Capital Structure Volatility During Financial Crisis: The Covid-19 Impact on Saudi Listed Companies

By

Islam Mahmoud

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Supervisor: Dr Robert Gharios

Viva Voce Committee:
Dr Vasileios Margaritis
Dr Ahmed Sobhi
Dr Abir El Saadi

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Abstract

The corporate capital structure financing decision is a critical issue for firms in emerging economies. This issue has been widely studied to examine the impact of capital structure decisions on firm performance. Researchers observed varying results when they examined the impact of different pandemics or crises on capital structure of different firms. These variations are due to differing market conditions, sectors, and research models used. This study aimed to examine how the capital structure of listed companies in Saudi Arabia was affected by the COVID-19 pandemic. The three leverage ratios utilized in this research as measures of the capital structure are the total debt ratio, long-term debt ratio, and short-term debt ratio, in addition to firm-related factors which are size, tangibility, profitability, efficiency, and growth opportunity to examine the changes in leverage from before COVID-19 to during COVID-19 using panel data analysis. The findings indicated that the COVID-19 outbreak has significantly impacted the total debt, long-term debt, and short-term debt ratios of listed firms in Saudi Arabia, and that firm-related factors such as size, tangibility, profitability, and efficiency influenced the capital structure. For the total debt-to-assets ratio, significant results were found in the consumer discretionary, consumer staples, healthcare, industrial, material, and utility sectors. For long-term debt, significant results were found in the consumer discretionary, healthcare, industrial, material, and utility sectors. Additionally, significant results for short-term debt were observed in the consumer staples, healthcare, and consumer discretionary sectors. The results of this study are beneficial for listed companies and their management in identifying and responding to shocks arising from future pandemics and preventing financial risks.

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Dedication

I dedicate my dissertation work to my loving wife, Zainb. A special feeling of gratitude to you for your immense sacrifices and the inspiration you provided, which were necessary for me to complete this dissertation. I love you!

I also dedicate this dissertation to my children, Omar, Rokkya, and Ahmed.

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1. Chapter One: Introduction

1.1. Study Background and Rationale

Firms need financing whether they are newly incorporated or have been operating for a long time. They require these funds to enable their expansion and facilitate day-to-day operations. This capital may be obtained either internally from retained earnings, which do not require repayment, or externally from lenders or shareholders, which necessitates repayment in the form of interest payments, dividends, value creation, and profit maximization.

Since capital structure affects the wealth maximization of firms and their ability to maintain their position in a competitive world, making the right decision about capital structure and developing a model that yields optimal results is critical and challenging (Koech, 2013).

Due to this, decisions regarding capital structure attract the attention of many business players and firm management. These decisions impact not only the profitability of firms but also their ability to maintain their going concern status during financial crises.

During financial crises, firms that are not performing well face financial distress.

Therefore, firms face significant pressure to develop a corporate structure that addresses these problems and maximizes shareholder profits.

A crisis of an exceptional nature, such as the COVID-19 pandemic, has adverse consequences for companies' operations.

The pandemic had significant effects on the economy, leading to financial difficulties for numerous firms. Many of these businesses were forced to acquire significant debts to maintain their operations in the short term (Huang & Ye, 2021).

The issue of capital structure has been widely studied in the literature. Many studies have examined capital structure decisions and their impact on firm performance. Other studies have measured the impact of different pandemics, such as the Global Financial Crisis, on capital structure and firm performance.

No research in Saudi Arabia specifically studies the impact of the COVID-19 pandemic. This study provides insight into the impact of the COVID-19 on the capital structure and performance of firms during the pandemic.

The main hypothesis of the study is that COVID-19 had a significant effect on capital structure, which varies across sectors.

This study will help policymakers, practitioners, and company management identify strategies to handle this crisis. It will also assist firms highly affected by the pandemic in preparing to face similar risks in the future. The study aids firms in planning and decision-making by predicting risks at an early stage.

1.2. Research Problem Statement

The COVID-19 pandemic has caused widespread market uncertainties and varying impacts on the global financial landscape and business industries. These impacts are generally attributed to the global restrictions imposed in response to the pandemic (He et al., 2020). Companies need cash inflow to cover their operational requirements and fixed costs. Due to the lack of internal resources during the economic recession caused by the pandemic, companies will seek other sources of financing, such as short-term financing. Obtaining financing through external sources may change the capital structure of companies.

The cornerstone of a company's sustainability and longevity in the market is its capital structure, which is vital to its overall success. Sound financial decisions are crucial for a company's

performance. Poorly advised decisions can have severe negative consequences, such as creating an inefficient capital structure that could ultimately threaten the corporation's future (Eriotis et al., 2007).

According to Colombage et al. (2017), capital structure decisions play a significant role in determining financial performance. This underscores the importance of capital structure decisions as a major component of a company's financial performance.

The volatile market conditions resulting from the financial crisis have provided researchers with a rare opportunity to assess the outcomes of an environment that may be considered a natural experiment (Mimouni et al., 2017).

Due to the importance of capital structure, studying it is crucial, and the changes due to the COVID-19 pandemic need to be investigated.

1.3. Research Questions

In this research, I attempt to answer the following questions:

- How did COVID-19 affect the capital structure of publicly listed companies in Saudi Arabia?
- Is the impact of COVID-19 on the capital structure different across sectors in Saudi Arabia?
- How did firm characteristics such as size, asset structure, profitability, and asset utilization affect their ability to raise debt financing during the COVID-19 period?
- What was the impact of COVID-19 on the growth opportunities of listed firms in Saudi Arabia?

1.4. Research Hypotheses

H1. COVID-19 has a significant impact of COVID-19 on capital structure.

H2. During the COVID-19 period, SMEs faced more difficulties than large companies in raising debt financing.

H3. During the COVID-19 period, firms with a high percentage of tangible assets. had a greater ability to raise debt financing than firms with a low percentage of tangible assets.

H4. During the COVID-19 period, firms with high profitability raised less debt financing than firms with low profitability.

H5. During the COVID-19 period, firms with high asset utilization had a greater ability to raise debt financing than firms with low asset utilization.

H6. COVID-19 had a significant effect on growth opportunities.

H7. COVID-19's effect on capital structure varies across sectors.

1.5. Research Objectives and Aims

1.5.1. *Overall Objective*

The study's main aim is to examine the impact of market uncertainty and financial instability from the COVID-19 crisis on the capital structure of publicly listed companies in Saudi Arabia.

1.5.2. Specific Aims

- To explore how financial and macroeconomic uncertainty arising from COVID-19 influences firms' capital structure.
- To explore the impact of the severity of COVID-19 on firms' capital structure.
- To explore whether all firms are equally affected or if the impact varies across different sectors in Saudi Arabia.

1.6. Scope and Delimitations of the Study

This study focuses on analyzing the impact of the COVID-19 pandemic on the capital structure of publicly listed companies in Saudi Arabia. The primary scope includes examining changes in leverage ratios and firm-related factors such as size, tangibility, profitability, efficiency, and growth opportunities. The study covers the period from before to during the pandemic, providing a comparative analysis of the changes. The delimitations include focusing solely on Saudi-listed companies, excluding non-publicly listed firms, and limiting the analysis to the non-financial sectors.

1.7. Definition of Terms

Capital Structure: The combination of long-term debt, specific short-term debt, and standard and preferred stock of a company that represents the financing of the total operations and growth of the firm (Titman et al., 1988).

Leverage Ratios: Comparison of the level of a company's debt to its assets, equities, or incomes, measuring financial leverage. Commonly used leverage ratios include total, long-term, and short-term debt ratios (Titman & Wessels, 1988).

Firm Size: A means of determining the size of an enterprise, which can be the total resources or capital value of an enterprise (Suriawinata et al., 2022). The natural logarithm of total assets is adopted for this study.

Tangibility: The ratio of a firm's fixed assets by total assets, including tangible assets such as buildings, machinery, and stock. It is usually defined as the extent to which fixed assets are backed by total assets (Vengasai, 2023).

Profitability: A relative estimate of a firm's profitability calculated by dividing earnings by revenue, assets, or equity. Popular measures of profitability include return on assets (ROA) and return on equity (ROE) (Fama & French, 2002).

Efficiency: The measure of the effectiveness of the operational utilization of a company's properties in profit generation. It can be measured by ratios such as the asset turnover ratio (Firman et al., 2020).

Growth Opportunity: The potential for expanding the business and increasing the company's income. It can be indicated by values such as the market-to-book ratio or the earnings growth rate (Lestari & Sintha, 2022).

