable gains for the firms in studied industries) still favours the Fama and French (2002), as it has very strong and a negative coefficient (-52.5500) implying that increase in non-debt benefits causes the D/E ratio to decrease.

The profitability coefficient proved significant (p-value<0.0000) and is large and negative (-24.6491), as predicted by the pecking order theory, suggesting an inverse relationship between firm profitability and its debt-to-equity ratio, a finding which is very similar to the scrutinised academic results by Frank and Goyal (2009), Kayhan and Titman (2007), Uysal (2007), Fan, Titman and Twite (2003), Hovakimian, Opler and Titman (2001).

Profitable firms are more likely to generate sufficient internal funds to finance their investments, resulting in lower reliance on debt financing and consequently lower debt-to-equity ratios. Though numerical support has not been found for the Trade-off theory in regards to pertinent to the relationship, the theory is more nuanced and recognizes the dynamic nature of profitability and firm gearing. According to this theory, there is an optimal

capital structure that balances the benefits and costs of debt financing. Profitable firms have greater capacity to service debt obligations, leading to lower bankruptcy risk and potentially allowing them to maintain higher debt-to-equity ratios. However, as profitability increases, firms may also prioritise internal financing, resulting in a decreased reliance on debt and lower debt-to-equity ratios - a notion which aligns with the Pecking Order Theory. Large negative coefficients found may act as a backing of the pecking order theory and simultaneously trade-off theory in the case when companies are generally located below their optimal target D/E ratios and strive to increase it while seeking the optimum.

TABLE 7
Correlations between CS determinants and leverage according to main capital structure theories and obtained correlations from the performed analysis

Factor	*Trade-off theory*	*Pecking order Theory*	*Net Income Theory*	*Performed analysis results*
Tangibility	+	-	+	+*
Size	+	-	No specific relationship predicted	-**
Growth	-	+	No specific relationship predicted	Insignificant
Firm cash flow volatility	-	+	No specific relationship predicted	+*
Debt tax shield size	+	+	+	+**
Non-debt tax shield size	No specific relationship predicted	No specific relationship predicted	No specific relationship predicted	Insignificant
Profitability	+	-	+	-**

`p < .10
*p < .05
**p< .01
***p< .001

In conclusion, the evidence collected from the conducted study finds larger support for the pecking order theory as it correctly predicts more determinant-capital structure coefficient relationship directions and relative magnitudes. At the same time the paper found limited support for trade-off and other theories in this field. It has been observed that in general, the

combined effect of selected CS determinants is statistically significantly different between the industries, nevertheless with some factors being different while others are not (appendix tables D-J).

5.2 Hypothesis 2

H2. Determining factors of capital structure affect firm performance in a similar way between S&P500 listed healthcare and energy sector companies.

The stated hypothesis seeked to test whether there is a statistically significant difference between the effects of capital structure determining factors on two types of performance measures between the tested Energy and Healthcare sector companies. As in the case of the previous hypothesis, the relationship for the presence of the difference was studied by the instrumentality of the MLR model where the belongingness to the particular industry was captured by the means of a dummy variable coded into 0 for energy and 1 healthcare. The results of two regressions, while being relatively close to each other, do vary. First, in terms of the overall explanatory power (adjusted coefficient of determination R^2 of 22.45% for accounting-based versus 12.53% for portfolio-based performance). Although the equation is unlikely to be used as a predictive mechanism for firm performance forecasting, it should be noted that while being generally low for both cases, the proportion of explained variation in the dependent variable is much (two times) higher when the accounting measure is being used. The most likely explanation for that is the nature of the Tobin's Q - its calculation is to the great extent based on the balance sheet elements, when Jensen's alpha is a completely external figure retrieved from the CAPM - separate regression model where the Bloomberg US Aggregate Equity Index (AGGE) benchmark is being used - meaning there is much less correlation between both (Bloomberg, 2022).

