Does the capital structure impact the company performance: empirical research of the effect of financing decisions on a company's profitability?
Evidence from the UK Pharmaceutical and biotechnology sector

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 Abstract:

Capital structure is among the most significant subject in finance, and managers are tasked with selecting the optimal capital structure option to improve the performance of their organisations. In this thesis, we aim to analyse how capital structure choice affects the company's performance and value. The research was conducted using a multiple regression model on a sample of 10 pharmaceutical and biotechnological companies listed on the London FTSE all share from 2016 to 2021 for 6 years period to evaluate the type of connection between gearing and profitability. We tested the assumption that leverage positively affects profitability and boosts the value of the company by measuring the gearing with debt to Equity and debt to capital and measuring the profitability with ROE, ROA and Operating Margin. The outcomes of the findings demonstrate the favourable correlation between gearing and a company's performance in the biotech and pharma industry.

Acknowledgement:

"Seeking knowledge from the cradle to the grave" is a quotation that explains that there is no age for seeking knowledge and never say is late to do. It is evident that difficult routes lead to beautiful destinations nevertheless without the support and the supplications of the persons who surround you; this destination could not be attained. This MBA was my parent's dream, my soulmate's dream and my beloved kids' dream and the dream that I have travelled from my home to other lands looking for it from Algeria to Spain to Norway and eventually once I arrived in this land, I was convinced that now is the perfect moment to do it. This thesis represents a very crucial parade in my educational and professional life that I paused it to build up my lovely family. Therefore, I would like to express all my gratitude to those who assist me during my study. I would like to thank all my family and friends for their support, additionally, I would like to show my gratitude to all my MBA lecturers for the knowledge and the skills they transmit to me notably my Supervisor Jia Miao for his patience and support and dedication.

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Chapter1: Introduction

1.1 Capital structure background:

Capital structure choice generally is seen as secondary and less important, even so, it is the most important decision that a company can take on how to finance the business pursuing what products to produce or services to offer (Clayman, 2012).

It has been 66 years since the landmark paper known as MM Irrelevance Theory (1958) was published by Modigliani and Miller. This theory is the keystone of all the upcoming theories addressing capital structure choices and related problems therefore we surely found arguments among scholars about how companies should finance their investments with the least financing costs and higher returns by evolving many theories.

Capital structure points to the variations that may impact the company's debt or equity option and it grants to the proportions of capital deployed (debt, equity) to finance the company's functioning. The role of the managers is to find out how to balance the two sources to realise the optimal capital structure (Gomez-Gonzalez, et al., 2022)

The literature on corporate finance contains a substantial amount of discussion on the question of capital structure because of its importance. The relevance of learning about this subject is mostly based on the objective of the management team of the company, which is to increase the wealth of the shareholders. The capital structure has a massive impact on the company's operations and performance since the leverage ratio is such a significant factor in the firm's taxation variance, risk, cost of capital, investment prospects, and firm value. The decisions made to structure the company's capital are impacted by both macroeconomic variables and the company's circumstances. To put it another way, the alternatives available to businesses for selecting a mode of financing change with time and vary significantly between businesses, as well as between industries. Within the scope of this study, I will analyse the capital structure and the effect that a company's financial decisions have on its value within the healthcare industry and its subsectors that are traded on the FTSE All-Share index of the London Stock Exchange.

1.2 Reason for choosing this sector.

To commence, I have chosen to analyse the capital structure choices of the healthcare segments and its subsectors pharmaceutical and biotechnology, listed in the FTSE All Share, since it is among the leading stock markets in the globe and the most well-known corporations trading there. In this paper, I will focus on collecting 6 years of data from 10 healthcare, pharmaceutical, and biotechnology companies that belong to the subsectors of the healthcare segment and analysing how the choice of finance is made by companies of this industry and how companies choose the way of financing.

I am interested in this sector because I believe that science and health are extremely important to humanity and that people's health and well-being have an indirect effect on the global economy, particularly in the last few decades, when the general state of health has deteriorated significantly due to the emergence of life-threatening diseases. And the finest example was covid-19 and the pandemic, which demonstrates the significance of medical research at a time when the world and government concerning the discovery of a vaccine that returned our lives to normal. I believe investors should be encouraged to invest in this sector. By studying the capital structure in this sector, I am willing to uncover how companies are behaving concerning capital structure, how managers decide whether to use debt financing or equity financing, what factors influence their decision, and how this decision affects the value and overall performance of the company.

1.3 Objectives of the research

In this study, we analyse the financial performance as a function of a large number of explanatory factors, such as financial ratios that indicate companies' decisions regarding the proportion of debt and equity in the overall capital, intending to test the hypotheses of the Irrelevance Theorem.

Through an analysis of the FTSE All-Share medical and pharmaceutical sectors, this study aims to determine the impact that a firm's preferred method of financing has on the value of that company. In addition, the capital structure theory and the findings of earlier researchers will be examined and contrasted with the findings of this research. As mentioned earlier I have chosen 10 companies and six years of data from 2016 to 2021. We will perform a multiple regression model on the data to figure out the connection between leverage, return and profitability ratios. Additionally, these findings are employed to evaluate the research hypothesis and address the research problems. To achieve the primary goals, I have established the following objectives:

- investigate and analyse the connection between leverage and Return on Equity, Return on Assets in medical and pharmaceutical firms listed on the FTSE-All Share of the London Stock Exchange.
- Investigate the relationship between leverage and operating margin to figure out how the choice of financing impacts the company's performance.

1.4 questions of the research

It is difficult to produce an effective research paper without first formulating appropriate research questions that lead to an analytical response to the problem. To point on the right path while I do my research, I have based my study on the following questions:

- How does the choice of financing affect a company's value?
- To what degree does leverage influence ROE and ROA, and what factors contribute to this relationship? Is there any positive or negative relationship between them?

- Does the amount of debt affect the operating margin? If so, does it have a positive or negative impact?

1.5 Hypothesis of the research

- Strong financial health and strong assets allow firms to take on substantial debt.
- The relationship between leverage and return on equity (ROE) is positive.
- Leverage and Return on Asset ROA are positively correlated.
- Leverage negatively affects the operating margin.

1.6 Structure of the research

The dissertation paper is going to be broken up into five separate chapters.

The first chapter will be the introduction, where I have included a brief background of the topic that was selected; the chosen market and the industry where the data collection and analysis will take place; an approach to the goals and objectives of the study; and finally, a formulation of the research questions and hypothesis.

The review of the previous research will be presented in Chapter two: This will consist of a discussion of a range of theories and findings from earlier empirical research relating to capital structure decisions.

The third chapter will feature both a description of the methodology utilised for the study as well as a review of the data obtained from the medical and pharmaceutical companies that are included in the FTSE All-Share index. In the fourth chapter, I will discuss the findings and explain them.

In the fifth chapter, I will come to a conclusion on the extent to which the research that was carried out was successful in meeting its aims and objectives. In addition to that, I will discuss my thoughts for further study as well as my recommendations.

Chapter2: Literature review

Four major capital structure theories are dominating the corporate finance literature: Modigliani and Miller's irrelevance theory; Trade-off theory; Pecking order theory; and Market timing theory. Those four theories are based on three assumptions that are: tax benefit of debt; bankruptcy cost and asymmetric information.

Selecting an adequate balance of debt and equity in the capital structure can be crucial to the effective application of a company's strategy. Theoretically, a company should corporate sufficient debt into its capital to increase its return on investment by applying debt to activities that generate more than the cost of borrowing. However, this must be weighed against the requirement to meet fixed debt payments regardless of periods of low earnings. Whilst equity does not normally bring with it fixed service requirements, concerns like dilution of ownership and the need to share future revenues with new

shareholders must be considered. In times of weak share prices, debt may prove to be the most cost- and demand-effective solution. Conversely, when interest rates rise, equity issuance becomes more desirable (Reuvid, 2002).

2.1 Capital structure overview

numerous capital structure theories have been developed by academics. This section looks at these theoretical and empirical writings. In 1985 when Modigliani and Miller published the first work about capital structure: the irrelevance of capital structure theorem since then many researchers were concerned about capital structure issues and started to examine the link between the level of leverage and the firm's value. Modigliani and Miller(1958) argue that the choice of leverage ratio does not impact the company's value in the assumption of being in a perfect market. Several academics have challenged this argument by finding other factors that may affect the capital structure decision.

Numerous factors may affect the firm's debt and equity selection: asset structure, tax shield, growth and profitability, type and size of the industry and macro-economic factors. The majority of capital structure theories state that capital structure choice may be affected by the asset owned by the company. According to (Scott, 1977), the company can enhance the value of their equity by selling secured debt. Share a similar argument about the favourable position of the firm in issuing secured debt. And they explain that it is an opportunity that the company would avoid the securities associated costs when issuing them. Their argument explains that a company's assets could be used as a guarantee and permit the company to relocate more debt and make the most of this opportunity (Titman & Wessels, 1988).

A model built by DeAngelo Masulis proves the influence of a non-debt tax shield (depreciation expenses and investment tax credits) on optimal debt levels. Their argument is: companies will include less borrowing in their capital structure when they have considerable non-debt tax shields (Chang, et al., 2009).

2.2 Theories of capital structure

Although various important capital structure theories are highlighted in the literature, managers aim to choose the way of financing based on the company's circumstances and market situation. Despite that, it is important to study and understand the theories to be taken into account while making financial decisions.

Miller and Modigliani theory

The origins of the contemporary discussion on the corporate capital structure may be linked to Modigliani and Miller (MM, 1958). The study by MM challenged the conventional perspex of corporate finance (Prasad, et al., 2001).

In their seminal article published in 1958, Modigliani and Miller established that a company's cost of capital is unrelated to its debt-to-equity ratio.

The initial statement and the fundamentals of Modigliani and Miller's Theorem (1958) indicate that a highly efficient economy occurs within the absence of taxes, agency and bankruptcy costs, and it also argues a massive amount of information is accessible by all parties. In 1963, Modigliani and Miller included the influence of taxes in their framework so that it would be more accurate to reality.