1.8. Research Significance

COVID-19 has caused significant issues and losses for companies, which are till now trying to recover. This study will help companies and practitioners identify strategies to handle future crises. Additionally, the study will assist companies in planning, preparation, and early risk forecasting for similar situations that may arise in the future.

As a summary of the first chapter, the study seeks to determine how the pandemic impacted the capital structure of Saudi Arabia's publicly listed firms, emphasizing sectorial differences. Therefore, the main research questions revolve around the effects of COVID-19 on capital structure and the differences Within sectors. The study's overall relevance is that it may provide recommendations to firms and policymakers on how to cope with and prevent such a financial crisis. The structure of the dissertation is explained to the readers so that they have a clear understanding of what is to be achieved.

2. Chapter Two: Literature Review - Theoretical Framework

2.1. Introduction

In December 2019, an outbreak of an unknown etiology was identified as a new virus called coronavirus disease-2019 (COVID-19). The coronavirus spread rapidly and had a wide range of impacts (World Bank, 2020).

Within months of the initial diagnosis, COVID-19 had spread to more than 200 countries.

As of March 1, 2021, more than 119 million cases of the virus and 2.6 million deaths had been reported to the World Health Organization (WHO). By December 4, 2022, these numbers had risen to over 656 million cases and 6.7 million deaths (COVID-19 Dashboard, John Hopkins University).

On March 4, 2020, Saudi authorities announced a ban on travelers and pilgrims entering the Kingdom to prevent the spread of COVID-19. The Saudi Ministry also canceled all sporting events and prohibited public attendance (Orfali et al., 2021). Additionally, due to the high number of cases reported from Italy, Iraq, the UAE, Bahrain, South Korea, and Kuwait, the Kingdom restricted travel from these nations. Except for pharmacies, hospitals, and supermarkets, all foreign flights, dining establishments, shopping centers, and other public gathering places were temporarily closed. The public was placed under quarantine for 21 days starting on March 23, 2020, from 7 p.m. to 6 a.m. These measures significantly impacted firms across all regions and countries (Shen et al., 2020). The epidemic has severely damaged the global economy, with 2.20% of countries experiencing a recession. Middle Eastern countries heavily dependent on oil saw their gross domestic product (GDP) decline by 6% that year, with a 5.75% loss in non-oil sectors (Shen et al., 2020). During the COVID-19 pandemic, Saudi Arabia's GDP fell by 4.8%, and many countries experienced periods of unemployment, bankruptcies, and other difficulties (Shen et al., 2020). The pandemic negatively impacted corporate productivity and profitability, resulting in

significant human and economic consequences. The epidemic has particularly harmed the global economy, especially for the poor. Governments face ongoing challenges in balancing public health crises with economic considerations, which often have conflicting objectives. The crisis has adversely affected everyone in the economy, changing how people live and businesses operate. The pandemic has created significant challenges for the global business environment. Blockages and restricted movement have created many obstacles in supply chains (Sharma et al., 2020).

Although the pandemic has brought substantial uncertainty to the economy (Huang & Ye, 2021), the outbreak of COVID-19 came as an unexpected shock to financial markets worldwide, resulting in significant volatility. More corporate bankruptcies were observed Within a short period. Businesses sought financial assistance to maintain their day-to-day operations (Huang & Ye, 2021).

Crises limit the availability of lending resources, significantly reducing enterprises' capacity to borrow.

Firms, on the other hand, may require greater debt financing during financial turbulence to cover a shortage of internal resources. As a result, the exact impact of a crisis on a firm's capital structure remains unclear.

Financial crises like the COVID-19 crisis have always challenged financial theories since the assumptions of normality and well-behaved markets are usually violated, and capital structure theories are no exception.

2.2. Capital Structure Theories

2.2.1 *The Theorem of Modigliani-Miller*

Before the theory proposed by Modigliani and Miller (1958), there was no accepted theory for capital structure; hence, they are credited with establishing the basis of modern finance. The theory states that capital structure has no impact on the market price of the firm and the average

cost of capital. They highlighted the irrelevance of capital structure in determining a firm's value and the cost of capital, provided that management focuses on value maximization. They started with assumptions that a firm has a particular set of expected cash flows, which it divides among investors when choosing a certain combination of debt and equity for purchasing assets. Firms and investors have equal opportunities to access the financial market.

Investors can create any leverage they desire but is not offered, or they can eliminate any leverage the firm has taken on but is not wanted. As a result, the firm's leverage has no effect on its market value. The research of Modigliani and Miller led to much ambiguity and controversy. From a theoretical perspective, the irrelevance of capital structure can be proved under certain circumstances; otherwise, it cannot. There are two different types of capital irrelevance propositions.

The first is the classical theory, which states that a firm can create its own leverage, irrespective of the investors. Further contributions to this theory were made by Hirshleifer (1966) and Stiglitz (1969).

The second irrelevance proposition states that “given a firm's investment policy, the dividend payout it chooses to follow will affect neither the current price of its shares nor the total return to its shareholders” (Miller and Modigliani, 1961). In other words, in perfect markets, neither capital structure choice nor dividend policy decisions matter.

The idea behind Modigliani and Miller's theory assumes an ideal capital market with no transaction costs, no taxes, and risk-free debt (Modigliani and Miller, 1958). These assumptions are considered very restrictive (Harrison and Wisnu Widjaja, 2014), and much research has been conducted to disprove the irrelevance theory of Modigliani and Miller because it works under specific circumstances; otherwise, it fails. Other capital structure models against Modigliani and Miller's approach consider various elements commonly included in the capital structure model,

such as taxes, bankruptcy, agency costs, transaction cost, time to market, impact on clients, lack of separation of operations and financing, and the market value of the stock. Many other theories have also contributed to capital structure theories.

Even though Modigliani and Miller's theory has some limitations, it still provides the groundwork for capital structure and other theories (Ahmad et al., 2012). In 1963, Modigliani and Miller acknowledged market imperfections and presented a new study to address their earlier mistakes, including the tax benefits from debts as a possibility to increase firm value. Thus, capital structure is related to the value of the firm, and this value can be maximized by increasing the level of debt in capital structure (Sabin and Miras, 2015). This theory is also supported by Nirajini and Priya (2013). Deed et al. (1995) reveal that Modigliani and Miller's theory is appropriate for small firms only to explain decisions about capital structure.

2.2.2 *The Traditional Theory of Capital Structure*

The traditional theory of capital structure, also known as the traditional approach, posits that a firm's value is maximized when the average cost of capital is minimized, thereby achieving an optimal configuration of capital (Myers, 2001). According to this theory, there exists an optimal debt-to-equity ratio where the overall cost of capital, when mixed with equity, becomes equal. Thus, the optimal capital structure is the point at which debt and equity are balanced. At any other point, adjusting the mix of debt and equity financing can increase the firm's value by altering its leverage. The theory assumes that the cost of equity and debt varies with the degree of leverage (Myers, 2001). It also assumes that equity and debt are the only financing options available, and that the firm must pay its earnings as dividends. Additionally, it assumes that financing, revenue, and total assets are static and constant, and that investors are rational in the absence of taxes. The traditional theory argues that wealth is created by investing in high-yield assets and purchasing such assets with an optimal blend of equity and debt. This theory differs

from the Modigliani and Miller theory, which posits that financial markets are efficient and that equity and debt financing are interchangeable (Myers, 2001). Other factors, such as tax deductibility and corporate tax rates on interest payments, also influence the optimal structure of a firm.

2.2.3 *The Brusov–Filatova–Orekhova (BFO) Theory of Capital Structure*

The Brusov–Filatova–Orekhova (BFO) theory of capital structure, developed by Brusov, Filatova, and Orekhova, replaced the Nobel Laureates Modigliani and Miller's theory of capital structure and capital cost (Brusov et al., 2023). This theory shifts from the assumption of the infinite lifespan (perpetuity) of companies, as posited by Modigliani and Miller, to provide more insights into the quantitative theory of valuation, considering the arbitrary lifespan of firms (Brusov et al., 2023). Modigliani and Miller's theory underestimates the weighted average cost of capital due to its perpetuity assumption. The BFO theory applies to companies with finite lifespans and investment projects of arbitrary durations.