R^2 is not the only difference, individual factor effects captured by the direction (sign) and the magnitude (absolute value) of the OLS equation coefficients are also dissimilar between the two model outputs. For accounting performance tangibility, size, CF volatility, size of the debt tax shield, and profitability have been found to have statistical significance (p-values less than 0.0000 for all of them), firm growth and non-debt tax shield were concluded to have no effect (p-values 0.1493 and 0.7649 effectively). Portfolio-based performance, on the other hand, found that only size, debt benefits and profitability matter (see the regression number 3 output). In both cases two things are of major importance: first, it is debt-tax shield and profitability that have coefficients large enough to have a substantial impact (-0.8921 and 5.8534 in regression 2 versus 0.0263 and 0.3933 in regression 3). Unexpectedly, the direction of the relationship is different, Tobin's Q is set to decrease by 0.8921 units per unit of debt tax shield growth, in contrary, Jensen's alpha is observed to rise by 2.63 percent per unit of debt tax shield growth, this can correspond to the theories of tax deduction and the general idea of the tax shield is the reduction of taxable income positively affecting profitability as suggested by the Trade-off, revised Modigliani-Miller, and Net Income Theories. This observed relationship between debt tax shield and profitability, as a measure of performance, follows the predictions by the aforementioned theorems by applying the debt tax shield as a means to optimise firm performance and therefore value.

The strong positive relation between the profitability as a CS determinant and two types of firm performance is to be expected, as the firms' general-well being and attractiveness for the investor (degree to which it is over or undervalued - the condition measured by Tobin's Q and Jensen's alpha) is closely related to the profitability of those enterprises.

Pertaining to the actual difference between industries, the sector dummy variable is significant and positive (switch from Energy to Healthcare brings performance up) in both regressions (p-value <0.0000 and 0.0308 accordingly), what is not similar is the magnitude of

the effect, for the Tobin's Q it is 1.1167 and the Jensen's alpha it is only 0.0086, meaning that industries are much more varying if measured by accounting performance, but not portfolio-based one. Taking into account aforementioned the authors conclude that the set of factors assumed to act as a determinants of the capital structure for the firms is different between the studied industries indeed, specifically, if performance is to be measured with Tobin's Q, the dissimilarity is more announced than in the case of the abnormal return. Additionally, the difference in coefficients that is linked to the tangible asset proportion (4.2502 and 0.0044) has to do with the industry characteristics, most importantly the nature of operation and production factor intensity (see the analysis of the descriptive statistics and the discussion about the sectors in the following segment).

5.3 Hypothesis 3

H3. Firms from the S&P 500 Healthcare and Energy sector with higher debt will have better firm performance.

TABLE 8
Relationship between CS and firm performance according to main capital structure theories and obtained result from the performed analysis

	Modigliani & Miller	Net Operating Income Approach	Net Income Approach	*Performed analysis results*
Capital Structure (D/E)	No Relationship	No Relationship	Positive Relationship	No significant relationship

The hypothesis was tested using two separate regression models; firm performance was subdivided into two parts, firstly, accounting-based (Tobin's Q) and, secondly, portfolio based (Jensen's alpha) being dependent variables against the single independent variable of

debt-to-equity ratio. Measurement scales for response variables were different - unitless fraction coefficient for the Q ratio and percentages of return for Jensen's alpha.

The MLR model describes the aforementioned relationship numerically, providing a sufficient and statistically significant regression model (considering the large F-statistics, 154.34 and 87.508, at p values of $p<0.0000$). Nevertheless, overall goodness of fit for both regressions is unacceptably low (R^2 equal to 5.8597% and 3.3925%) making them unsound for forecasting within the observation cloud (interpolation) and beyond it (extrapolation).

The intercept coefficient representing the expected value of Tobin's Q when firms use equal debt and equity is 1.5903 - at the neutral CS, market value is greater than the value of the company's recorded assets. The D/E coefficient while being significant (p-value <0.0000) is extremely close to zero. The aforementioned observation implies that in studied Energy and Healthcare industries the market valuation encompasses certain intangible or unaccounted assets possessed by the companies. Granted the elevated Tobin's Q regardless of the firms' capital structure, the observed companies are incentives to engage in heightened capital investments due to their perceived worth surpassing the acquisition cost. As for industry dummy, the very nature of the industries and enterprise operation within is different due to the dissimilarities in production factor production intensities (see section 2.4), and difference in firm size (on average energy sector companies are up to 20% larger as a measure of total assets owned, maturity and speed of growth).