According to (Ahmeti, 2015), the M&M publications of (1958, 1961 and 1963), it is possible to introduce three essential statements that constitute the foundation of their theory (Breuer and Gürtler, 2008):

P1: the capital structure does not determine the company's total Market value.

P2: there is a direct correlation between the cost of equity and the debt-to-equity ratio.

P3: A firm's total market value and dividend policy are independent of each other.

Given that the M&M propositions were produced in a "not-exactly genuine reality," it is not unexpected that the majority of academics and scholars keep debating these assumptions because they were established based on nonreal market conditions (Ahmeti & Prenaj, 2015).

(William R, 2015) tested the MM theory for capital structure for banks. And he concludes the following: The Modigliani-Miller theorem is used as supporting evidence by proponents of significantly increased capital requirements for banks. These proponents argue that the related costs would be insignificant. The M&M theorem states that the capital structure of a company does not have an impact on the average cost of capital for a corporation. Any decrease in capital cost that ultimately resulted from shifting to higher leverage by using lower-cost debt is exactly surpassed by a rise in the unit cost of higher-cost equity capital due to the associated increase in risk. This is because higher leverage is associated with greater exposure to risk. This means that any reduction in capital cost that occurs is effectively nullified. Between the years 2002 and 2013, large banks in the United States realised less than half of this M&M offset in fact, compared to the half of this M&M offset that was realised in theory. Thus, a rise in capital requirements would result in a rise in financing costs, as well as a decline in capital creation, which would incur output costs. To determine the ideal amount of capital requirements, these costs to the economy would have to be weighed against the advantages of a reduced likelihood of banking crises.

It is clearly evident that the MM theory has contributed massively to modern corporate finance from numerous economics academic perspectives, even though this theory works under very restricted assumptions or propositions in particular the neutralisation of taxes and the ignorance of the additional costs of capital and the equality in the opportunities that companies have for the access to the capital market. The major limitation of the theory is the lack of evidence in proving that the capital structure is irrelevant to the company's performance as their propositions were created based on non-real conditions.

Trade-off theory

The trade-off theory of capital structure suggested by (Myres1984) is the theory that has been around the longest, and it forms the basis for a significant portion of the extensive amount of empirical study

on capital structure. The concept of this theory is to emphasise a balance between the increase in the tax saving from debts and a drop in agents' costs and the cost of bankruptcy and financial distress.

Under the trade-off theories, every company has an ideal capital structure that maximises its market value, the trade-off occurs in various patterns, such as the trade-off between the tax shield of debt and the distressed cost of capital. However, The ideal capital structure is obtained when the marginal present value of tax deduction benefits and the marginal present value of the costs of financial distress on increased debt are in equilibrium. In the case of agency costs, the trade-off between agency costs dictates that the optimal capital structure can only be attained when agency costs are reduced. In the context of signalling theory, the optimal level of debt financing is determined by equating the opportunity cost of signalling advantages and financial challenges. It suggests that a corporation uses its debt ratio as a classification indicator (Jarallah, et al., 2019).

According to (ABEL, 2018) The inclusion of interest deduction and accumulated depreciation costs of default is insufficient to guarantee the validity of the trade-off hypothesis where he highlighted three situations where the theory is not operative despite the presence of a tax shield. The first situation is where the taxation is relatively low in this case the trade-off is not applicable and the reason is the company benefits from a tax shield given by interest deduction, however borrowing until the point where avoiding exposing itself to the cost associated with the increase in indebtedness. Secondly, when the tax rate is substantial but not excessively, the trade-off theory doesn't work because the debt limit is restricted. This indicates that the economic benefit of the interest tax shield is greater than the marginal cost of a greater likelihood of default. And finally, the trade-off argument fails regardless if the tax rate would be either too low or too high   EBIT falls below the key figure. In this case, a low EBIT value indicates that the firm's current value is low, indicating that the firm's borrowing capacity is severely constrained.

(Jarallah, et al., 2019)in the finding of their research concerning pecking order and trade-off theories-new evidence from Japan their finding results were consistent with the trade-off theory and show that bigger companies can quickly gain the loan market, and the distress risk associated with debt financing does not develop as quickly for them as it does for smaller firms.

The trade-off theory is found at an obvious concern on the tax front, as it appears to restrict taxpaying corporations from maintaining conservative debt levels. If the hypothesis is accurate, a value-maximizing company should never pass up interest tax shields when the likelihood of financial trouble is even somewhat minimal. Microsoft and the big pharmaceutical corporations are among the many well-established, successful businesses with high credit ratings that have maintained low debt ratios for years. (Myers, 2001) mentioned that as one downside of the trade-off theory in his paper called "capital structure. He built this argument based on an empirical study made by (Graham2000).

In the end, we can say that the trade-off theory suggests the firm borrow as much as can to take advantage of the tax shield benefits and trade-off between the advantages and disadvantages of debts, however, it does not indicate the suggested amount of debt that companies should contribute to their

capital structure and only focuses on the assumption that profitable companies are highly indebtedness for the reason of beneficiating from the tax benefits and maintaining a high level of available capital.

Pecking order theory

Another important dominant theory following the trade-off theory is the pecking order theory for the capital structure that was introduced by Myres1984. The pecking order model of Myers (1984) and Myers and Majluf (1984) assumes that issuing equity—transaction costs and notably expenses resulting from asymmetric information issues are substantial. This is what creates the hierarchy. Due to the high costs associated with issuing stock, investments are often financed through retained earnings, then debt, and finally as a last option using equity. Since debt capacity is desirable to avoid the expenses of issuing stock, the pecking order theory assumes that repurchases of equity would be uncommon and confined to enterprises with fewer investment opportunities compared to revenues and, hence, a minor necessity for debt capacity (Fama & French, 2005).

This theory assumes that profitable companies issue less debt than unprofitable companies in other words profitable companies use internal funding first in favour to avoid the costs related to borrowings like agency costs and asymmetric information. Consequently, one may anticipate an unfavourable association between debt amount and the firm's performance (profitability). Several empirical findings confirm this negative correlation between leverage and a company's performance or profitability (Kester, 1986; Friend and Lang, 1988; Wald, 1999; Booth et all 2001; Fama and French, 2002).

(Myers & Majluf, 1984) clarify the issues related to debt and equity using asymmetric information which means that the pecking order theory will fulfil similar results as M&M theory (1963) in case of the absence of asymmetric information between market participants. Nevertheless, in a world where asymmetric information is existing external investors are less aware or informed than managers and ask for less discounted prices for new shares or bonds. If this were not the case, the company's internal investors would advantage since they would be able to issue new securities based on incomplete information. Therefore, in this theory, it is recommended to utilise first internal funds and issue debts if it is necessary and leave equity as a last resort.

In most cases, differences in information asymmetry are at the root of the problem that comes with issuing equity. An investigation of the multigenerational connection between unequal access to knowledge and problems of equality was carried out by (Autore & Kovacs, 2010). According to their findings, the lack of information that varies over time has a substantial relationship to the decisions that businesses make regarding the sources of the funds that come from outside the company. They conclude that when the information asymmetry of a company is low in comparison to its most recent history, the company is more likely to issue stock rather than debt. It is important to note that this relationship only holds true for businesses that have a considerable amount of knowledge asymmetry when compared to other enterprises. If greater information asymmetry leads to an increase in the cost of releasing

information-sensitive securities, as the pecking order theory suggests, then we would anticipate that businesses with greater information imbalance would gain the most from issuing equity when the volume of asymmetric information was partially low. This is because businesses that have a wider knowledge gap will be required to pay a higher price to issue information-sensitive securities.

 The findings of their study indicate that changes made in asymmetric information should be taken into account by equity-issuing companies (Autore & Kovacs, 2010).

(Fama & French, 2005) argue that during their sample duration from 1973 to 2002, almost two-thirds of the companies in the sample issued equity, whereas only a minority repurchased stock. This suggests that the opposite consequence may be driven by asymmetric information. Or that managers are pessimistic or risk-averse or that the cost of obtaining information is not as high as Myers assumed. and also, their study comes to similar results in that companies had more net share issues than net debt issues throughout the data period.

According to (Myers, 2001) although the pecking order model demonstrates how variation in information might impact the way of finance. Similarly, to numerous theories of capital structure, it functions better under particular contexts and conditions. The theory posits that managers maximise the value of existing shares by acting in the best interest of current shareholders. Myers and Majluf (1984) fail to demonstrate why managers should care if a new stock offering is overvalued or undervalued. No clear treatment of managerial incentives is provided. Moreover, the theory is not able to clarify the reason for not developing financing strategies to avoid the consequences of managers having superior information than shareholders and the interest of managers and shareholders are not aligned.

2.3 Finding from empirical researches

I have assembled several international empirical studies on the connection between capital structure and firm performance that have been done in developed and developing countries and different industries.

(Mathur, et al., 2020) carried out empirical research to figure out how capital structure affects the financial performance of India's pharmaceutical companies for 19 years from 2000 to 2018. The sample cover 25 pharmaceutical companies listed in BSE500. The researchers apply return on asset, return on equity and Tobin's Q ratio as variables to measure the firm's performance and long debt ratio LDR, short debt ratio SDR and total debt ratio TDR to measure the capital structure. According to the findings of their statistical study, ROE and ROE demonstrate a negative and unfavourable correlation between gearing and the profitability of pharmaceutical companies. This finding explains why large interest obligations a basis might be to criticise the company's performance. While Tobin's Q ratio is positively connected with all capital structure variables (LDR, SDR, TDR) as the issuing debt will boost the book value to market value.

Likewise, the Indian pharmaceutical business has been expanding at a pace of more than 15% each year   Thus, it has been determined that firms with strong growth opportunities have a negative link between debt and business performance (Mathur, et al., 2020).