According to the BFO theory, an average increase in the debt-equity ratio generates a trade-off between bankruptcy risk and the interest tax shield, leading to an optimal capital structure. When the cost of debt decreases with leverage, a minimum dependence of WACC on leverage is formed at moderate levels, beyond which financial distress and bankruptcy risks increase (Brusov et al., 2014). This minimum dependence causes a maximum in the firm's capitalization, suggesting that the BFO theory provides a new mechanism for forming the optimal capital structure, differing from the trade-off theory (Brusov et al., 2014). The theory considers the actual conditions companies face, such as revenue fluctuations and the arbitrary frequency of tax payments, which can occur annually, semi-annually, quarterly, or monthly (Brusov et al., 2023).

2.2.4 *Market Timing Theory*

The Market Timing Theory explains that a firm's current capital structure is the cumulative result of previous attempts to time the equity market (Abeywardhana, 2017). According to this theory, firms issue new equity when the share prices are overrated and repurchase shares when prices are underrated. Thus, price changes influence share buying decisions, affecting corporate financing and capital structure. Similar to the pecking order theory, the market timing theory does not target leverage; instead, equity transactions are timed based on stock market conditions. Consequently, changes in the capital structure are influenced by market timing and have long-lasting effects. Baker and Wurgler (2002) found that market timing has a regular and continuous influence on capital structure, with past stock returns negatively related to gearing ratios. However, Alti (2006) noted that the impact of market timing begins to fade after two years. The theory assumes that managers are aware of inside information about the firm's value and can lower the cost of capital by issuing securities when prices are favorable. Investors can use this theory for technical analysis and economic data to determine the right time to buy or sell assets, making it essential for understanding the economy's capital structure.

2.2.5 *Net Income Approach*

The Net Income Theory of capital structure, developed by David Durand in 1950, posits that the capital structure maximizing a company's net income is its ideal capital structure (Satyanarayana & Rao, 2023). This implies that a firm combines debt and equity to fund its operations based on predicted net income. A business will increase its debt financing if it increases net income and decrease it if additional debt reduces net income (Satyanarayana & Rao, 2023).

2.2.6 *Net Operating Income Approach*

The Net Operating Income Theory of capital structure, developed by David Durand in 1952, posits that the optimal capital structure maximizes net operating income (Durand, 1952). A firm's choice of debt and equity depends on anticipated net operating income, which is based on the utilization of varying amounts of debt and equity. Debt financing is applicable until it increases net operating income. If additional debt lowers net operating income, the firm must reduce its debt component (Durand, 1960). According to this approach, changes in debt or leverage do not affect the firm's total value, as the overall cost of capital is independent of leverage. A key characteristic of this approach is that an increase in leverage leads to an increase in equity capitalization, and vice versa, indicating a direct proportionality (Satyanarayana & Rao, 2023).

2.2.7 *Trade-off Theory*

The importance of the Trade-off Theory in capital structure should not be ignored, emerging after the debate on the Modigliani and Miller theorem. Initiated by Myers in 1984, the Trade-off Theory suggests that decision-makers evaluate the costs and benefits of various leverage alternatives. The theory assumes that an internal solution is obtained where marginal costs and benefits are balanced. According to the Trade-off Theory, there exists an optimal debt ratio where the marginal benefit of debt equals the marginal cost. The theory also suggests that the debt ratio exhibits target adjustment, gradually eliminating any variance from the target. Firms are assumed to have a long-run optimal debt ratio, influenced by firm-specific characteristics that vary over time and across firms (Frank and Goyal, 2008). The Trade-off Theory indicates that every business should have an optimal capital structure, justified by the trade-off between the costs and benefits of debt (Kraus and Lizenberger, 1973; Myers, 1984). As recognized by Modigliani and

Miller (1963), corporations can benefit from leverage since interest on pre-tax profits is deductible, providing a tax shield (Graham, 2003).

Masulis (1980) provides more evidence of the beneficial effect of leverage on company value. However, Mayers (1984) contends that while businesses might get tax deductions by raising their debt levels, each business should work toward its own optimal capital structure, which can involve either raising or lowering debt levels. Furthermore, the trade-off theory recognizes the detrimental impacts of leverage on firms' performance. Due to the required future interest payments on debt, debt financing is linked to a commitment for forthcoming financial outflow. Hence, interest payments negatively impact a company's financial performance and liquidity, increasing the likelihood of bankruptcy and insolvency (Kraus and Litzenberger, 1973; Myers, 1984). Trade-off theory presupposes that businesses should grow debt under normal market conditions as long as the cost of bankruptcy risk is less than the benefit of debts. However, the risk of bankruptcy significantly increases during times of crisis, raising the possibility that the costs of debt exceed the benefits. In other words, businesses are motivated to reduce their debt levels during a crisis, but the trade-off theory supports the benefits of debt financing if the business effectively balances the benefits of debt with the costs. To put it another way, the tax benefits should improve business performance. Even while bankruptcy costs do exist, Gruber and Warner (1977) and Miller (1977) conclude that they are insignificant compared to the tax savings.

During financial crises and when uncertainty increases, lenders' expected returns rise, making borrowers unwilling to take on more long-term debt (Demirguc-Kunt et al., 2015). Due to their unfavorable perceptions, some businesses may encounter lenders' reluctance to offer financing under these dangerous situations, even if the borrowers themselves are not reluctant. To be able to borrow again in the near future, these companies are compelled to reduce their debt (Campello et al., 2010). Lastly, the crisis exacerbates certain companies' potential unfavorable

selection costs, thereby excluding them from public markets (Doukas et al., 2011). Trade-off theory states that a crisis causes a rapid rise in the cost of bankruptcy, forcing businesses to reduce their ideal debt level (Bradley et al., 1984; Howe and Jain, 2010). This finding is consistent with the study presented above.

2.2.8 Pecking Order Theory

The pecking order theory, established by Myers and Majluf in 1984, is a competing theory to the trade-off theory. The rationale for the hypothesis is founded on the assumption that managers and investors have asymmetric information (Frank and Goyal, 2009; Baker and Martin, 2011). Managers are said to act in the company's best interests since they understand the business more thoroughly and know more about it than outsiders do (Harrison and Wisnu Widjaja, 2014; Boadi et al., 2015).

Pecking order theory indicates the presence of a financial hierarchy. Instead of starting with the optimal capital structure, the pecking order theory relies on the empirical fact that firms prefer to be financed firstly by internal funds such as retained earnings, then debt, and finally, equity (Saputra et al., 2015).

Firms use external funds only when necessary, and only if internal finance is insufficient (Myers, 1984; Myers and Majluf, 1984). There is a link between the issuance of additional shares and a drop in stock price (Baker and Martin, 2011). When proceeding with external sources of finance, the selection of various finance possibilities largely depends on the relative costs and the investment's lowest risk (Myers, 1984; Boadi et al., 2015). As a result, businesses prefer to issue debt rather than equity (Myers, 1984; Graham and Harvey, 2001). According to pecking order theory, this is the best course of action for businesses since issuing shares to fund operations signals to outsiders that a company lacks funds, which can lead to a decline in stock price.

Pecking order theory argues that businesses that are profitable and produce high earnings are also those that are anticipated to utilize less debt based on the justifications stated above. The rationale is that these businesses use internal resources, including retained earnings, to finance their investments (Boadi et al., 2015). The pecking order theory presupposes that corporations have lower levels of debt before a financial crisis occurs because they are more likely to be profitable and generate earnings under normal market circumstances or during booms. However, businesses experience decreased profitability and frequent liquidity problems during a crisis (Cetorelli and Goldberg, 2011), which forces them to seek external finance. In other words, pecking order theory presupposes a larger debt level during financial crises when there is a higher likelihood that companies' internal finances won't be sufficient. Pecking order theory also assumes a negative relationship between financial leverage and corporate performance since profitable firms require less debt. Researchers like Kester (1986), Friend and Lang (1988), Titman and Wessels (1988), Rajan and Zingales (1995), Fama and French (1998), Wald (1999), Wiwattanakantang (1999), Gleason et al. (2000), and Abor (2000) have further confirmed that there is a negative correlation between the two variables.

The capital structure is based on the firm's profitability and investment prospects, as per the pecking order theory. Firms with higher profits can use retained earnings, whereas those with smaller profits must rely on debt to finance their investments (Booth et al., 2001; Rajan & Zingales, 1995). Prior research findings of Degryse et al. (2012), that SMEs use profit to lower their debt levels, provide evidence for the pecking order theory. Gonzalez and Gonzalez (2012) have noted that debts and profitability have a negative relationship.