The second regression with portfolio-based performance provides a slightly different picture, if Tobin's Q was larger than average for nearly all CS mixes, for Jensen's alpha intercept of -0.00353 that is not significant (p-value = 0.18759) meaning that it is not different from zero, as in accordance with the overall finance world where on average (numerous companies studied in the paper) and on the long timeline (20 years with a quarterly frequency) no company is capable of showing consistent abnormal returns. The

absence of any effect of capital structure is expressed in near-zero (-2E-06) not significant (p-value = 0.067678) slope coefficient - as in the previous case a horizontal regression line is shown. Belongingness to the particular industry is very significant (p-value = 5.87E-39) and large. Healthcare is on average showing by 4.0076 percentage point higher abnormal return than the energy industry. In conclusion, pertaining to the overall hypothesis: both performance measures were found to have no relation to the capital structure, as supported by Modigliani-Miller (MM) Theory, but contrary to the Pecking Order Theory or Information Asymmetry Theory proposed by Myers and Majluf in 1984.

Interpreting the results via the MLR model indicates that there is no statistically significant relationship between the aforementioned predictor and response variables. Our work results, although including all forms of debt and equity, reinforce the theoretical propositions from Modigliani and Miller (1958)'s original proposition (that considered all debt to be risk-free, but equity all-risky) and Durand's (1952) Net Operating Income approach of capital structure independence. The lack of statistically significant relationships imply that the performance of the firms remains independent of the capital structure of the firms from both the Energy and the Healthcare sectors. An interesting consideration that arises from this conclusion is the question of the assumptions' weakness from the original theorems by Durand and Modigliani-Miller; notably, their explanations for the independence of capital-structure on the firm's value and performance is reliant upon a taxless world. Furthermore, as stressed by reviews and revisions of the Modilgiani-Miller theorem, such as the works by Brusov, Filatova and Orekhova (2022) specifically note that the weaknesses of the assumptions critically weaken the theorem's real world applicability and reliability. Nevertheless, the MLR model aligns with the predictions placed in the theories, despite the real world elements not accounted for via assumptions. Given the aforementioned, the relationship observed via the model seems to counter the propositions of the revised

Modilginai-Miller and the Net Operating Income approach - given they are reciprocal of the original Modiligani-Miller and NI approaches. A similar consideration can be raised considering the more strict assumptions, a point certain authors considered a strength to the debt-preferring theorems' real world applicability; yet, remaining non-accurate to the real world model.

5.4 Limitations

Analysis of the full sectors of S&P500 removed the problem of sufficient sample size selection from the population that would satisfy the confidence requirements as all index constituents of the aforementioned sectors were selected. In total 87 companies with 80 quarterly observations for each firm was studied. The problem connected with the influence of adverse selection costs on the equity selling outlined by Lucas and McDonald (1990) will be minimal in the connected study, as only top tier credit ranking enterprises were analysed.

The regression model being the choice for measuring the impact of different determining factors has, according to Brooks (2019), numerous fundamental problems that decrease the validity of the results. One of the identified issues pertains to the use of financial statement indicators. The lack of a strict selection preference coupled with the availability of an array of possible indicators to describe the same characteristic of a company introduces ambiguity to the process, thus complicating the process of deriving meaningful insights (Brooks, 2019).

Another critical problem lies in the strong intercorrelation between the explanatory variables, specifically those defining the capital structure (Brooks, 2019). This intercorrelation can skew the statistical results of the model, further reducing the reliability of the derived data. Moreover, the variables used within these models are not flawless representations of the underlying attributes and characteristics they aim to measure. This

imperfect proxying can lead to inaccuracies that distort the overall findings of the analysis (Brooks, 2019).

The authors have undertaken two specific procedures to mitigate the negative effects associated with the usage of multiple linear regression models for analysis. The first procedure was the use of several theoretical approaches to allow the selection of proxy variables that have demonstrated excellence in measuring the underlying factors, specifically those most frequently used and ones receiving better evaluations. Secondly, to ensure the integrity of the model, the regression models were tested numerically against necessary assumptions, including the problematic issue of near multicollinearity.