Another research done by (Cole, et al., 2015) analysed the impact of capital structure on firms' performance in three US sectors: The industrial sector, the healthcare sector and the energy sector. They evaluate 300 observations in the three sectors. For their study, they utilized Market Value per Share; Operating Return; Return on Asset and Profit Margin. The outcomes of the study indicate a mixed relationship depending on which variable is used to determine the firm's performance and which industry. They argue that the capital structure choice of issuing debt results in a negative effect on both variables either Return on Asset and Operating Return in all three sectors, whereas debt is positively connected with Profit Margin and results in high profitability. This finding supports the tax benefit theory in the Industrial sector while the capital structure harms profit margin and has no relation with stock price in the healthcare sector. Regarding the Market value per share, the variable is statistically insignificant because it seems that capital structure does not affect stock price in all three sectors. This means that issuing debt won't affect the company's share price. Thus, companies can obtain debt or equity funding without having concerns about lowering share value.

(Abdullah & Tursoy, 2021) also, investigate the impact of capital structure on the performance of non-financial firms listed in Germany from 1993 to 2016, and take into consideration the European Stock Market Transition in 2015 as a turning point that impacted the relationship between capital structure and firm performance in some way or another. They also used ROA and ROE as variables, their findings demonstrate a favourable association between company performance and capital structure. In addition, they revealed that the adoption of IFRS has boosted the performance of the companies covered in their sample while demonstrating a weak correlation between capital structure and company performance.

Other evidence from Malaysia where the authors of the analysis evaluate 528 non-financial companies listed in the Bursa Malaysia stock exchange for 12 years from 2005 to 2016. In their research, they apply also the ROE, ROA Gross Profit Margin, Tobin's Q and Debt to Equity Ratio. The results indicate that the leverage ratio improves business performance, which is consistent with leverage working as an effective technique for preventing managers from creating personal empires, indicating a correspondingly greater benefit for Malaysian firms than the cost of debt financing. When the degree of leverage exceeds the ideal level, the link between leverage and business performance turns negative, according to the authors. Therefore, the change from positive to negative suggests that debt has a duplicate (nonlinear) outcome on a company's performance (Ayaz, et al., 2021). In contrast (Salim & Yadav, 2012) did a separate study of Malaysian companies on a sample of 237 companies of six sectors from 1995 to 2011 and the outcomes of their analysis were that the analysis reveals that ROA, ROE and earnings per share (EPS) have a negative association with short-term debt, long-term debt, and total debt, as independent variables. Moreover, all industries exhibit a favourable correlation between

productivity and growth. Tobin's Q indicates a considerable positive correlation between short-term debt and long-term debt. Parallel to the preceding research, it indicates that total debt has a substantial negative association with the firm's performance. Similarly in Vietnam empirical study of 488 companies in a period of six years from 2013 to 2018 demonstrates that capital structure has a statistically significant detrimental impact on the performance of the companies (NGUYEN & NGUYEN, 2020).

This empirical research includes some evidence that supports the argument that leverage is positively correlated with firm performance while others deny it and demonstrate the opposite. And the reason for the variation in the results may be related to different factors that can impact the studies like macroeconomic factors such as the country, industry….. or the firm's own characteristics and so on.

The research mentioned earlier has a mutual methodology regarding the way of studying the impact of the capital structure on firm performance and the variable selected dare mostly the same.

One of the limitations of these empirical researches is the focus on the secondary data obtained from the companies I believe it is recommended that future research to us also in qualitative data such as manager's interviews if it is available to understand more their behaviour toward the capital structure selection preferences and compare if this will validate the quantitative findings.

2.4 Determinants of capital structure

Numerous academics engaged in analysing additional capital structure concepts, resulting in the development of numerous theories. Overall, they all agreed that the ideal capital structure involves retaining the advantages and costs of debt financing. Multiple empirical studies have been conducted to determine the ideal capital structure and its implications on a company's ability to obtain capital. Several favourable and unfavourable perspectives are involved. Interest payments are tax deductible, providing a tax shield for the firm. This is the primary benefit of issuing debt in capital structure. when covering the capital structure theories, we considered the most important determinant of capital: tax benefit, bankruptcy costs, financial distress and asymmetric information costs. Multiple prior studies have demonstrated that capital structure is influenced by variables such as profitability, tangibility, company size, growth opportunity, volatility, tax and non-debt tax shield. Consequently, we must analyse these variables, which are often connected to the business environment, as well as the traits of the company.

Profitability: even though several theoretical research has been performed about the capital structure, no clear forecasts about the link between profitability and leverage have been made. according to the tax-based model, highly profitable companies must borrow more debt as they have a higher need to shield revenues from corporation tax. However, the pecking order theory suggests the use of retained earnings first followed by bonds and additional stocks as mentioned previously. (Jensen, 1986) states that debt is a form of management control that ensures revenues are distributed rather than used to establish an empire. Even for businesses that generate free cash flow and have strong profitability,

having a large amount of debt might limit managerial discretion. In contrast (Chang, 1999) model demonstrate that the assumption of managers(insiders) always act for the best benefit of the outsider shareholders is not correct in the model as the existence of interest disagreement between managers and outsiders is clearly modelled in his study, and The ideal arrangement between corporate insiders an investors and may be characterized as a mixture of debt and equity, and profitable companies have a preference to employ less debt.

Several empirical studies demonstrate a negative connection between gearing and profitability (Kester, 1986) demonstrating that leverage negatively affects profitability either in the USA and Japan. also (Titman & Wessels, 1988) publish some evidence from the United States, and a more recent empirical study made by (Rajan & Zingales, 1995)agreed and confirmed these results in developed countries. (Huang & Song, 2006) made the study in Chinese listed companies and the finding was also a negative connection is found between leverage and profitability.

Tangibility: Many theoretical frameworks propose a positive correlation between tangibility and leverage in terms of capital structure. Since the company may switch to potentially risky investment after issuing bonds and transfer wealth from bondholders to shareholders to utilise the option nature of equity, the agency cost of debt exists, as pointed out by Jensen and Meckling (1976) in their seminal paper on agency cost, ownership, and capital structure several empirical studies confirm the theories prediction including (Rajan & Zingales, 1995) (Huang & Song, 2006).

Tax: nearly all academics acknowledge that tax considerations must be fundamental when determining a company's capital structure. More debt should be used by companies having a higher effective marginal tax rate to establish a tax shield (Huang & Song, 2006).

Non-debt tax shield: Depreciation and investment tax credits are two methods for reducing taxable income that does not involve taking on additional debt (NDTS). Non-debt tax shields are intended to substitute for the tax benefits of debt financing, and DeAngelo and Masulis (1980) find that firms with more tax shields use less debt financing. The findings have been replicated by other researchers (Huang & Song, 2006)**.**

Growth opportunity: growing companies with more investment options will pay more for this agency arrangement. Thus, long-term debt should reduce future growth. Myers emphasised that short-term debt mitigates this agency problem. There is a possibility that short-term debt ratios will have a positive correlation with growth rates if growing businesses opt for short-term financing rather than long-term financing. The agency cost is decreased through convertible debt. This shows that convertible debt ratios may increase growth opportunities (Titman & Wessels, 1988).

Volatility: Market uncertainty, also known as "business risk," is a common stand-in for the possibility of financial distress and is commonly believed to have a negative correlation with leverage**.**

Size: According to (Rajan & Zingales, 1995) and Wald (1999), leverage grows with company size. (Wald, 1099) also observes that bigger German enterprises have less debt and that a small number of skilled managers control a high proportion of the stocks of large industrial corporations (such as Siemens and Daimler-Benz) and may push management to behave in the shareholders' best interests. According to him, the negative size factor of Germany is attributable to centralised corporate control (Huang & Song, 2006)**.**

2.5 Review of the UK medical and biotech-pharmaceutical sector

The UK excels in medical research and development, which benefits the country's health and economy. pharmaceutical and biotechnology companies. The pharmaceutical business accounts for 25% of R&D investment in the United Kingdom. The healthcare industries are key drivers of broader productivity and make a significant contribution to the UK economy. Nevertheless, the UK is confronted with competition in addition to other western countries, and Asian countries that benefit from cost advantages and easy accessibility to skills and other infrastructure supports, which enables them to contribute significantly to worldwide scientific publications. However, those countries provide new opportunities and markets for the UK to exploit (Cooksey, 2006).

Several developing variables in medical research, together with the previously stated economic considerations, are converging to provide significant advances in the diagnosis and treatment of illnesses. particularly, the rising complexity of biopharmaceutical, molecular medicine, gene therapy, and stem cell-based replacement therapies derived from ordinary chemical substances. These findings provide the impetus for an increase in the specificity of medications, resulting in a narrowing of the target patient group, which has significance for the business models and costs of drug development. As an outcome of these developments, the United Kingdom has faced some issues, including how to introduce the new technology quickly, safely, and cost-effectively, in addition to how to control the possible financial impact on healthcare systems (Cooksey, 2006).

In 1999, the UK government spent around £650 million annually on medical and biosciences, including financing for universities, research institutions, regulatory authorities, and other national projects. Major multinational corporations, non-profit organisations, and biotech firms contributed to financing future medical, biotech and pharmaceutical researches the same period, businesses sponsored 49% of all UK R&D in medical and biosciences, while 68% of all UK R&D financing went to work undertaken in organizations. According to the UK Bioindustry Association, there are between 300 and 400 biotech/bioscience companies. Forty of these companies are listed on the London Stock Exchange, AIM, or NASDAQ. According to the 1999 Sainsbury Review on biotechnology, the main places are Oxford, Cambridge, and central Scotland (Lawton Smith, 2004).

The way that health research is conducted in Britain offers a number of benefits. Since its inception in 1913, the Medical Research Council has been responsible for the sponsorship of 27 individuals who

have gone on to win the Nobel Prize in recognition of their outstanding contributions to fundamental scientific research. The expertise of the health research base and the national health service provides a powerful selling point for biotechnology and pharmaceutical companies that invest in research and development. These businesses are essential components of the UK's economy, so they must have this competitive advantage. The UK is a leading country in its major strength in basic biomedical research. As a nation, the United Kingdom is obviously proud that major discoveries, such as the discovery of penicillin and the structure of DNA, occurred in its laboratories. The results of the laboratory's research have been exploited in several ways, such as the development of treatments and therapies used in clinical settings (Cooksey, 2006).