According to Rank and Goyal's 2003 argument, when the funding gap increases, stock issuance grows faster than debt issuance. According to Strebulaev and Yang (2013), many businesses still favor equity financing even when they appear to have easy access to debt funding.

3. Chapter Three: Literature Review - Empirical Literature

3.1. Financial Crisis and Capital Structure

During financial crises, companies face financial distress and bankruptcies, providing a foundation for empirical studies to explore the outcome of financial crises on the capital structure of firms globally (Demirgüç-Kunt et al., 2015).

Capital structure is not only a significant matter for companies attempting to increase their value, but it is also an important issue during economic downturns. During financial crises, companies in various countries faced a trend of bankruptcies with extreme leverage, which can lead to sovereign default and financial distress. Previous studies are mostly related to the theories of capital structure, i.e., trade-off theory and pecking-order theory. These theories are developed under normal economic circumstances. There is less research on capital structure during economic downturns or financial crises (Lyubov and Heshmati, 2019).

Following the COVID-19 pandemic outbreak, the OECD (2020) anticipated a disruption in macroeconomics and economic activity, including a worldwide recession, as a result of the implementation of lockdowns in several countries worldwide. It was demonstrated that several governments, including the US and Japan, authorized significant fiscal packages to strengthen their struggling economies. During the first nine months of 2020, Japan and the US each approved USD 1.7 trillion and USD 3 trillion. To strengthen the economy's resilience in the face of the COVID-19 pandemic, the Malaysian government announced economic stimulus measures and recovery plans of RM 295 billion in 2020, according to the Central Bank of Malaysia (BNM). The government pledged an additional RM 10 billion in funds for further assistance, mostly for individuals and small and medium-sized enterprises (SMEs). Trinh and Phuong (2016) highlighted three important influences on the economy during a recession. First, as demand power declines, product supply is significantly lowered. Second, the fall in foreign direct investment has had an

indirect impact on local financing. The lack of investment activity and changes in interest rates have also had a significant negative impact on the financial market. As the COVID-19 pandemic has caused the recent economic crisis, some governments have adopted the same strategies used during the financial crisis (Quéré & Weder, 2020). To ensure that banks can satisfy businesses' liquidity needs during the COVID-19 crisis, examples include specific support for affected firms, temporary layoff support, and temporary credit guarantees. The serious effect of COVID-19 on the financial health of many companies, especially those with high levels of borrowing, may cause them to experience financial trouble (Huang & Ye, 2021). Profitable, low-leverage enterprises are thought to have more financial flexibility since they can more easily obtain loan financing. When businesses depend more on debt financing, they will be at greater risk. In these businesses, a lack of cash flow might cause a liquidity crisis. As a result, firms have changed their financial structures due to the COVID-19 epidemic.

The COVID-19 pandemic negatively affected the capital structure, favoring the static trade-off theory. According to the trade-off theory of capital structure, each firm possesses an optimal capital structure that maximizes firm value, where the marginal costs of debt are equivalent to the marginal benefits of debt. The financial crisis influences the firms' capital structures through various channels (Demirguc-Kunt et al., 2015). Risk and uncertainty levels increase while anticipated returns decrease (Rutter et al., 2020). Consequently, borrowers and lenders are reluctant to commit capital to long-term investments (Demirgüç-Kunt et al., 2019). The prospects of various businesses become highly uncertain, and firms unable to commit to an aggregate maturity structure opt to shorten their debt maturity and reduce leverage. This aligns with the Rat Race capital structure model, which posits that high volatility incentivizes firms to shorten their debt maturity, even when the roll-over costs associated with short-term debt rise, as the payoffs for long-term investors become diluted (Hohenstatt et al., 2011). Lenders perceive a

higher likelihood of default, making short-term debts more suitable than long-term debt (Demirgüç-Kunt et al., 2019). The financial crisis of 2008-09 led to a decline in debt maturity and firm leverage in both developing and advanced economies, regardless of whether they experienced the pandemic. However, the effect of maturity reduction was more pronounced in privately held firms, such as small and medium enterprises (Demirguc-Kunt et al., 2015). Small and medium enterprises suffered more in countries with shallower banking systems, weaker information-sharing mechanisms, more restrictions on bank entry, and less efficient legal systems.

During volatile economic conditions, firms also start valuing financial flexibility and reneging on long-term contracts with covenants. This leads to a decline in the demand for long-term debt as the future becomes uncertain. Thus, in a financial crisis, the likelihood of increased short-term debts due to their short maturities and reduced long-term debts becomes evident as the forces of demand and supply come into play (Demirgüç-Kunt et al., 2019). Economic shocks negatively affect assets, impacting the balance sheet and potentially violating debt covenants. Companies must divest non-core assets or restructure assets to maintain a healthy capital structure.

The composition of corporate debt maturity is crucial as it determines how many assets the liabilities can finance (Demirguc-Kunt et al., 2015). When the maturity of the corporate debt shortens, roll-over risks shift to firms, away from lenders. These refinancing risks negatively influence long-term productive investments and firm growth. Firms that had accrued short-term debts before the pandemic suffered significant investment declines when the crisis set in (Almeida et al., 2012). Therefore, firms use shorter maturities to address the challenge of debt finance amid rising uncertainties. By taking such actions, firms regain their value to borrowers, who find them attractive as the value of short-term debt is less sensitive to future investment opportunities compared to long-term debt.

According to economic theory, the institutional environment in which a firm operates and its financial systems determine the depth of the crisis's impact on its capital structures through power returns, higher uncertainty, and higher risks. This supports the agency cost model, which stipulates that returns compel shareholders to take more risks in nations experiencing high bankruptcy and monitoring costs (Jensen & Meckling, 1976). Leverage ratios, such as the debt-to-equity ratio, a measure of capital structure, also become altered. The pandemic causes firms to experience severe financial constraints, leading them to decrease reliance on debt and prefer equity financing, consequently causing a decline in leverage ratios. The resulting decline in leverage significantly impacts the institution's risk profile.

As companies experience a decline in their finances, they opt for alternative sources of funds such as equity dilution. However, equity issuance results in ownership dilution, impacting shares and thus future profits and control of the company (Bradley & Stumpner, 2021). Firms start conserving their cash reserves to ensure financial stability and liquidity. Thus, the balance sheet shows higher cash reserves, positively impacting the company's financial health. Although this measure appears attractive, it can lead to excessive cash hoarding, implying that the firm has no investment opportunities, which hinders potential future growth.

Drawing upon established theories of capital structure, such as agency theory and trade-off theory, it is commonly observed that listed companies tend to opt for debt financing as a means of capital expansion when immediate funds are unavailable. This preference can be attributed to the lower cost associated with debt financing compared to intra-firm financing, as posited by Jensen and Meckling (1976).

3.2. Financial Crisis Impact Across Sectors

Any financial crisis, such as the COVID-19 pandemic, affects all industry sectors. The health sector is most widely affected, and its effects spread to others. Financially, the health sector

became severely impacted due to heightened demand for services and corresponding resources. As more resources are needed, finances are used to make purchases. Thus, the financial system becomes seriously strained by the growing demand for healthcare-related resources and services such as personal protective gear, oxygen, medicines, and other related machines (Graves et al., 2021). The condition and services offered at healthcare facilities become challenged as many people gather to receive services. Healthcare workers are left strained and exhausted. The pandemic dramatically affects cash flow and operating margins (Broome, 2020).

Due to social distancing measures intended to prevent the epidemic from spreading, hospitals are forced to cancel various elective inpatient and outpatient surgical procedures and elective physician visits since they are not mandatory and do not require urgency. Upon canceling such services, healthcare facilities are left to care for those suffering from the virus or those in critical condition (Broome, 2020). This implies reduced income for the hospital since electives earn almost half of all hospital admissions combined despite being about a quarter in number. Another challenge is that ambulatory practices experience an increase in demand but need access to capital and numerous sources of liquidity (Barnett et al., 2020). These demands leave the healthcare sector with vast burdens of pressure.

Other sectors are also negatively affected by the pandemic. For instance, the ICT sector must purchase more recent devices to match the growing demand for online meetings and other related developments. The sector is expected to spend on infrastructure such as new software and cloud computing technologies due to increased demand for storage spaces and A.I. services. Similarly, the ICT sector is pressured to spend more on new technologies, like other sectors. An example is learning institutions forced to close due to the pandemic. However, they later developed an online system through which learning can occur. This requires investment in resources to facilitate seamless learning through the online platform. Several businesses also

instituted online platforms to hold meetings and coordinate operations and daily activities. All sectors appear to have been negatively affected financially by the pandemic.