The empirical research part of the paper is subject to following biases of statistical analysis of financial data which affect the research paper to varying degrees. Survivorship bias is present in the paper and potentially skews results towards overestimation due to only present S&P 500 constituent companies being covered that have managed to get excluded over time, which could inflate average returns or other financial metrics as of Bodie, Kane, and Marcus (2013) and Brooks (2019). Look-ahead bias is another concern that affects the validity of authors results, because analysis and recommendations that the authors provide are made using historical data, and in the present moment real-time data is not available for making predictions for the future decision making (Brooks, 2019).

Another important bias according to Brooks (2019), is data-mining bias, which the authors have limited, through stating pre-specified hypotheses and seeking to find an answer to them, rather than analysing data first and then constructing hypotheses based on the findings. The authors have also minimised the effect of sample selection bias, through selecting all the healthcare and energy companies from the S&P500 index, thus allowing for generalisation to be made on that population. The time period bias presented by Brooks

(2019) has also been minimised by the authors through choosing a 20 year observation period, which increases the ability to adapt findings to long-term trends and market cycles.

The thesis is fairly immune to overfitting bias which according to Brooks (2019) happens when the model is tailored closely to the obtained data, but due to the authors model being general, the utilisation of the model by other researchers on different time periods and industry will not encounter major issues. The effect of confirmation bias which according to Brooks (2019) emerges when analysts interpret data in ways that confirm their prior beliefs or hypotheses, was also minimal due to the authors lack of prior knowledge in the field that allowed for objective analysis of data. Finally, the results of the thesis are undermined by reporting bias presented by Brooks (2019), as the thesis is based on selected academic texts that highlight certain results while downplaying or ignoring others, resulting in a skewed representation of the data.

5.5 Research Question

Research Question: *How do the different capital structure combinations affect firm performance in the S&P 500 Healthcare and Energy sector firms?*

A theoretical understanding of the industry-related issues developed during the literature review and studying the previous academic research papers allowed to make suggestions about the differences between CS determining factors and relationship later to be confirmed by the numerical analysis. Running single MLR model with a dummy variable for industry allowed the capturing of the presence of the difference in overall effect, meaning that there is statistically significant difference between the studied sectors, although as it is described earlier, individual differences and effects of every determinant were not visible from it, due to this reason separate single-factor ANOVAs and two regressions specifically for each industry helped to expressed those effects quantitatively. As indicated by the

difference between the labour intensive healthcare sector and capital-intensive energy sector (section 2.4), this study's models confirm that there is a statistically significant difference between the CS determinants between the observed Energy and Healthcare sectors. Notably; however, there is not a universal linkage between all tested CS determinants and the performance measures; rather, individual CS determinants were proven to either be statistically significant or insignificant (section 5.1).

Hypotheses 2 and 3 looked at the connection of CS to the firm performance: First, performance levels in the two sectors are not similar, with the Healthcare sector being significantly ahead, its volatility is much higher (chapter 4), that is not unusual given the idea of risk-return trade off developed Sharpe and Markowitz. Second, CS determinants affect performance differently (hypothesis 2), but, the whole CS captured with a D/E proxy has no statistically significant effect on either of the firm performance measures used by the authors of this work. All regression equations have near-zero slopes meaning that the Tobin's Q and Jensen's alpha are capital structure inelastic, which is consistent with Modigliani & Miller theory (1958).

From the hypothesis testing and statistical tests run on the sample, the research question can be answered as such: capital structure combinations are indeed different between the Energy and Healthcare sectors; yet, this difference does not have a significant effect on performance. These findings align with the original Modigliani & Miller (1958) theory and the Net Operating Income approach of Durand (1952). It is true that many external factors can be present in the differentiation between various capital structure decisions, as market timing and agency theory suggest; therefore, this study cannot act as an all-encompassing verification of Modigliani & Miller and Durand's points of view. It is also noteworthy to consider that certain patterns observable in the sample seem to suggest that the alternate to the original M&M and Durand works act as better theorems to explain the real world

phenomena, namely the observations from hypothesis 2 regarding tax debt-shields from the revised M&M, the NI approach, and the Trade off Theory. As such, drawing a distinct unilateral conclusion becomes a muddled expression of reality combining various theorems and observations from distinct observable phenomena in the sample.