Over the past 19 years, biomedical science and innovation have benefited from strong growth in public funding. This draws on the outstanding educational life sciences basis and pharmaceutical industry of the United Kingdom (Jones & Wilsdon, 2018).

It is predicted that the value of the biotechnology sector in the UK would rise to $18.3 billion in 2024, representing a growth of 60.5% from 2019 although the sector has achieved strong growth during this year with a total revenue of $11.4 bn and a growing rate of 8.2% more higher than the French market in the same period. The sector of the United Kingdom is mostly driven by healthcare-related biotechnology, segments that are strengthened by the country's outstanding pool of scientists. The Biomedical Spark programme aids in reducing the risk associated with creative science and bringing novel products to market. Since its inception in 2012, MRC and Innovate UK have collectively committed more than £250m ($320.5m), providing favourable conditions for UK biotech firms. (Marketline, 2020).

The pharmaceutical industry's R&D investment peaked in 2011 and has since declined by more than 20%, showing a shift in R&D towards physical and digital sciences. The medicines and biotechnology market in the United Kingdom is unstable and concentrated by two main players: AstraZeneca and GSK. Long-held hopes for innovative, well-capitalized, and lucrative biotechnology enterprises in the middle tier have not arrived. Four huge and lucrative businesses in the United States — Gilead, Amgen, Celgene, and Biogen — underpin a vibrant industry with more than 20 companies, each worth more than $10 billion. Numerous biological pharmaceuticals with therapeutic value and economic success have been brought to market by this industry (Jones & Wilsdon, 2018).

Biotechnology's future is uncertain after the pandemic paralyzed the global economy and caused unprecedented uncertainty in several fields. Non-COVID R&D has been neglected despite rising demand for treatments and therapies. Due to significant R&D expenses, biotech companies will find it harder to invest in supply chain disruptions than pharma. Nonetheless, increased investment in pharmaceuticals, the market's largest segment, should benefit it in the mid-to-long term. Brexit raises

questions. After 2020 the UK will no longer be allowed to participate in EU programmes after Brexit (Marketline, 2020).

Leading firms in the biotechnology industry invest extensively in R&D, which is one of their most essential tactics. This technique is very successful in this industry owing to the necessity of introducing new products to stimulate revenue development. The firms in this industry benefit from R&D Government funding schemes and programs as a way of encouragement to achieve new medicines and technologies also they keep a proportion of their retained earnings for future investment, and they raise their capital by using debt offering very often and eventually they issue new stocks in the stock market. For example, AstraZeneca invests a large amount of its income in research and development. In FY2020, this segment accounted for 24.1% of the company's total revenue. The company's R&D efforts emphasise developing novel medications for the treatment of various ailments (Marketline, 2021). In the last 4years, GSK raised its capital through debt offerings respectively in 2018 and 2020. The company also announced a listing on shares in LSE in February 2020 (Marketline, 2022). Similarly, AstraZeneca raised its capital through a public debt offering in 2018, and 2020,2021. And in 2019 the company raised USD1.3 billion dollar in a private placement of shares (Marketline, 2023). Likewise, Hikma Pharma Raises USD500 Million in Public Offering of 3.25% Bonds Due 2025. Smith and Nephew plc raised their capital in 2020 and 2022 using debt offerings.

Summary of review and conclusion

in this chapter, we intend to cover the most known theories concerning optimal capital structure and the empirical literature, previous finding, and explanations. The theories are connected to each other in some ways however each theory works under its own assumptions. The relationship between capital structure and a company's performance has been a perplexing topic in the corporate literature since the fundamental work of Modigliani and miller and followed by subsequent theories and empirical findings. Based on this literature study, many hypotheses will be investigated in subsequent chapters. Moreover In order to better understand the differences between markets, I organise to highlight a wide range of empirical research findings relating to capital structure from various countries. It is common knowledge that the tax systems in each country play a unique role in shaping the structure of the capital employed. Empirical results on the relationship between leverage and firm performance were split down the middle, with half finding a positive association and the other half finding a negative one.

The chapter also covers the determinants of the capital structure such as profitability, growth, company size and so on. And finally, a brief review of the UK medical and biotech and pharmaceutical sectors, and the research and development programs launched by the UK Government to boost the growth of this particular industry to compete with other countries. how they finance their investments.

Chapter3: Data and Methodology

3.1 Sample and Data

Our sample is a compound of 10 medical and pharmaceutical companies listed in the FTSE All shares were chosen from the London Stock Exchange website. The FTSE-All share index was chosen because it includes a diverse variety of companies. In addition, it has the distinction of being one of the world's most ideal capital markets. Public corporations in the United Kingdom typically utilise long -short-term and long-term debts, and shareholder wealth maximisation is one of their most important strategic goals. Which is relevant to theories of capital structure. Since they are required to issue an annual report, it is straightforward for publicly traded corporations to determine the impact of their financial decisions.

The data employed in this research spans six years from 2016 to 2021. The information used in this research is obtained from outside sources including yearly reports and Yahoo Finance. The annual report was obtained from the yearly published reports of the company, which are available on their website.

According to Statista, a statistics portal for market data, research, and studies, I have chosen to include the firms listed below in my research since they are the leading listed biotechnology and pharmaceutical companies in the United Kingdom based on market capitalization. They are also listed in the FTSE100 and FTS250 indices on the London Stock Exchange, which is another cause for my selection. (Miculic, 2022).

Companies name and specialization

AstraZeneca plc: is a vertically integrated company that specialises in developing, manufacturing, and marketing pharmaceuticals products and selling them using owned marketing companies to specialists and primary care professionals. The company supplies medications for a variety of therapeutic areas, such as cancer, cardiovascular, renal, and metabolic disease, respiratory, inflammation, and immune disease, vaccines, and neurology.

GlaxoSmithKline plc: is a company that develops, manufactures, and distributes vaccines, pharmaceuticals, over-the-counter medications, and consumer healthcare products. The firm offers medications for a broad range of therapeutic areas, such as respiratory, HIV, metabolic, anti-virals, urogenital, neurology, immunology, inflammatory, cardiovascular, anti-bacterial, and dermatological.

Novartis plc: Novartis AG is a multinational pharmaceutical corporation with participation in several biopharmaceutical markets. Surgical, biopharmaceuticals, ophthalmology pharmaceuticals, anti-infectives, generic drugs, eye-care products, and biosimilars comprise the company's product line. It delivers cancer, cardiometabolic, cell, and gene therapy products. Through the Novartis Institutes for Biomedical Research, it engages in a variety of advancement and research operations.

Smith & Nephew plc is a global provider of orthopaedic, advanced wound treatment, and endoscopic medical products. In addition, the firm offers systems for energy-based and mechanical surgery, high-definition imaging solutions, fluid management and access portfolios, and ear, nose, and throat devices. It serves paramedics, surgeons, doctors and GPs, administrators, retail customers, medical systems and purchasing organisations, as well as patients.

Hikma Pharmaceutical plc: develops produces, and markets generic and in-licensed pharmaceutical products. The firm's product line includes a diverse range of therapeutic areas, such as anti-infectives, cardiovascular, central neuro-system, diabetes, cancer, pain control, and respiratory medications.

e-Therapeutics plc: is a drug research and development firm that focuses on identifying innovative therapeutic methods and mechanisms for the treatment of a variety of disorders. The organisation accomplishes its goals by combining proprietary databases and computational tools that employ network analysis, machine learning, artificial intelligence, data mining, and optimization. The firm makes use of two exclusive, efficient, and distinctive technological platforms.

Indivior plc: produces and distributes medications for opioid addiction treatment addiction. Suboxone is a monthly depot and the only authorised film therapy for opioid dependency. as well as perseris treatment for schizophrenia.

Convatec Group plc is a firm that focuses on medical equipment for continence and critical care, ostomy care, infusion devices, advanced wound care, disposable infusion sets, urological catheters, as well as equipment and accessories for patients with ostomies, urinary continence, spinal cord injuries, diabetes, ulcers, multiple sclerosis, spina bifida, and other conditions the company sells its product either directly to its clients or by network distributors.

Abcam plc: is a provider of life science research tools for the examination of live cells at the molecular level in order to comprehend a broad spectrum of illness situations. the company's products assist life scientists in identifying proteins for use in life sciences and veterinary sciences.

Mediclinic International: is a multinational provider of private healthcare services. It provides patients with comprehensive healthcare services, including acute care, specialised care, and multidisciplinary treatment.

3.2 Methodology

There are several research methodologies available. Multiple regression analysis is a prominent and commonly used technique. This approach is renowned for its flexibility and adaptability, as well as its applicability to virtually every dependency situation. Under my study topic and its nature, I will conduct my research using multiple regression analysis.

Definition of the method

Typically, the linear multiple regression model is used to analyse data from two categories of research topics. The first kind focuses mostly on prediction. Using multiple regression approaches, a linear equation is derived that best combines available results to predict a subject's eventual level on a dependent variable. The fundamental objective of the second type of problem is to identify a meaningful independent (predictor) variable (Halinski & Feldt, 1970)**.**

Objectives of multiple regression model

An application of generic linear modelling and a quantitative statistical procedure, multiple regression analysis can be thought of as a statistical technique. It looked at the relationship between a single dependent variable and many independent factors. In order to get the most out of using multiple regression models (Kavitha , et al., 2016), I will address the following three key issues:

A- **The relevance of the research issue**: mainly since regression is by far one of the multivariate techniques that are utilised the most. Because of its widespread applicability, multiple regression analysis has been carried out for a variety of purposes. The ever-growing applications of multiple regression may be broken down into two categories of different kinds of research issues. These are examples of predicting and explaining. The explanation approach will be used in this research since the explanation approach considers the regression coefficients for each independent variable for the purpose to demonstrate a propensity toward the development of a meaningful or conceptual explanation for the influence of the independent variables. This method additionally examines the size, sign, and statistical significance of the regression coefficient for each independent variable, furthermore detailing the strength and nature of the correlation between the dependent and independent variables.