The aviation sector was greatly affected by the financial crisis arising from a pandemic such as COVID-19. The 2019 pandemic led to restrictions on movement and travel from one country to another. This implies that aircraft operations were impacted as they could not carry passengers from one country to another or within the country. The aircraft remained grounded, earning nothing unless they carried cargo. When a pandemic spans more than a year, which is generally the case with many crises, substantial financial constraints are experienced, and some aircraft may never operate again.

The financial performance of listed firms in China was examined by Rababah et al. (2020) in their analysis of the effects of the COVID-19 pandemic. It was determined that the pandemic had a detrimental effect on the performance of firms. Moreover, it is evident that the financial performance of sectors and industries that experienced the greatest impact from the pandemic, such as tourism and aviation, exhibited a more pronounced decline compared to other sectors.

Based on these studies, H7 has been formulated.

3.3. Financial Crisis and the Total Debt-to-Asset Ratio

The total debt-to-asset ratio influences a company's total income through its assets. The 2020 global recession introduced a sharp rise in debt as the pandemic hit hard (Kose et al., 2021). This period was referred to as the fourth wave of debt and was described as being more dangerous than a tsunami. Countries faced significant financing gaps and the need for investment, meaning additional issues during the pandemic could further increase debts (Kose et al., 2021). Small firms need more market access, making them more constrained. Such companies experience liquidity constraints, causing credit tightening and reduced access to funding. These firms struggle to meet their short-term obligations, compelling them to take short-term loans to mitigate immediate

liquidity needs. The move leads to an increase in the total debt-to-asset ratio. However, large firms have higher market access and are less financially constrained, allowing them to use their credibility to increase their liquidity buffers.

Debt repayment also becomes a problem for companies struggling to meet their short-term debts. The financial crisis strains a company's cash flow, triggering challenges in servicing debt obligations. The greatest possibility is that the company experiences difficulties in servicing the debt and can sometimes fail, leaving the total debt high. The long-term debt ratio declined by 1.4% between the 2008 and 2009 financial crisis, while in the subsequent two years, 2010-2011, it fell by about 3% (Demirgüç-Kunt et al., 2019). The total debt-to-asset ratio fell by 3% between 2008 and 2009 and by 4% in the preceding two years, 2010-2011 (Demirgüç-Kunt et al., 2019). The trend shows that the impact is even greater after the crisis ends. The effects are experienced several years later at a greater magnitude.

3.4. Financial Crisis and the Long-Term Debt-to-Asset Ratio

The return on assets depicts an inverse relationship with long-term debt. An increase in long-term debt leads to a decrease in return on assets. The long-term debt to asset ratio is a financial metric that shows the proportion of a company's assets that long-term debt can finance. Thus, the ratio is essential in understanding a company's long-term financial health and risk profile. It indicates whether the company can finance its assets in the long run. Pandemics cause financial crises that affect long-term debts and assets and, consequently, the ratio. One of the remarkable impacts of a financial crisis on a company is the increase in long-term debt as it experiences challenges in cash flow. According to the World Economic Forum (2020), the debt-to-GDP ratio by sector rose. As countries experienced a rise in debt levels, companies also saw an increase in their long-term debts (Adrian, 2021). The global debt rose by $19.5 trillion during the COVID-19 pandemic. Such challenges compel firms to seek additional funding to meet their

obligations. In a financial crisis, companies become financially strained, raising more long-term debt to augment liquidity and financial stability. However, this move can backfire by causing an increase in long-term debt, leading to a rise in the ratio. A high long-term debt-to-asset ratio implies that the company relies heavily on debt to finance its operations.

A financial crisis can also cause assets to lose value. Due to the forces of demand and supply, the value of assets can decrease as the economy becomes uncertain and demand and revenue decline. When the value of assets goes down, the long-term debt-to-asset ratio increases. In rare cases, the long-term debt-to-asset ratio can improve if the company employs proactive measures to lower incurred long-term debt. Such a move would significantly diminish financial risks and enhance financial stability. Focusing on debt repayment leads to an improved long-term debt-to-asset ratio. Another measure with a similar impact is government support during economic downturns. Government stimulus assists firms in supporting their operations, and some may opt to settle their long-term debts, significantly improving the ratio. In the past, financial crises have worsened the long-term debt-to-asset ratio. This occurrence was experienced during the global financial crisis of 2008. In the 2008-2009 financial crisis, the ratio of long-term debt to total assets decreased by 1% and continued to decline by 1.7% in the subsequent two years (Demirgüç-Kunt et al., 2019).

3.5. Financial Crisis and the Short-Term Debt-to-Asset Ratio

During the pandemic, firms in the United States experienced an increase of 2.4% in the debt-to-asset ratio (Almeida, 2021). These effects were due to the shocks created by the COVID-19 pandemic, which challenged firms' short-term liquidity and impaired corporate cash flows. When this happens, firms go profoundly negative as they fail to cut costs while revenue plunges. The best alternative is to take loans to fund short-term expenses, increasing the short-term debt-to-asset ratio. Adrian (2021) posited that companies experience solvency stress, meaning they have a

low ability to meet short-term financial obligations. Banks are also affected as their capital is reduced, limiting their capacity to lend money. Even those with funds may be reluctant to lend to firms. As a result of the pandemic, health ministry restrictions impacted commercial activities. In such situations, firms experienced reductions or no returns as they could not sell. Thus, they struggled to sell existing inventories, and if that did not suffice, they ended up borrowing (Adrian, 2021). Another likelihood is that trade credit freezes as firms defer payments, depriving the corporate sector of a vital source of liquidity.

3.6. Financial Crisis and Firm Size

A financial crisis affects all firms regardless of size. However, the magnitude of the effects depends on the firm's size. Small and micro firms lack the extra resources and investment to alleviate the effects of economic downturns and are more affected by a financial crisis compared to large firms, which have more resources to cover the negative implications. This implies that, as posited by Ngo and Duong (2023), small and micro firms are more vulnerable to the financial crisis caused by a pandemic such as COVID-19.

Whenever a crisis occurs, a firm is expected to respond. Size influences how a firm responds to a financial crisis. The way a small firm responds is different from how a large firm responds due to their different capabilities. As posited by Alsamhi (2022), a firm with a small investment scale or sales income experiences a more substantial detrimental effect on its performance. During the COVID-19 pandemic, small firms were more affected than large ones. Small firms, such as SMEs, were significantly hit and, as a result, are less likely to access formal finance opportunities (Gür et al., 2023). Since financers tend to renege on offering small and medium firms' debts, they opt to rely on informal financing sourced from friends and relatives. On the contrary, large firms find it easier to access loans from banks to finance their operations. Medium firms are also more likely to apply for loans from banks than small firms (Gür et al.,

2023). Small firms are riskier than medium and large firms; thus, banks tend to take precautions before lending money to them.

During the pandemic, micro and small firms borrowed more money from their acquaintances to finance their operations (Gür et al., 2023). These firms experienced challenges restructuring their outstanding loans, borrowing from banks, and injecting capital. To avoid difficulties during the pandemic, micro and small firms preferred cutting costs to avoid additional financial difficulties.

The size of a firm leads to a term referred to as the firm size advantage, denoting the benefits that come with a larger size. However, this advantage is less in sectors highly affected by the pandemic. The lower advantage among small and micro firms is associated with limited access to financial relief (Lin et al., 2021).

3.7. Relationship between Firm Size and Capital Structure during Financial Crisis

The larger the firm, the better it is in terms of its capital structure. A firm will perform better if it is large rather than small. Since a large firm has a higher level of investment, it tends to generate more profit and thus utilize internal funding (Alsamhi, 2022). The opposite is true for a small firm. According to Gür et al. (2023), SMEs find it difficult to obtain external financing due to the high level of risk and uncertainty associated with the pandemic, which disrupts the market. For small firms, financing daily business operations and investments is challenging since the enterprise is both the source of income and the source of finances for the business.