5.6 Recommendations

The results are of direct practical relevance. An implication of these findings are that the business manager should take into account several key findings from this study when strategizing for optimal performance. The research indicates distinct differences in the effect of capital structure determinants on healthcare and energy companies, specifically in terms of size, tangibility, and tax shields. Healthcare companies were found to have a substantially higher debt to equity ratio, which could be attributed to inherent sectoral variances discussed by IEA (2022). As a result, the manager should customise their approach towards constructing capital structure depending on the industry they are operating in.

Notably, the study found no direct link between a firm's capital structure and its performance, supporting the ideas of Modigliani and Miller (1958) and Net Operating Income approach of Durand (1952), which proposes that a firm's value is independent of its capital structure. Thus, the manager should primarily focus on the company's operational efficiency and competitive advantage rather than specifically trying to manipulate capital structure to enhance firm performance. However, due to the study's inherent limitations, it is advisable to continuously monitor the evolving discourse around the topic capital structures effect on firm performance, because for business managers such strategy can provide insights that necessitate a revision of the company's strategy.

5.7 Future research

The present study has explored one angle of the dynamics of capital structure in healthcare and energy companies and its influence on firm performance. Due to the field's ever-evolving nature, there are numerous opportunities for academics to conduct further studies in. Future studies are possible in expanding the scope of the study to other sectors present in the S&P500, providing a more comprehensive overview of how capital structure determinants affect different industries in USA. The process could involve deep-diving into sectors that show significant divergence in their capital structure determinants, similar to the observed difference between healthcare and energy companies.

There is further possibility to conduct a study to further verify the pecking order theory in the context of different industries and geographies. As this study indicates, the theory can explain to an extent the capital structure determinants in healthcare and energy sectors within the S&P 500 using the specific variables and time period. Still, additional research could ascertain whether the theory's applicability extends beyond these confines, across various global markets and diverse sectors within different time periods. Moreover, despite the finding that capital structure does not seem to affect firm performance in the studied sample aligning with the Modigliani-Miller theory, the relationship between capital structure and firm performance might not be direct, but could potentially exist via mediating or moderating variables. Conducting in-depth research on those variables is thus concluded to be another possibility for future research.

Considering the methodological constraints of the current study, future research could aim to improve the validity of results by adopting more sophisticated statistical techniques that limit the biases present in the analysis or considering other potential variables affecting firm performance. Furthermore, while the study focuses on a 20-year period, expanding the temporal scope could yield insights into the evolution of capital structure effects over an

extended period. In essence, the field is complex and constantly developing which leaves room for future studies due to the numerous limitations of this academic paper.

6. Conclusion

The purpose of this study was to assess the impact of capital structures effect on firm performance in S&P500 healthcare and energy industry companies in order to provide evidence for the possibility of reaching optimal capital structure. In order to provide an answer to the research question, three hypotheses were constructed and tested with Multiple Linear Regressions.

The results of the hypothesis show that there is a difference in the magnitude of the effect that capital structure determinants have on capital structure across the healthcare and energy industry. The biggest difference in variables is present in the size, tangibility and tax shields measured. Furthermore, based on the results, healthcare companies have a 108.26% higher debt to equity ratio than energy companies, which can be mainly explained by theoretical differences of factor intensity in the compared sectors. The observed results for the effect of capital structure determinants was analysed to be best predicted by the pecking order theory presented by Myers and Majluf (1984).

Although there are differences in the capital structures and their determinants across the healthcare and energy industries, the authors did not find evidence that there exists a relationship between the capital structure and firm performance. The two regressions testing capital structure relationship with accounting-based and portfolio-based firm performance yielded results that follow the ideas presented by Modigliani and Miller (1958), who discussed that the value of the company is independent from its capital structure.