B- **Definition of observed relationships**: Estimation of the statistical connection, as well as the average value may be broken down into two distinct categories:

1. When collecting numerous observations, it is typical to analyse more than one value of the dependent variable for each value of the independent variable.

2- If we use a sample group to make predictions, we assume that the uncertainty in those predictions is similarly random, and we can only anticipate that the mean value of the dependent variable corresponds to a given independent variable. If we use a larger population to make predictions, we assume that the uncertainty in those predictions is similarly random.

C- **Assortment of the variables**: To get the best results from a regression analysis, you need to use the variables that best fit your data. To mitigate any potential damages, I studied resilience theory, testing, and specification error.

Dependent variable

Leverage indicated the contribution of debts to the overall capital structure. Therefore, experts utilise the leverage ratio to measure the strength of a company's capitalization structure. The debt ratio indicates what proportion of a company's assets are financed by debt. According to the subjects of the topic and the theoretical foundation I have chosen debt-to-equity ratio and debt-to-capital ratio as a measurement of capital structure and selected them as dependent variables.

$$\text{debt-to-equity ratio} = \frac{total\ debt}{total\ equity}$$

$$\text{debt to capital ratio} = \frac{total\ debt}{total\ equity + total\ debt}$$

The independent variables

These variables are known as explanatory variables, and it is believed that they may have an influence on the dependent variables and contribute to understanding the study's outcome. For maximising overall predictive relevance and reducing measurement and specification faults, it is necessary to incorporate solid dependent variables. The selection of the variables was carried out with consideration given to the objectives and research hypotheses, as well as the impact that the incorporation of debt into capital structure has on various companies of the same industry. These independent variables are Return On Asset (ROA); Return On Equity (ROE); and Operating Margin.

Return On Asset: ROA measures the profitability of a company while using its asset. The metrics indicate if a company is using its asset efficiently.

$$\text{ROA} = \frac{Net\ income}{total\ Asset} \times 100\%$$

Return On Equity: ROE assesses how much return a corporation makes for its common shareholders from the capital they have put into the business. Because ROE is sensitive to gearing level, it is been treated as an independent variable of leverage level.

$$\text{ROE} = \frac{Net\ income}{total\ Equity} \times 100\%$$

Operating margin:

The operating profit is a calculation that measures how much profit a company is generating after paying for different costs of operations but before paying any interest rates and this is the reason why it is being chosen as an independent variable even if it could not be a strong variable.

$$\text{Operating profit margin} = \frac{Operating\ Profit}{Revenue} \times 100\%$$

Control variable

In order to avoid model incompleteness and ensure to have a comprehensive model, we used firm size as a control variable, and the reason for choosing it is because is a company's specific factor. And the size was interpreted by the total revenues and the firm's total asset since it is positively connected with the performance and influence the firm's profitability. In other words firm's size is predicted to have a positive effect on performance.

3.3 Research design of multiple regression analysis

Across a broad variety of sample sizes, multiple regression maintains the required levels of predictive and statistical significance. This is perhaps one of the most crucial aspects of constructing the analysis. The sample size has a direct bearing on the statistical power of the significance test and the generalisation of the result.

Sample size

When planning the design of the study, one of the most important aspects to take into consideration is the size of the sample. The multiple regression model is capable of satisfying the requirements for statistical power and significance across a broad spectrum of sample sizes. The size of the sample has a direct influence on the statistical power of the significance test as well as the results' capacity to be generalised.

Concerning statistical power, the sample size has a direct influence on the accuracy and statistical power. Typically, a small selection consists of less than 30 data. And these are only suitable for uncomplicated regression analysis. In contrast, statistical significance tests become more specific for samples with 1000 or more data or larger. When discussing multiple regression, the term "power" refers to the probability that the variable is statistically significant. Assigning statistical significance to a certain value of R squared or regression coefficient for a specified sample size. This probability is calculated based on how likely it is to find a statistically significant correlation between the two variables. This probability is derived from the possibility that this level will be regarded as statistically significant. This likelihood was used in the calculation of this probability. Excel, on the other hand, makes it possible for every cell to have its own individual power setting. Consequently, When analyzing the data, one of the most important considerations is the size of the sample that was employed. a number of independent variables, in addition to the significance level, which is going to be utilised in the process of calculating an R-squared value. The least value of R squared that a sample size of a certain size with a power of 0.8 may detect as statistically significant at the level of significance that has been specified. This value is determined based on the sample size. Excel, on the other hand, will make the necessary

adjustments to the power on its own based on the requirements. Taking the previous scenario as an example, if there were five independent variables, a significance criterion of 5%, and a determination of R square, then this would be the case 80% of the time. As a direct result of this, a sample size of one hundred observations is sufficient for determining an R-square value of at least 12%.

Concerning generalizability of the results is obviously affected by the proportion of the observations to the independent variable in the sample size. It is imperative that the ratio not go below 5:1, which indicates that observations be used for each independent variable that contributes to the variance. As a result, the ratio is 5:1, and the range of the expected value for the variable that is independent spans between 15 and 20 observations. If we are successful in achieving this objective, the outcome should be relevant across a wide range of contexts.

Estimation of statistical significance.

The regression coefficient does not have a distribution that is consistent throughout all of the outcomes. It can be difficult to get a representative sample, thus there may be random swings. The two fundamental forms of the statistical test are testing the variance explained by the R square and the regression coefficients.

1- Analysing the correlation coefficient

Throughout to test the hypothesis that the amount of variance that is characterised by the regression model is greater than the basic forecast, it is necessary to establish the coefficient of determination. The hypothesis being tested is that the quantity of variance that is characterised by the regression model is larger than the basic forecast. Calculating the coefficient of determination is one method for accomplishing this goal. The output of the regression must have a significant value in the explanatory variable if the ratios of the described to the variation in the dependent variable are more than one. The F distribution provides a potential means of conducting a statistical test to determine whether or not a given ratio is different from zero. In instances where statistical significance exists. R square values result in greater F values, and it cannot be assumed that statistical significance is equivalent to practical relevance.

2- Testing the regression coefficient significance

Statistical significance When assessing a collection of data, it is essential to make an assessment of the estimated coefficients in a regression analysis. It is anticipated, when utilising the sample, to observe how it fluctuates throughout the entirety of the sample, not just the predicted regression coefficient for that sample.

3- Developing a coefficient of determination

A significance test for a regression coefficient is a quantitative assessment of the possibility that the estimated coefficient will be different from zero across a large number of samples of a given size. This assessment is performed on a specific number of samples. In order to test this hypothesis, we will first establish a degree of confidence in the coefficient that was anticipated. The deviation from zero could be regarded as statistically significant if the confidence interval does not include the value zero. This assessment is founded on the following three principles:

- Determining significance level: The degree of significance is determined by taking into consideration the potential of making an error in determining whether or not the valued coefficient does not equal to zero. In most situations, I established 5% as the figure in question.
- Alteration in the expected regression coefficients on every sample data from a population is one evidence of sampling error. There is a possibility of sampling error whenever there is such a variance. It is connected to the sample size in the majority of cases, and the relationship varies from sample to sample. Large samples have the potential to become more reflective of the population as a whole, and the degree of variance in the estimated coefficients for these large samples tends to be lower.
- Due to errors in the sampling process, the predicted coefficient variation is represented by the standard error. The standard deviation of a variable is equivalent to the standard error, which indicates the predicted deviation of coefficients obtained from replicates of this sample size.

The Evaluation of Multicollinearity

The principal goal of collinearity analysis is to locate the connection that exists between the many independent variables. The interaction of two or more separate factors may result in the emergence of collinearity. In order to conduct an investigation into multicollinearity, it is necessary to collect a certain number of measurements in which each independent variable is defined by a group of other independent variables. The tolerance index and its rival, the variation inflation factor, are the two most prevalent methods for evaluating the degree of connection between many variables.

A. Tolerance is the accurate measurement of multicollinearity, which is described as the degree of the fluctuation of the chosen independent variable that cannot be represented by the fluctuations of the other independent variables. Tolerance is the precise measurement of multicollinearity. The calculation of tolerance can be broken down into two phases:

1- One independent variable Can be chosen from the other independent variables to act as a dependent variable, and the R square can then be calculated. During this step of the procedure, it is possible to choose all the independent variables at once and compute the R square for each of the independent variables.

2- Tolerance can then be determined using the formula 1- R square. The high tolerance value suggests a lower degree of collinearity.

B. Variance Inflation Factor: As the reciprocal of the tolerance value, the variance inflation factor (VIF) may be simply determined. Less tolerance value is desired. Generally, multicollinearity of tolerance value is permitted up to 0.10, and variable interference factor is permitted up to 10.

3.4 Panel data and the reason for selecting it

the way multiple regression analysis is implemented mostly relies on the researcher's preferences. Using a variety of computer-assisted programmes, and multiple regression analysis methodology may be implemented in several ways. In this analysis, the ordinary least square method was selected to analyse the data using Microsoft Excel.

Panel refers to a specific type of study design that involves the collection of information from the same unit on multiple occasions over the course of the study. Historically, panel research involves surveys and concentrates on persons, but increasingly, this design is being applied not only to businesses but also to different social structures, making use of a wide variety of data sources and information. And the presence of panel data in academic research date back to the 1940s and panel data models are available and employed in all social life sciences (Andreb, et al., 2013). Linear regression is a statistical technique of simulating the connection between the dependent variable Y and a single or multiple independent variables X presented in the panel data and provides researchers with a high number of distinct data sets, which improves the freedom they have to investigate explanatory variables and relationships. The benefit of using panel data is that it results in a meaningful relationship by combining data collected from the same test subjects over an extended period of time. One of the benefits of using panel data is that the number of observations for the study can be increased. by repeating observations over time, we have fewer standard errors relative to cross-sectional data analysis estimates. This indicates that a larger number of observations resulting from the accumulation of cross-sectional data boosts the effectiveness of estimation, result from the accumulation of cross-sectional data.