Another challenge that arises during a crisis is that financing opportunities dry up, creating bottlenecks for firms. As a result, financial institutions become reluctant to lend money to risky and uncertain small and medium firms. Banks, for instance, raise their standards and requirements for offering loans, narrowing the pool of qualified borrowers. Additionally, when a financial institution is weakened, the amount of money it can lend to firms decreases, making it difficult for

them to access credit during a crisis. Credit rationing becomes the norm as banks refrain from issuing credit to any firm. Banks prefer issuing loans to large firms that have a higher capability to repay. This leaves micro-sized firms, which have less capability to repay, with more difficulties accessing credit to support their business operations and activities (Cowling et al., 2012). In such situations, small firms suffer more compared to large ones that do not experience rationing. However, in some cases, community banks with stronger lender-borrower relationships increase their credit supply to SMEs. During the global financial crisis, debt maturity and firm leverage declined significantly. This effect adversely impacted SMEs since they have less developed financial markets and less efficient legal systems.

According to a study conducted by Demirgüç-Kunt et al. (2020), the global financial crisis affects the evolution of the capital structure of firms. The study found that debt maturity and firm leverage declined significantly. The adverse effects were more pronounced for small and medium firms, leaving SMEs more financially constrained during the COVID-19 pandemic. During the pandemic, cash shortages were the major challenges that small and micro-sized firms experienced (Bartik et al., 2020). Whenever a financial crisis occurs, many businesses turn to financial institutions to cushion themselves from the devastating effects of the crisis. However, the expectations that such firms have on bank loans have diminished. For instance, it has been established that small and micro-sized firms have more positive conditional expectations for trade credit, yet they end up receiving less. This situation deteriorates their expectations and future investment energy. The high-level expectations are evident in their loan applications. However, despite their enthusiasm for making applications, large firms are more likely to receive bank credit than micro and small firms.

Cumulatively, micro and small firms restructure their loans and inject capital at a significantly lower rate than larger firms. This indicates that since securing a bank loan is

challenging, the majority of small and micro firms end up borrowing funds to run their operations from acquaintances, while large ones borrow from banks. This aligns with Liu et al. (2022), who stated that SMEs experience a decline in loan demand compared to large ones and rely on friends and relatives. The level of suffering that a small and micro firm experiences is greater than that of a medium and large firm. Therefore, the smaller the firm, the less favorable the capital structure.

According to Yildiz et al. (2009), capital structure and firm size are positively related. In contrast, Uyar and Guzelyurt (2015) observed that the connection between capital structure and firm size is negative.

Taking into account all the above theoretical studies, H2 has been hypothesized.

3.8. Financial Crisis and Tangibility

Amidst a financial crisis, there is a significant disparity in information between borrowers and lenders due to the unpredictable nature of the market (Ang, 1992; Van der Wijst, 1989). The significance of tangible assets increases as companies with greater collateral can obtain debt more readily (Frank and Goyal, 2008). Conversely, short-term debt is typically backed by consistent earnings, indicating a negative correlation between physical assets and short-term debt (Hall et al., 2000; Sogorb-Mira, 2005). Research on the capital structure of Small and medium-sized enterprises (SMEs) during crises suggests that companies with a higher proportion of tangible assets tend to issue a greater amount of long-term debt (Muijs, 2015; Proença et al., 2014). The association between tangible assets and short-term debt remains uncertain, as evidenced by the findings of Proença et al. (2014), who report a negative link, and Muijs (2015), who report a nonsignificant relationship. Surprisingly, the ratio of tangible assets appears to have a detrimental impact on overall debt (Balios et al., 2016; Proença et al., 2014).

3.9. Relationship between Tangibility and Capital Structure during Financial Crisis

During a crisis, factors that determine capital structure, such as tangibility, become significant in leverage. The tangibility of a firm and leverage are positively related. A firm with fixed tangible assets is considered more favorable than one with fewer tangible assets. A firm with tangible fixed assets provides sufficient assurance to creditors that they can recover their funds in the event of a financial crisis.

One of the factors that affect the capital structure is tangibility (Mazunder & Rao, 2022). Tangibility is a determinant of leverage and thus essential in a crisis.

A firm avoids related asymmetric costs by issuing debts secured through collateral. Thus, investors gain greater certainty when investing in a firm that possesses assets that can be used as collateral (Leeuwen, 2011). Therefore, tangibility is essential when related to leverage. During a crisis, most firms become distressed, necessitating the liquidation of fixed assets. When there is a higher liquidation environment, higher collateral is demanded to issue long-term debt. As the liquidation right increases, the long-term debt-to-tangibility ratio decreases. In a distressed situation, such as during a crisis, the higher liquidation right makes it likely that a firm's fixed assets will be repossessed and liquidated to recover the loan.

Prior research indicates a positive correlation between the tangibility of assets and the level of leverage (Van der Wijst and Thurik, 1993). Both the pecking order theory and the trade-off theory posit that there exists a positive correlation between asset tangibility and a long-term debt, and a negative correlation between asset tangibility and short-term leverage (Degryse et al. (2012), Hall et al., 2000; Sogorb-Mira, 2005). This relationship can be attributed to the fact that tangible assets can serve as collateral, thereby reducing the risk of default. Companies utilize their collateral to secure long-term loans, which are associated with a lower cost compared to short-term debt. The presence of significant levels of tangible assets can also indicate a consistent and

reliable stream of income, generating internal finances that diminish the need for short-term borrowing (Daskalakis and Psillaki, 2008; Harc, 2015).

Considering these arguments, H3 has been formulated.

3.10. Financial Crisis and Profitability

The COVID-19 pandemic spearheaded a dynamic shift in businesses. Most firms globally either reduced or closed down their operations, indicating the direness of the situation. Even those businesses that formulated policies to remain relevant and operational in the market saw their profitability greatly affected by the pandemic. The interdependency of several factors in business was the core reason for the profitability shift experienced in all firms. Profitability relies on factors such as sales, employment, and operations. A change in one of these factors is likely to affect business profitability negatively or positively. The rise of the pandemic led nations to formulate strict measures to curb the spread of the virus. These stringent measures hit the business sectors as businesses had to alter their operations and employment structures. The change in these sectors directly impacted the profitability of businesses. Due to the changes spearheaded by the pandemic in the business sector, many scholars found this an area of interest to aid and prepare businesses for future occurrences of a similar situation.

One of the significant impacts that was universal across the globe on firms was a decline in sales. This consequence translated to minimal profits in the business sector. According to Fairlie and Fossen (2021), approximately 84% of businesses reported that their sales decreased by 49% compared to pre-pandemic levels. Notably, the percentage of sales decline fluctuated depending on the measures formulated by organizations and external environmental factors such as government regulations. This percentage also varied depending on the prevalence of the virus in a particular environment. The decline in firm sales during the pandemic was primarily driven by the drastic reduction in consumers. During this period, most countries enacted measures restricting

consumer movement, hindering them from accessing their favorite stores and business enterprises. As a result, the low customer base in businesses translated to lower sales and minimal profits. The sales of countries such as Nepal, Bangladesh, and Tunisia dropped by more than 60%, clearly indicating the economic disparity initiated by the pandemic (Christine et al., 2020). Additionally, the nature of the business was a significant factor determining sales volume. For instance, personal selling businesses were the most affected. Face-to-face interactions were highly discouraged by many businesses globally, significantly reducing their profits. With a decline in sales in most business enterprises, profits significantly declined, leading to closures or the formulation of new strategies to remain relevant in the market.

Employment is another critical issue affecting businesses' profitability directly and indirectly. Some of the most common measures taken by businesses to solve their financial crisis during the pandemic were worker retrenchment, granting leaves, reducing wages, or reducing working hours for their employees. These strategies had a tremendous impact on business enterprises and society. Firms with significant sales drops reduced their employment levels for sustenance (Congressional et al., 2021). Though reducing the number of employees in an organization could be viewed as one of the best ways to minimize expenditure and solve the financial crisis, it also minimized production. As a result, this approach meant that production levels in firms were low, translating to minimal profits. The correlation between sales and employment was also evident since firms could only employ a few employees with minimal profit gains. According to the Congressional Research Service (2021), for every percentage reduction in sales, there was a 0.077% decline in employment rates. Consequently, a decline in profits resulted in the retrenchment of employees.

The aspect of laying off workers was mostly experienced in businesses that demanded the physical presence of consumers, such as the tourism sector. These sectors were worst hit by the

pandemic as the movement of tourists was restricted. Similarly, the transport sector was severely affected. Some airports were temporarily shut down as countries prohibited their citizens from traveling to the most affected regions to control the virus spread (Barczak et al., 2022). Not only did this action lead to the retrenchment of workers, but it also significantly impacted the global economy. It is estimated that in 2021 alone, the transport sector contributed 8.4 percent of the GDP. These statistics indicate how much countries lost during the pandemic.