The study makes a contribution to the existing literature of quantitative studies that seek to explain capital structure effects on firm performance. Through conducting a study on 87 companies quarterly observations for a 20 year period of healthcare and energy industry companies in the USA, the authors make a contribution by providing researchers analysis

about the observed sample and ability to compare the results if they seeked to conduct a study on a different sample in the same period. Another contribution that the authors make is providing analysis about the capital structure effects in between different industry sectors, which adds further proof to the contemporary literature that discusses the different levels of debt present in the healthcare and energy industries.

Ultimately, this paper shows that the topic of capital structure's effect on firm performance is an ever evolving topic with multiple theoretical viewpoints trying to explain the relationship which provides opportunities for future studies. There are opportunities to delve into the impact of capital structure determinants across different industries, test the pecking order theory's applicability beyond healthcare and energy sectors, and explore potential mediating or moderating variables. Additionally, advancing methodological approaches and expanding temporal scope could further enrich understanding in this ever-evolving field.

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Appendix

TABLE A
Descriptive statistics on the studied variables for the Energy sector companies

	D/E	Tangibility	Growth	Size	CF volatility	Debt tax shield	Non-debt tax shield	Profitability	Accounting Performance	Portfolio Based Performance
Mean	0.94	0.91	0.39	10.43	502.79	0.35	0.01	0.03	1.60	0.00
SE	0.06	0.00	0.35	0.03	20.81	0.01	0.00	0.00	0.02	0.00
Median	0.49	0.97	0.00	10.37	230.58	0.32	0.00	0.03	1.42	-0.01
Mode	26.52	1.00	0.00	10.09	0.00	0.29	0.00	0.06	1.16	-0.03
SD	2.01	0.14	11.74	1.05	691.60	0.18	0.00	0.04	0.66	0.08
Sample Variance	4.06	0.02	137.93	1.11	478306.99	0.03	0.00	0.00	0.44	0.01
Kurtosis	119.67	2.77	892.65	-0.05	2.50	2.78	32.15	36.43	7.36	2.20
Skewness	10.15	-1.60	28.68	0.27	1.84	1.31	3.19	-4.04	2.27	0.92
Range	26.49	1.04	391.99	4.64	3331.05	1.14	0.04	0.64	4.92	0.68
Min	0.02	0.36	-21.99	8.19	0.00	0.05	0.00	-0.42	0.53	-0.27
Max	26.52	1.40	370.00	12.82	3331.05	1.19	0.04	0.22	5.45	0.41
Sum	1034.35	1003.59	432.14	11528.24	555584.57	386.52	5.55	34.04	1763.38	-4.11
Count	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105
Confidence Level 95.0%	0.12	0.01	0.69	0.06	40.82	0.01	0.00	0.00	0.04	0.00

TABLE B
Descriptive statistics on the studied variables for the Healthcare sector companies

	D/E	Tangibility	Growth	Size	CF volatility	Debt tax shield	Non-debt tax shield	Profitability	Accounting Performance	Portfolio Based Performance
Mean	2.16	0.71	0.07	8.61	584.67	0.51	0.00	0.03	2.94	0.04
SE	0.21	0.00	0.06	0.03	41.00	0.01	0.00	0.00	0.04	0.00
Median	0.50	0.76	0.00	8.77	72.96	0.45	0.00	0.04	2.14	0.02
Mode	97.28	1.00	0.00	10.15	0.00	0.00	0.00	0.02	2.63	0.01
SD	13.02	0.21	3.92	1.75	2534.94	0.34	0.00	0.04	2.53	0.09
Sample Variance	169.46	0.04	15.33	3.06	6425911.05	0.11	0.00	0.00	6.40	0.01
Kurtosis	210.77	-0.26	2852.10	-0.59	49.27	15.13	295.26	18.14	22.21	37.77
Skewness	12.71	-0.46	49.59	-0.31	6.89	2.60	12.67	-2.82	3.85	-1.41
Range	316.51	1.67	264.23	8.75	24921.07	4.15	0.06	0.65	28.79	2.09
Min	0.00	0.13	-39.34	3.52	0.00	0.00	0.00	-0.38	0.73	-1.43
Max	316.51	1.79	224.88	12.27	24921.07	4.15	0.06	0.27	29.52	0.66
Sum	8241.99	2702.50	264.22	32912.38	2235209.56	1948.20	10.28	127.53	11225.92	138.05
Count	3823.00	3823.00	3823.00	3823.00	3823.00	3823.00	3823.00	3823.00	3823.00	3823.00
Confidence Level 95.0%	0.41	0.01	0.12	0.06	80.38	0.01	0.00	0.00	0.08	0.00