Chapter4: analysis of the results

4.1 Presentation of the analysis

When an analysis is based on a sample of a population, statistical significance testing is important. As I am utilising a sample and indicating that I am willing to accept a 5% probability of being incorrect regarding whether the estimated coefficient is different from zero, I am willing to take a 5% chance of being incorrect. Therefore, I will evaluate the significance of my observations using a 5% significance level.

I conducted three separate regressions on my data in order to acquire a deeper understanding of the variables I chose to study and to see how one variable is affected by the interactions of the others.

In the first regression, a comparison was made between the Return on Equity (ROE) and the debt-to-equity ratio. The control variable in this analysis was the size of the company, which was represented by yearly revenues.

The second regression sought to determine whether or not there was a correlation between the Operating Margin and the debt-to-equity ratio. Company revenues served as the control variable for this analysis.

The final version of the regression model compares the return on asset (ROA) to the debt-to-equity ratio, with the total asset amount (the size of the business) functioning as the control variable.

4.2 Statistical significance

Regression Statistics	
Multiple R	0.4121991
R Square	0.1699081
Adjusted R Square	0.1407821
Standard Error	0.6158719
Observations	60

	df	SS	MS	F	Significance F
Regression	2	4.4253092	2.21265	5.833549	0.0049556
Residual	57	21.619998	0.3793		
Total	59	26.045307			

This part of the model presents various distinct values that represent the fit of the regression model, or the degree to which the regression model is able to "fit" the dataset. The multiple R is the correlation coefficient and indicates the connection between the predictors and response variables in this case the results show a below-average (41%) linear relationship between ROE and D/E.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-0.05218192	0.103850377	-0.502472	0.6172713	-0.260138708	0.155774877	-0.260138708	0.155774877
D/E	0.200876405	0.061960754	3.2419942	0.0019852	0.076802135	0.324950674	0.076802135	0.324950674
size(revenue)	5.16E-07	5.13665E-06	0.1004781	0.9203173	-9.76985E-06	1.08021E-05	-9.76985E-06	1.08021E-05

This regression analysis result indicates about 17% variance explained by the independent variables in other words only 17% of the variance in ROE is explained by the variation in D/E and the company size.

The significance F is equal to 0.5% and the value is substantially below 5% indicating that the R square is significant, the regression model as a whole is significant, and the overall equation fit to join with impact.

The **p**-value of b1 is 0.2% is less than 5% which means that b1 is significant and D/E has an impact on ROE.

The p-value of b2 is 92% means that b2 is insignificant and company size has no impact on ROE the estimated regression equation using the coefficients is:

$$Y = -0.052 + (0.20087 * X1) + (5.16121 * X2)$$

Y= ROE

X1= D/E significant

X2= Size (revenue) insignificant

ROE and D/E relationship in the pharmaceitical and biothechnology companies in the UK
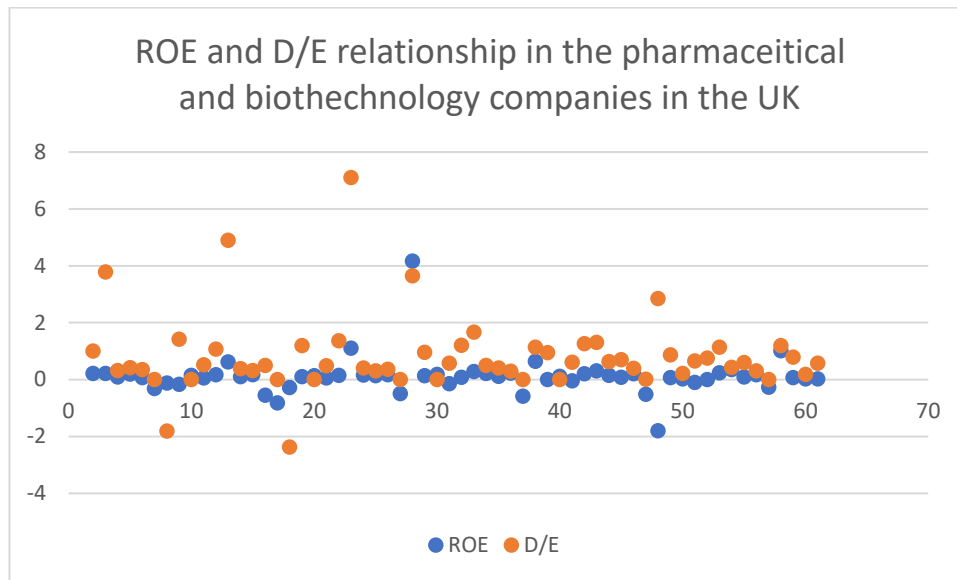
Regression Statistics2	
Multiple R	0.165474401
R Square	0.027381777
Adjusted R Square	-0.006745178
Standard Error	0.75184755
Observations	60

	df	SS	MS	F	Significance F
Regression	2	0.907096868	0.453548	0.80235	0.45327155
Residual	57	32.22066007	0.565275		
Total	59	33.12775694			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.00018641	0.157016142	0.001187	0.999057	-0.314233	0.3146058	-0.314233	0.31460581
X1(D/E)	0.17108241	0.26385713	0.64839	0.519336	-0.3572824	0.6994472	-0.3572824	0.6994472
X2(revenue)	6.12E-06	6.04192E-06	1.012744	0.315462	-5.98E-06	1.822E-05	-5.98E-06	1.8218E-05

The regression analysis indicates that 2.7% of the variation in the operating margin is explained by the variation in D/E and the company's revenues.

Significance F equals to 45% which is significantly greater than 5%. The meaning of the R square is insignificant, and the overall equation does not fit to join impact.

The observation that the p-value of b1 is 52%, which is higher than 5%, demonstrates that X1(D/E) is statistically insignificant and does not have an effect on the operating margin.

The p-value of b2 is 31%, which signifies that x2 (sales) is inconsequential, since it is higher than 5%, and thus it has no impact on the operating margin.

the estimated regression equation using the coefficients is $Y = \mathbf{0.0001864} + (\mathbf{0.1710} * \mathbf{X1}) + (\mathbf{6.12} * \mathbf{X2})$

Y= operating margin

X1= D/E

X2= Size (revenues)

Operating Margin and D/E relationship for the Pharmaceutical and Biothechnology companies in the UK

Regression Statistics 3	
Multiple R	0.32267235
R Square	0.10411745
Adjusted R Square	0.07268297
Standard Error	0.16802704
Observations	60

	df	SS	MS	F	Significance F
Regression	2	0.18702757	0.09351379	3.31220568	0.0435668
Residual	57	1.60928589	0.02823309		
Total	59	1.79631346			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-0.07573382	0.03577065	-2.11720569	0.03861817	-0.1473633	-0.0041043	-0.14736331	-0.0041043
X1(D/C)	0.1245437	0.05865967	2.12315726	0.03809499	0.0070797	0.24200766	0.007079741	0.24200766
X2(T Asset)	7.08E-07	5.1011E-07	1.38741024	0.17071748	-3.137E-07	1.7292E-06	-3.1375E-07	1.7292E-06

the regression analysis results show that 10% of the variation in the ROA is explained by the variation in debt-to-capital ratio and company size (represented by the total asset) jointly. Significance F is less than 5% and equals 4.3% the R square is significant, and the overall equation fit to join impact.

The observation that the p-value of b1 is 3.8%, which is below 5%, demonstrates that X1(D/C) is statistically significant and has an effect on the ROA.
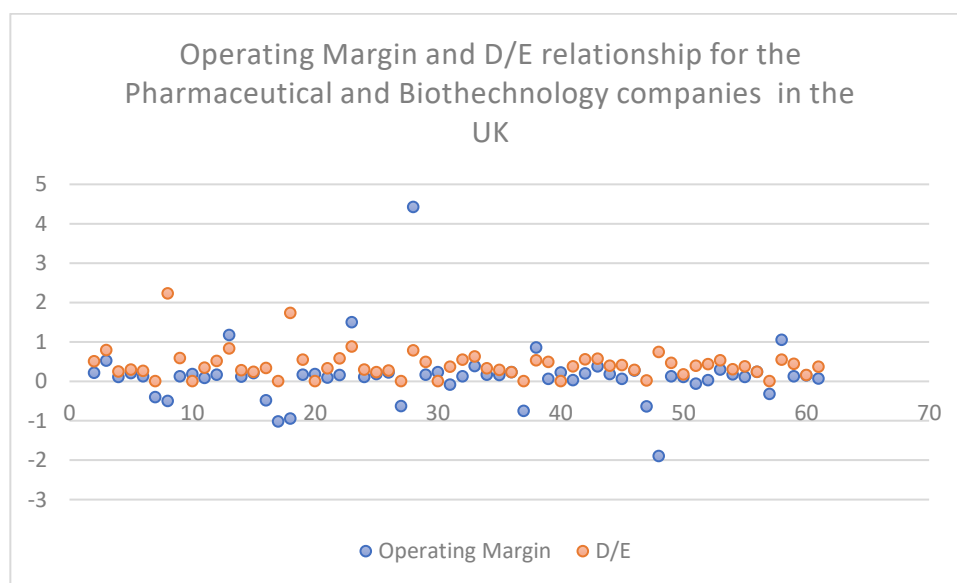
The p-value of b2 is 170%, which signifies that x2 (sales) is inconsequential, since it is higher than 5%, and thus it has no impact on ROA.
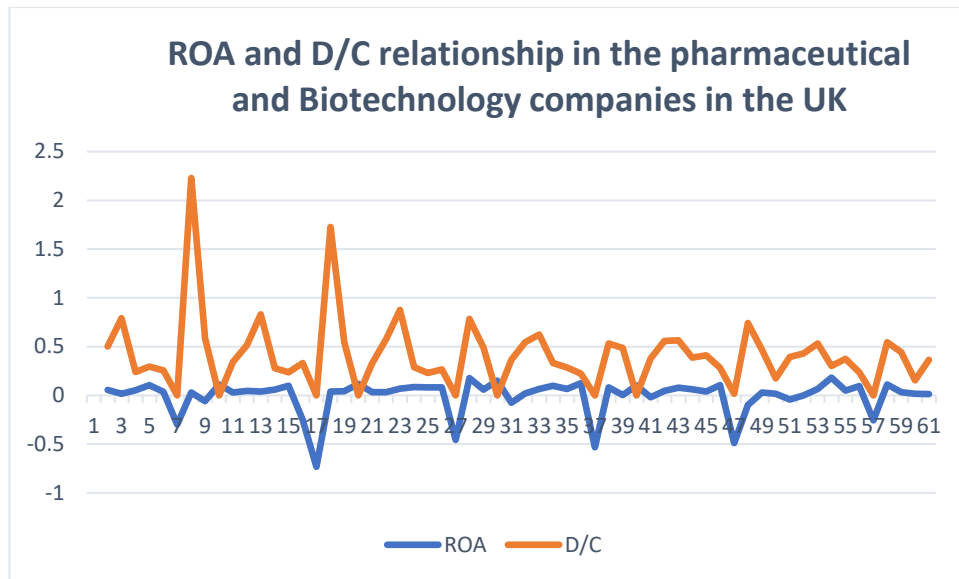
the estimated regression equation using the coefficients is:

$$Y = -0.07573 + (0.12454 * X1) + (7.0773 * X2)$$

Y= ROA

X1= D/C

X2= Size (Total asset)