Additionally, the fact that the transport and tourism industries are connected to other business industries in a country indicates that the COVID-19 pandemic affected profitability in diverse ways. Tourism promotes other businesses in a country by injecting money into the economy. As a result, shutting down these sectors to prevent the spread of the virus led to financial crises in numerous sectors.

The COVID-19 pandemic led to a drastic change in modes of operation. The production and transportation sectors were the most affected. Firms had to formulate better strategies to cut costs and align themselves with the measures set by different authorities. For instance, most significant business enterprises opted for technological options to minimize physical contact. Most companies conducted their meetings through Zoom. Additionally, the majority of employees were required to work from home. Though these strategies ensured business continuity, they also came at a cost. Firms had to purchase the necessary equipment to facilitate this change. It was also their mandate to ensure all necessary resources were available. Due to the level of unpreparedness of most firms to handle such situations, they plowed down the little profit they acquired to remain relevant in the market during such unprecedented times. As a result, firms received fewer returns than expected, leading to strategies such as lowering employees' wages. The pandemic raised the cost of production in most firms, consequently lowering profits.

The COVID-19 pandemic, in most instances, impacted the profitability of firms directly. However, it also had an indirect impact. Generally, pandemics affect the global population. The most common consequence of the pandemic was that it led to unemployment. This repercussion meant that income in the economy was significantly minimized. As a result, consumer expenditure was also minimized. Consumers needed more income to make purchases, a situation that impacted sales in companies. With less income in the economy, the circulation of money was drastically reduced, leading to the closure of many business enterprises. The COVID-19 pandemic was the leading cause of a decline in business profitability between 2019 and 2022.

3.11. Relationship between Profitability and Capital Structure during Financial Crisis

The financial crisis in 2007/2008 arose due to the undercapitalization of the banking sector, untidy financial regulations, and poor risk management. Profitability is one factor affecting capital structure (Proenca et al., 2014). Profitability and capital structure can be related in light of the pecking order theory, which states that a company should prefer financing itself internally at first through retained earnings. However, if the internal capacity is lacking, it should consider financing itself through debt. If debt is also not possible, the last option a company can use is financing itself by issuing new equity (Caselli & Negri, 2021). This depicts a hierarchical order in financing the company where debt is not the first consideration but funding through what the company has generated, which is profit. In a crisis, the company considers using the available resources it has obtained through profit. However, profit can diminish during a crisis, impacting how it finances its operations (Proença et al., 2014). The choice of internal funding is due to the risks associated with external financing costs.

In line with the above studies, we hypothesized H4.

3.12. Financial Crisis and Asset Utilization

Asset utilization refers to how efficiently or effectively a company utilizes its assets to lower costs and generate revenue. This indicates the productivity of a firm gained from the use of assets. The measure of asset utilization is fixed asset inventory and inventory turnover as it depicts the measure of stock in relation to a flow (Filbeck & Gorman, 2000). Asset turnover shows how effective the company is in generating sales from its assets.

Lockdowns and movement restrictions were significant measures adopted to curtail the spread of the COVID-19 virus. This implied that many companies had to close down and stop operating. Such lockdowns and movement restrictions significantly curtailed normal economic activities, and as a result, businesses had to close, and some were driven to bankruptcy despite government support. During the financial crisis, small financial markets closed, reducing the liquidity of many asset classes (Demirguc-Kunt et al., 2015). This created market turmoil in which increased valuation uncertainty occurred, and the pressure on fund liquidity increased as investors sought to redeem or reallocate holdings. Besides, production and sales went down significantly as demand reduced. The underutilization of assets due to the company's stoppage of operations caused a reduction in asset turnover ratios. There were also disruptions in the supply chain as movement restrictions were imposed. Thus, as stated above, machines went without running, experiencing wear and tear. The supply of raw materials was affected, and companies stopped producing or produced less than usual.

The COVID-19 pandemic revealed the significance of online work, remote working, and selling products online. Thus, companies adjusted to fit into the new technological world to remain functional (Himanshu et al., 2021). However, shifting to the new e-commerce or online platform implies a shift of the business models, requiring a shift in the assets utilized by the company. The shift in business models leads to changes in asset composition. Some assets are

diverted as new ones are acquired to adapt to changing demands. The overall effect is altering asset utilization efficiency and patterns (Himanshu et al., 2021).

3.13. Relationship between Asset Utilization and Capital Structure during Financial Crisis

During a crisis, asset utilization positively impacts the return on equity and asset turnover. However, it negatively affects the value of a firm. Thus, when agency costs increase, the performance of a firm is significantly affected. The theory of free cash flow states that additional debt is beneficial as it reflects a firm's positive attitude toward enhancing the productivity of its assets (Filbeck & Gorman, 2000). However, during a crisis, the most probable reason a firm acquires additional debt is to shield itself from harsh economic conditions. In this context, additional debt becomes a burden that may not improve a firm's productivity (Ahmed, 2019). Consequently, more debt is a sensitive cause for concern. In the oil industry, the cost of goods, net sales, and inventory—measures of asset utilization—are statistically positively related to the leverage measure of debt price per share. Conversely, the mining industry does not exhibit a systematic relationship between asset utilization measures and leverage measures such as debt/price per share (Filbeck & Gorman, 2000). In an economic downturn, a highly leveraged firm may experience a severe recession, creating vulnerability. Such a severe recession compels a highly leveraged firm to increase its rate of resource utilization to avoid bankruptcy (Filbeck & Gorman, 2000).

The findings have indicated varying associations between leverage and asset usage. Feidakis and Rovolis (2007) conducted a study examining the determinants influencing the capital structure of European construction firms listed between 1996 and 2004. Their findings revealed a negative correlation between total debt and asset utilization in the context of long-term debt. In

simpler terms, as organizations become more efficient, they increasingly rely on equity rather than debt for financing.

One rationale for this correlation is that enhanced efficacy in utilizing fixed assets for commercial purposes augments a corporation's capacity to generate cash flow, thereby diminishing the necessity for external financing (Alipour et al., 2015).

Another body of research has documented a favorable correlation between leverage and the asset utilization ratio. Volugaris et al. (2007) conducted a study examining the factors influencing the capital structure of manufacturing enterprises in Greece. Two samples of large and small enterprises were utilized for this objective. The study's findings indicate a positive correlation between asset utilization and firm leverage in major corporations. However, no statistically significant association was observed between these variables in small organizations. This finding is consistent with the outcomes reported by Filbeck and Gorman (2000) and Alipour et al. (2015).

H5 hypothesized considering these studies.

3.14. Financial Crisis and Growth Opportunities

In periods characterized by favorable market and macroeconomic conditions, economic and company expansion is typically anticipated. Conversely, during times of crisis, growth forecasts diverge.

An expanding body of literature demonstrates that economic crises present favorable prospects for the entrepreneurial sector (Bartlett, 2008). This is particularly true for companies that can recognize market fluctuations and respond rapidly (Hodorogel, 2009). Therefore, even during an economic downturn in a declining sector, certain companies will experience tremendous growth while others undergo significant decline (Kitching et al., 2009). The industry in which a company operates significantly influences both the rate of growth (Davidsson et al. 2002) and the

ability to withstand economic downturns (Burger et al., 2014). The performance of firms during recessions does not uniformly correspond to each sector. Even in industries severely affected by recession, certain enterprises outperform others (Kitching et al., 2009). According to Fort (2013), young and small firms across many industries are susceptible to the adverse effects of local economic downturns. The decline in industrial performance metrics subsequent to the crisis exhibited unevenness across several industries.

According to Moore and Mirzaei (2014), the crisis has primarily affected businesses that heavily depend on external financing, particularly small and young firms (Siemer, 2014).

Pandemics create a financial crisis with profound consequences (Xiang et al., 2021). COVID-19 brought not only negative aspects but also positive implications. While some organizations regressed in terms of growth, COVID-19 presented growth opportunities for others. Therefore, the impact of COVID-19 had varied influences on growth opportunities. A pandemic such as COVID-19 induces financial pressures on various sources of development finance. The most affected are low and middle-income countries that struggle to finance their highly demanding, significantly impacted, and struggling public health sectors as they respond to the pandemic (Xiang et al., 2021). The public health challenge induces financial pressures on social and economic areas. Countries and their companies suffer from massive debts and equity outflows as they struggle to operate amid low or no returns (OECD, 2020).