TABLE C
Pearson's correlation coefficients for the relationships between all studied variables

Factor	D/E	Tangibility	Growth	Size	CF volatility	Debt tax shield	Non-debt tax shield	Profitability	Accounting Performance	Portfolio Based Performance
Total Debt to Total Equity	1.00									
Tangibility	0.07	1.00								
Growth	0.00	0.02	1.00							
Size	-0.14	-0.03	-0.01	1.00						
CF volatility	-0.03	0.00	0.00	0.27	1.00					
Debt tax shield	0.32	0.02	-0.01	-0.21	-0.09	1.00				
Non-debt tax shield	-0.01	0.24	0.00	0.00	0.00	-0.09	1.00			
Profitability	-0.17	-0.10	0.03	0.19	0.10	-0.23	-0.02	1.00		
Accounting Performance	0.04	0.15	0.02	-0.38	0.00	-0.03	-0.02	0.05	1.00	
Portfolio Based Performance	-0.02	-0.01	-0.03	-0.31	-0.06	0.12	0.00	0.09	0.22	1.00

TABLE D
Single factor ANOVA results for tangibility

Groups	Count	Sum	Average	Variance
Tangibility (E)	1105.00	1003.59	0.91	0.02
Tangibility (H)	3823.00	2702.50	0.71	0.04

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	34.74	1.00	34.74	913.91	0.00	3.84
Within Groups	187.26	4926.00	0.04			
Total	222.01	4927.00				

TABLE E
Single factor ANOVA results for growth

Groups	Count	Sum	Average	Variance
Growth (E)	1105.00	432.14	0.39	137.93
Growth (H)	3823.00	264.22	0.07	15.33

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	88.86	1.00	88.86	2.08	0.15	3.84
Within Groups	210861.37	4926.00	42.81			
Total	210950.23	4927.00				

TABLE F
Single factor ANOVA results for size

Groups	Count	Sum	Average	Variance
Size (E)	1105.00	11528.24	10.43	1.11
Size (H)	3823.00	32912.38	8.61	3.06

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2851.19	1.00	2851.19	1088.51	0.00	3.84
Within Groups	12902.95	4926.00	2.62			
Total	15754.14	4927.00				

TABLE G
Single factor ANOVA results for CF volatility

Groups	Count	Sum	Average	Variance
CF volatility (E)	1105.00	555584.60	502.79	478307.00
CF volatility (H)	3823.00	2235210.00	584.67	6425911.00

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5747524.74	1.00	5747524.74	1.13	0.29	3.84
Within Groups	25087882939.00	4926.00	5092952.28			
Total	25093630463.00	4927.00				

TABLE H
Single factor ANOVA results for debt tax shield

Groups	Count	Sum	Average	Variance		
Debt tax shield (E)	1105.00	386.52	0.35	0.03		
Debt tax shield (H)	3823.00	1948.20	0.51	0.11		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	21.89	1.00	21.89	231.45	0.00	3.84
Within Groups	465.92	4926.00	0.09			
Total	487.81	4927.00				

TABLE I
Single factor ANOVA results for non-debt tax shield

Groups	Count	Sum	Average	Variance		
Non-debt tax shield (E)	1105.00	5.55	0.01	0.00		
Non-debt tax shield (H)	3823.00	10.28	0.00	0.00		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.00	1.00	0.00	870.20	0.00	3.84
Within Groups	0.03	4926.00	0.00			
Total	0.03	4927.00				

TABLE J
Single factor ANOVA results for profitability

Groups	Count	Sum	Average	Variance		
Profitability (E)	1105.00	34.04	0.03	0.00		
Profitability (H)	3823.00	127.53	0.03	0.00		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.01	1.00	0.01	3.68	0.05	3.84
Within Groups	7.46	4926.00	0.00			
Total	7.47	4927.00				