ROA and D/C relationship in the pharmaceutical and Biotechnology companies in the UK

4.3 Practical significance

In the above findings of the regression analysis of the pharmaceutical and medical companies listed in the London stock exchange; the results indicate 17%,2.7% and 10% of the variation in ROE, Operating Margin and ROA respectively is explained by the variation in debt to equity and debt to capital ratios. The results indicate that there is a satisfactory positive relationship between leverage and the company's profitability and performance (ROE, ROA, and operating profit margin). Nevertheless, these variables are measured differently, and there are other elements involved in their quantification. Changes in accounting policy, mode of calculation, and use of numerator and denominator, as well as company-specific factors, have an effect on their values. For instance, when computing ROA and ROE, the nominators, net income, are identical for both variables, whereas the denominators change. As the p-value of D/E is less than 5%, it is clear that there is a strong relationship between gearing and ROE. As a consequence, owners of leveraged companies operating in the pharmaceutical industry stand to potentially benefit from the advantages of increased leverage. in contrast, the operating margin and the amount of leverage are unrelated due to the high p-value of D/E (52%) which is substantially greater than 5%. It is fundamental that measuring the operating margin and D/E is totally different the operating margin is measured by the company's operating profit and its revenues instead, the D/E ratio is the proportion of debt in comparison with equity. therefore, the company's revenues can be increased or decreased by its systematic risks and unsystematic risks. Whereas the D/E tells us the amount of debt taken to finance the operations.

In conclusion, the findings of my analysis provide evidence in favour of the study's hypothesis that a positive correlation exists between leverage, ROA, and ROE. The data, on the other hand, contradict the third hypothesis, which asserts that leverage has a negative impact on the operating margin. this theory by demonstrating that the fluctuation in the operating margin may be partially explained by the variation in the D/E. In other words, there is a minor relationship between the level of debt and operating

margin, but it is not significant. And Consequently, it can be concluded that an increase in gearing will result in a rise in trading profits. As long as a business generates sufficient income to generate a considerable profit, these conclusions will be valid. However, when trading profits begin to decline, the management will struggle to pay finance fees and other obligations. The pharmaceutical and biotechnology industry is more predictable than other industries. Their annual trading profit is very constant, and their business risks are low. As a result of the fact that the majority of companies in this industry patent their inventions for a long time, the unsystematic risk is diminished. When analysing profitability ratios, one of the typical expenses that may be seen in this industry is the cost of research and development, which is included in the income statement as a component of the cost of sales and these costs lower the operating profit and the accounting profit margin. For instance, research and development play a crucial role in the pharmaceutical and biotechnology industry and the speed at which new treatments are developed can be significant and potentially affect profitability rather than capital structure, particularly depending on the circumstances. For example, AstraZeneca was the first company to develop the covid-19 vaccine, which has benefited the company by generating a significant amount of revenue and has enhanced the company's profitability.

4.4 Comparison with the previous empirical findings

Numerous academics have researched companies' capital structure, and it appears that one theory is in contradiction with another the capital structure of companies, and it would appear that one theory is in conflict with another theory. In practice, a company does not always follow the rules outlined in capital structure theory.

These findings correspond with the capital structure theories, the regression results connect back to Modigliani and Miller's capital structure theory. When a corporation employs any form of financing, its value will increase. Also, the findings are aligned with the trade-off theory at the point that companies with a reasonable capital market and a sustained profit and tax shield encourage them to corporate debt into their capital structure, despite that those findings contradict some academic research.

Firms in the pharmaceutical and biotechnology industries are more prone to prediction than other types of businesses. They have a trading profit that is relatively steady from year to year, and the dangers associated with their firm are relatively minimal. Because the majority of companies in this industry do in fact patent their products for the long term, and because of this, they are able to limit the systemic risk.

According to the pecking order concept, profitable companies borrow fewer funds than less profitable ones. According to Pharmaceutical industry regression results, it does not appear to be the case. A profitable corporation would benefit from issuing debt within its capital structure. The Return on Equity (ROE) figure is useful for informing investors about the efficiency with which they can reinvest their capital because it takes into account retained earnings from previous years. When seen from the

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perspective of the investors, it is evident that their goal is to see the company achieve success through the utilisation of debt within its capital structure.

my study findings indicate a potential relationship between debt to equity, debt to capital and a company's return on asset and equity as well as a moderate positive relation with the operating margin. Consequently, this directly relates to the trade-off theory. In accordance with the trade-off concept, as long as a corporation has solid tangible assets and a consistent trend of taxable income, it can incur the maximum amount of debt. Where financial hardship exists, tax costs and benefits would be identical. My finding differs from the findings of (Rajan & Zingales, 1995) whom they concluded that leverage and profitability have a negative correlation. Although in the essence of the company size (Rajan & Zingales, 1995) and (Wald, 1099) clarify that company size boosts the gearing ratio.

A similar study has been made for the Indian pharmaceutical industry by (Mathur, et al., 2020) and their statistical analysis contradicts mine, where they reveal a negative relationship between gearing and a company's profitability. Similarly (Cole, et al., 2015) support this argument when they analyse three sectors in the US and they prove that the choice to issue debt as part of the capital structure has a negative impact on either Return on Asset or Operating Return in all three markets; nevertheless, debt has a favourable connection with Profit Margin and leads to high levels of profitability. One more research paper from Malaysia was done by (Ayaz, et al., 2021) who assent to my finding results that gearing is positively connected with firm performance. although (Salim & Yadav, 2012) contraries this argument and reveals a negative correlation between ROA, ROE and debts.

In order to summarise the findings of the analytical chapter. The conclusions of this study are among numerous that support the claim that gearing has a positive connection with a company's profitability and performance. On the other hand, the comparison includes a considerable number of research that refute this argument. We may say that profitability is the key factor that determines capital structure; nevertheless, other factors, such as tax shield advantage, company size, and industry can play a considerable influence in defining the capital structure of firms.

Chapter 5: Conclusion and Recommendation

5.1 summary of the study

In this research, I have conducted my analysis to discover how the chosen form of financing affects the value and profitability of the firms in the biotechnology and pharmaceutical industry. I have chosen to conduct my empirical analysis on 10 pharmaceutical and biotechnological companies listed on the London Stock Exchange from 2016 until 2021. The aims of the research were determined in favour to formulate the study questions and predicting the possible hypothesis to answer them. the objectives purpose was to investigate the correlation between gearing, Return on Asset and Return on Equity, as well as the type of relationship between operating Margin and gearing.

After providing an overview of the capital structure theories, beginning with the earliest ones such as Modigliani and Miller's theory and working my way up to the most recent ones, I have compiled several empirical findings from a variety of researchers, countries, and businesses in order to determine whether or not these findings are compatible with the theories, and if they are compatible, at what places in the theories they are compatible. This was done to gain an accurate comprehensive image of the circumstances surrounding the theories and the factors that determine the capital structure.

I have chosen to utilize multiple regression analysis to anticipate the statistical significance of the dependent variables on the independent variables and to determine the impact of gearing on the profitability of companies. As dependent variables, I have selected debt-to-equity and debt-to-capital ratios. The independent variables are ROE, ROA and Operating Margin. And I have utilised the company size as a control variable. The analysis consisted of three regression models the first examined the impact of Debt to equity on ROE, the second determined the connection between debt to equity and Operating Margin, and the last determined the correlation between the debt-to-capital ratio and ROA.

The outcomes of the finding results confirm a statistical significance of 17%,2,7% and 10% of variation occurred in ROA, Operating Margin and ROE respectively with the variation on the dependent variables (D/E and D/C) and affirming a significant positive relationship between gearing and ROE and ROA as well as a small positive connection with the Operating Margin. In conclusion, it is evident from the findings that companies with a consistent profit and a predictable market have a stronger link than companies with an uncertain market. However still, the selection of finance and the level of gearing is not constant and varies from one sector to another. Nevertheless, it cannot be denied that the selection of financing boosts both the return on investment for shareholders and the profitability of the company. Yet, for certain companies, an increase in their total debt causes a lowering effect on return, which in turn results in a decrease in both profit and the value of the company.

5.2 Limitations of the study and suggestions for future studies

From the standpoint of regression analysis, there are a few drawbacks, among them the fact that it does only quantify the relationship between the variables (dependent and independent), although in practice the dependent variable can be influenced by a considerable measure of other factors. In addition, it predicts that the previous pattern of behaviour exhibited by the data will continue into the years ahead. I have strived to determine the impact of the choice of capital structure on the value of pharmaceutical and biotechnology firms in the United Kingdom by observing the real situation of the chosen companies and other areas of exploration and why debt is issued into the capital structure by some companies and not by others and this may be determined by the company's own characteristics, performance and Market uncertainty and volatility.

In addition, the study only looks at a sample of the public pharmaceutical businesses that are listed on the London Stock Exchange. There is a pressing need for additional studies to be carried out on small

and medium-sized businesses, which may exhibit distinct patterns of behaviour concerning how they finance their investments. It is also recommended to explore more other elements that can affect the capital structure rather than concentrating exclusively on leverage because these other aspects play an essential role in the performance of businesses.

It is obvious that the way of financing affects the company's profitability and value. Profitable companies can either choose to issue short-term and long-term borrowing to finance their investment rather than financing by equity as it has a higher cost, however, it is recommended that managers need to be more careful of the risk of market volatility and uncertainty where the revenues are difficult to predict to avoid the threat of bankruptcy in case of not being able to meet the company's obligations.

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Appendix

Collected data for the selected companies.

AstraZeneca Plc	2021	2020	2019	2018	2017	2016
net income	115	3122	1227	2,050	2,868	3,406
total asset	105,363	66,729	61,377	60,651	63,354	62,526
total equity	39,287	15,638	14,596	14,044	16,642	16,669
operating profit	1056	5162	2924	3,387	3,677	4,902
revenue	37,417	26,617	24,384	22,090	22,465	23,002
total debt	29,794	19,699	17,550	19,113	17,807	16,808
ROE	0.0029272	0.1996419	0.0840641	0.1459698	0.1723351	0.2043314
ROA	0.0010915	0.0467863	0.0199912	0.0337999	0.0452694	0.0544733
Operating margin	0.0282225	0.1939362	0.1199147	0.1533273	0.1636768	0.2131119
debt-equity	0.7583679	1.2596879	1.2023842	1.3609371	1.0700036	1.0083388
debt to capital	0.4312908	0.557461	0.5459466	0.5764394	0.5169091	0.5020761

GlaxoSmithKline plc	2021	2020	2019	2018	2017	2016
net income	5,096	6,388	5,268	4,046	2,169	1,062
total asset	79,103	80,431	79,692	58,066	56,381	59,081
total equity	21,342	20,808	18,357	3,672	3,489	4,963
operating profit	6,201	7,783	6,961	5,483	4,087	2,598
revenue	34,114	34,099	33,754	30,821	30,186	27,889
total debt	24,173	27,150	30,508	26,064	17,089	18,790
ROE	0.238778	0.3069973	0.286975	1.1018519	0.6216681	0.2139835
ROA	0.0644223	0.0794221	0.0661045	0.0696793	0.0384704	0.0179753
Operating margin	0.2905538	0.3740388	0.3792014	1.4931917	1.1713958	0.5234737
debt-equity	1.1326492	1.3047866	1.6619273	7.0980392	4.897965	3.7860165
debt to capital	0.5310996	0.5661204	0.6243323	0.8765133	0.83045	0.791058

Novartis AG	2021	2020	2019	2018	2017	2016
net income	24018	8071	11737	12614	7,703	6698
total asset	131795	127778	118370	145563	133079	130124
total equity	67822	56666	55551	78692	74227	74891
operating profit	11689	10152	9086	8403	8,702	8268
revenue	51626	48659	47498	44833	42381	48518
total debt	29,197	36,044	27,384	32,145	28,532	23,802
ROE	0.3541329	0.1424311	0.2112833	0.1602958	0.1037763	0.0894366
ROA	0.1822376	0.0631642	0.0991552	0.0866566	0.0578829	0.051474
Operating margin	0.1723482	0.179155	0.1635614	0.1067834	0.117235	0.1104004
debt-equity	0.4304945	0.6360781	0.4929524	0.4084913	0.3843884	0.3178219
debt to capital	0.3009411	0.3887822	0.3301863	0.2900205	0.2776594	0.2411721

Smith&Nephew plc	2021	2020	2019	2018	2017	2016
net income	524	448	600	663	767	784
total asset	10,920	11,012	9,299	8,059	7,866	7,344

total equity	5,568	5,279	5,141	4,874	4,644	3,958
operating profit	593	295	815	863	934	801
revenue	5,212	4,560	5,138	4,904	4,765	4,669
total debt	3,339	3,690	2,074	1,465	1,450	1,650
ROE	0.0941092	0.0848646	0.1167088	0.1360279	0.1651593	0.1980798
ROA	0.0479853	0.0406829	0.0645231	0.0822683	0.0975083	0.1067538
Operating margin	0.1065014	0.0558818	0.1585295	0.177062	0.2011197	0.2023749
debt-equity	0.5996767	0.698996	0.4034235	0.3005745	0.3122308	0.4168772
debt to capital	0.3748737	0.4114171	0.2874567	0.231109	0.237939	0.2942225

Hikma pharmaceutical plc	2021	2020	2019	2018	2017	2016
net income	420	430	487	285	-839	158
total asset	4,372	4,135	3,930	3,497	3,388	4,363
total equity	2,467	2,148	2,129	1,697	1,528	2,411
operating profit	582	579	493	371	-747	302
revenue	2,553	2,341	2,207	2,070	1,936	1,950
total debt	763	850	617	613	756	838
ROE	0.1702473	0.2001862	0.2287459	0.1679434	-0.549083	0.065533
ROA	0.0960659	0.1039903	0.1239186	0.0814984	-0.247638	0.0362136
Operating margin	0.2359141	0.2695531	0.2315641	0.2186211	-0.488874	0.1252592
debt-equity	0.3092825	0.3957169	0.2898074	0.3612257	0.4947644	0.3475736
debt to capital	0.2362229	0.2835223	0.2246905	0.265368	0.3309982	0.2579255

e-Therapeutics plc	2021	2020	2019	2018	2017	2016
net income/loss	-3,684	-2,347	-3,999	-5,359	-13,125	-8,820
total asset	14,311	4,786	7,509	11,762	17,931	29,587
total equity	13,884	4,502	6,802	10,738	15,980	28,431
operating profit/loss	-4,485	-2,888	-5,114	-6,768	-16,330	-11,555
revenue	317	456	44	0	0	0
total debt	23	69	0	0	0	0
ROE	-0.2653414	-0.5213239	-0.5879153	-0.4990687	-0.8213392	-0.3102248
ROA	-0.2574244	-0.4903886	-0.5325609	-0.4556198	-0.7319726	-0.2981039
Operating margin	-0.3230337	-0.6414927	-0.7518377	-0.630285	-1.0219024	-0.4064226
debt-equity	0.0016566	0.0153265	0	0	0	0
debt to capital	0.0016538	0.0150952	0	0	0	0

Indivior plc	2021	2020	2019	2018	2017	2016
net income	205	-148	134	275	58	35
total asset	1,832	1,531	1,652	1,547	1,444	1,209
total equity	203	82	209	66	-203	-295
operating profit	213	-156	178	292	193	149

revenue	791	647	785	1,005	1,093	1,058
total debt	242	234	237	241	482	535
ROE	1.0098522	-1.804878	0.6411483	4.1666667	-0.285714	-0.118644
ROA	0.1118996	-0.0966688	0.0811138	0.1777634	0.0401662	0.0289495
Operating margin	1.0492611	-1.902439	0.8516746	4.4242424	-0.950738	-0.505084
debt-equity	1.1921182	2.8536585	1.1339713	3.6515152	-2.374384	-1.813559
debt to capital	0.5438202	0.7405063	0.5313901	0.7850163	1.7275986	2.2291667

Convatec group plc	2021	2020	2019	2018	2017	2016
net income	117.6	112.5	9.8	221.6	158.4	-202.8
total asset	3,674.00	3,766.50	3,609.80	3,660.40	3,800.90	3,513.90
total equity	1,694.80	1,670.70	1,561.00	1,617.20	1,523.80	1,246.20
operating profit	203.6	211	96.9	267.7	247.8	154
revenue	2,038.30	1,894.30	1,827.20	1,832.10	1,764.60	1,688.30
total debt	1,345	1,456	1,486	1,544	1,823	1,776
ROE	0.0693887	0.067337	0.006278	0.137027	0.1039506	-0.162734
ROA	0.0320087	0.0298686	0.0027148	0.0605398	0.0416743	-0.057713
Operating margin	0.1201322	0.1262944	0.0620756	0.165533	0.1626198	0.1235757
debt-equity	0.7933679	0.8717304	0.9520179	0.9544274	1.1962856	1.4248114
debt to capital	0.4423899	0.465735	0.4877096	0.4883412	0.5446858	0.5875968

abcam plc	2021	2020	2019	2018	2017	2016
net income/loss	17.2	12.5	45	62.2	42	37
total asset	986.1	809.3	446.7	414.8	361.7	330
total equity	656.1	500.9	384.8	351.7	307	261
operating profit	95.5	54	83.6	81.3	55	46
revenue	462.9	260	259.9	233.2	217	171
total debt	119	106	0	0	0	0
ROE	0.02621552	0.02495508	0.11694387	0.17685527	0.13806578	0.1431853
ROA	0.01744245	0.01544545	0.10073875	0.14995178	0.11722422	0.11347087
Operating margin	0.14555708	0.10780595	0.21725572	0.23116292	0.17942038	0.17725881
debt-equity	0.18167962	0.21241765	0	0	0	0
debt to capital	0.15374694	0.17520171	0	0	0	0

Mediclinic International plc	2021	2020	2019	2018	2017	2016
net income	79	-299	-130	-474	243	190
total asset	6672	6,954	6,428	6,343	7,422	6,549
total equity	2967	3,003	3,266	3,373	4,164	3,570
operating profit	209	-184	81	-288	362	288
revenue	2995	3,083	2,932	2,870	2,749	2,107
total debt	1,777	1,951	1,982	1,937	2,030	1,841
ROE	0.02662622	-0.0995671	-0.03980404	-0.1405277	0.05835735	0.05322129

ROA	0.01184053	-0.0429968	-0.02022402	-0.074728	0.0327405	0.02901206
Operating margin	0.06779111	-0.0612721	0.02480098	-0.0853839	0.08693564	0.08067227
debt-equity	0.57638664	0.64968365	0.60685854	0.57426623	0.48751201	0.51568627
debt to capital	0.36563786	0.39382317	0.37766768	0.36478343	0.32773652	0.34023286