Table K: The 65 company stocks used in analysis for healthcare industry

Name	Ticker	Name	Ticker
Agilent Technologies	A US Equity	Incyte Corp	INCY US Equity
Abbvie Inc	ABBV US Equity	Iqvia Holdings Inc	IQV US Equity
Amerisourcebergen Corp	ABC US Equity	Intuitive Surg Inc	ISRG US Equity
Abbott Laboratories	ABT US Equity	Johnson & Johnson	JNJ US Equity
Align Technology	ALGN US Equity	Laboratory Corp of America Holdings	LH US Equity
Amgen Inc	AMGN US Equity	Eli Lilly and Company	LLY US Equity
Baxter International Inc	BAX US Equity	Mckesson Corp	MCK US Equity
Becton Dickinson and Company	BDX US Equity	Medtronic Inc	MDT US Equity
Biogen Inc	BIIB US Equity	Molina Healthcare Inc	MOH US Equity
Bio-Rad Laboratories	BIO US Equity	Merck & Company	MRK US Equity
Bristol-Myers Squibb Company	BMY US Equity	Moderna Inc	MRNA US Equity
Boston Scientific Corp	BSX US Equity	Mettler-Toledo International	MTD US Equity
Cardinal Health	CAH US Equity	Organon & Co.	OGN US Equity
The Cigna Group	CI US Equity	Pfizer Inc	PFE US Equity
Centene Corp	CNC US Equity	Perkinelmer	PKI US Equity
Cooper Companies	COO US Equity	Insulet Corp	PODD US Equity
Charles River Laboratories Intl	CRL US Equity	Regeneron Pharmaceuticals	REGN US Equity
Catalent Inc	CTLT US Equity	Resmed Inc	RMD US Equity
CVS Corp	CVS US Equity	Steris Corp	STE US Equity
Quest Diagnostics Inc	DGX US Equity	Stryker Corp	SYK US Equity
Danaher Corp	DHR US Equity	Bio-Techne Cp	TECH US Equity
Davita Healthcare Partners Inc	DVA US Equity	Teleflex Inc	TFX US Equity
Dexcom Inc	DXCM US Equity	Thermo Fisher Scientific Inc	TMO US Equity
Elevance Health Inc	ELV US Equity	Universal Health Services	UHS US Equity
Edwards Lifesciences Corp	EW US Equity	Unitedhealth Group Inc	UNH US Equity
Ge Healthcare Technologies Inc	GEHC US Equity	Vertex Pharmaceutic	VRTX US Equity
Gilead Sciences Inc	GILD US Equity	Viatris Inc	VTRS US Equity
Hca Holdings Inc	HCA US Equity	Waters Corp	WAT US Equity
Hologic Inc	HOLX US Equity	West Pharmaceutical Services	WST US Equity
Henry Schein Inc	HSIC US Equity	Dentsply Sirona Inc	XRAY US Equity
Humana Inc	HUM US Equity	Zimmer Biomet Holdings	ZBH US Equity
Idexx Laboratories	IDXX US Equity	Zoetis Inc Cl A	ZTS US Equity
Illumina Inc	ILMN US Equity		

Table L: The 22 company stocks used in analysis for energy industry

Name	Ticker	Name	Ticker
Apa Corp	APA US Equity	Kinder Morgan	KMI US Equity
Baker Hughes Company	BKR US Equity	Marathon Petroleum Corp	MPC US Equity
Conocophillips	COP US Equity	Marathon Oil Corp	MRO US Equity
Coterra Energy Inc	CTRA US Equity	Oneok Inc	OKE US Equity
Chevron Corp	CVX US Equity	Occidental Petroleum Corp	OXY US Equity
Devon Energy Corp	DVN US Equity	Pioneer Natural Resources Company	PXD US Equity
Eog Resources	EOG US Equity	Schlumberger N.V.	SLB US Equity
Eqt Corp	EQT US Equity	Targa Resources	TRGP US Equity
Diamondback Energy	FANG US Equity	Valero Energy Corp	VLO US Equity
Halliburton Company	HAL US Equity	Williams Companies	SHW US Equity
Hess Corp	HES US Equity	Exxon Mobil Corp	XOM US Equity