The influence of the economic crisis on business growth continues to be a subject of significant debate in both theoretical and empirical literature.

3.15. Relationship between Growth Opportunities and Capital Structure during Financial Crisis

According to Trade-off Theory, the level of leverage is affected by the growth rate. Companies with a high growth rate typically finance their investments by issuing shares, as the

share price is relatively high. Another factor to consider is that high-growth enterprises often incur substantial financial burdens due to their heightened susceptibility to insolvency. The growth rate exhibits a negative correlation with the level of leverage. On the contrary, as posited by the Pecking Order Theory, there exists a positive correlation between the growth rate and the amount of leverage. This is attributed to the fact that the current level of investment remains insufficient, resulting in a temporary state of low leverage.

Growth and leverage are negatively related since growing firms have greater flexibility in choosing their future investments. They prefer internal financing over external funds to avoid asymmetric costs (Mazumder & Rao, 2022). Large firms are associated with lower risk levels, making creditors more willing to finance them for guaranteed returns. Smaller firms have higher risk levels and thus find it challenging to obtain additional debts from external financiers, limiting their growth potential. As posited by Leeuwen (2011), growth opportunities are negatively related to the capital structure during a crisis. Debt ratio and dividend yield have a significant negative correlation with growth opportunities. This affirms the theory that leverage and growth opportunities are positively related (Tsoy & Heshmati, 2017).

During a crisis, growth favors firms that are less distressed, more innovative, and generate more profit since they use long-term debt in the capital structure (Mazumder & Rao, 2022). A firm with a debt-heavy capital structure pays high interest yearly, reducing its net profit. Such a capital structure influences the cost of capital and consequently the financial performance of a firm. Once financial performance is affected, growth is affected too. Growth opportunities are limited during a financial crisis (Leeuwen, 2011). Due to this, firms will be less concerned with growth opportunities and more focused on sustaining what they currently have.

Growth is typically hindered during a crisis due to market contraction and turmoil. According to Ross (1977), a company undergoing expansion has the potential to convey a

favorable signal to lenders, facilitating their acquisition of debt. Conversely, Myers (1977) suggests that such a firm may engage in unwarranted risk-taking, leading to a negative assessment by creditors. An expanding company may find it necessary to seek external funding to coordinate its growth strategy, whereas smaller enterprises tend to rely solely on retained earnings. There is considerable debate surrounding the existing research on the capital structure of small and medium-sized enterprises (SMEs) during times of crisis. Proença et al. (2014) have reported a positive correlation between growth and all three debt ratios. Balios et al. (2016) have indicated a positive relationship between growth and total debt. On the other hand, Muijs (2015) has found a non-significant relationship between growth and long-term debt, while Hoang et al. have reported a significant positive relationship with short-term debt. This finding is consistent with prior research conducted by Hall et al. (2000).

It is anticipated that a company's growth prospects will exert a detrimental impact on its leverage. This assertion is supported by empirical evidence and the consideration of agency costs associated with debt. According to Myers (1977), companies with a greater number of investment alternatives are more inclined to decline investments if they have a higher level of leverage.

Considering these arguments, H6 has been formulated.

The literature expounds on the effect of financial crises on capital structure. For example, the capital structure changes resulting from the 2008 global financial crisis were monumental. The tightening of funds made it hard for companies to secure additional financing, compelling many to alter their debt, borrow again, or reorganize capital, given that they were prepared for the worst if the economy turned (Mimouni et al., 2017).

COVID-19 can be regarded as a unique and unprecedented case that influenced firms' capital structures worldwide. Some early works established that firms had to operate under increased and deep-seated market volatilities and risks affecting their financiers (Mouton et al.,

2023). Compared to prior crises, the COVID-19 lockdown measures reduced the mobility of several firms, and travel restrictions severely affected many companies' revenues while interrupting several supply chains.

This research study aims to fill this research niche by analyzing the effects of COVID-19 on the capital structure of firms operating in Saudi Arabia. Through this context, the research will endeavor to establish how the pandemic has impacted the capital structures of Saudi firms, considering factors like asset tangibility, profitability, and industry type. Therefore, this analysis helps explain the pandemic's effect on various sectors and develop possible financial scenarios for companies facing similar conditions in the future.

The literature review contributes to the research questions by defining variables and theoretical frameworks vital for studying the pandemic's effects. For example, understanding how specific characteristics of assets, including tangibility and profitability, affect firms' flexibility to adjust their capital structures during a crisis can aid in assessing the overall effect of COVID-19. Additionally, understanding sectoral differences helps identify how different sectors manage their finances and adapt their capital structures.

4. Chapter Four: Research Design and Method

4.1. Overview

Considering the study's nature, the research incorporates the Positivism philosophy. The methodological choice is quantitative, using the deductive approach.

Positivist Philosophy: A principle of positivist epistemology is that knowledge is generated through experience, acquired through perception and rational processes that are scientific. This philosophy is suitable for research designed to uncover truths and find patterns because it aims to identify existent patterns of real-life events. Therefore, the positivism that this research hinges on embraces the viewpoint that reality is quantitative. This worldview explains the rationale behind conducting crucial, quantitative procedures to make the results reasonable and replicable (Younas et al., 2022).

Quantitative Approach: Quantitative research involves measurements and the gathering of numerical data to study patterns, relationships, statistical outcomes, and results. This method is beneficial when research variables must be measured to compare outcomes; it can be used to test hypotheses derived from theoretical frameworks. The quantitative approach is relevant because it allows for making assumptions regarding the entire population based on a sample set. Therefore, this approach enhances the reliability and validity of the discovered trends by controlling researcher bias and providing a roadmap for measuring the extent of various variables and their correlations (Alistair et al., 2020).

Deductive Approach: This approach applies theory or hypothesis as accurate, and other data must prove or reject this hypothesis. It is practical because it enables the organization of the research process to support theories and hypotheses, adding relevance to the study. This liberalization allows the researchers to formulate a concrete hypothesis from the existing theories, after which the researcher has to conduct experimental or survey research to test the hypothesis

(Casula et al., 2020). Thus, there are some restrictions on the use of the deductive approach. It can be too structured, overlooking something the NULL hypotheses did not include. Secondly, it is highly dependent on the previous existence of the theory/framework; in other words, it does not look for emergence-new phenomena as actively

4.2. Population and Study Sample

The population of the study consists of firms listed in Saudi Arabia. Data of sample firms were taken for the period from Q1-2017 to Q2-2023. Firms were selected from different non-financial sectors.

The decision to focus on non-financial sectors while excluding the financial sector from this study is grounded in several important considerations:

Distinct regulatory environment: Financial institutions undergo legal requirements, bringing legal aspects that impact the corporate governance system. In this respect, a few crucial factors establish that the financial sector is in quite a different and separate environment; therefore, any comparison with other sectors or industries may generate incorrect results.

Specialized accounting practices: The sector uses different accounting techniques and practices from those used in other sectors. Such differences may be problematic when comparing industries and may even introduce bias and alter the results.

Risk profile and capital structure: Two features can be delineated: first, firms in the financial sector reveal higher leverage ratios than non-financial firms; second, the risk profiles differ significantly.

Homogeneity in non-financial sectors: Because the study shall be carried out on non-financial sectors, it shall have a better-matched sample, which in return shall yield more generalizable results across different economic sectors.

Previous literature support: Similarly, many other empirical studies on capital structure have also intentionally excluded financial firms due to concerns about the comparability of results (For instance, Yermack, 1996; Core et al., 1999). This approach is beneficial as it correlates well with the subsequent interaction of works under consideration with previous literature and comparisons to the aforementioned works.

Table 1

Data Collection Process and the Population by Sector

Population		Number of Firms	
Listed firms		290	
Excluding financial Sector		45	
Excluding missing data		115	
GICS Sector Name	**Freq.**	**Firms**	**Percent**
Communication Services	156	6	4.70
Consumer Discretionary	549	22	16.56
Consumer Staples	414	16	12.48
Energy	104	4	3.14
Health Care	208	8	6.27
Industrials	500	20	15.08
Materials	1087	42	32.78
Real Estate	246	10	7.42
Utilities	52	2	1.57
Total	**3316**	**130**	**100.00**

4.3. Collection of Data

Secondary data were collected for this research from the financial statements of listed companies in Saudi Arabia from their publicly available quarterly reports, which are available on listed companies' websites, capital market authorities, or economic platforms such as Investing.com and Argaam.

The study was conducted on nine non-financial sectors. The firms are classified under sectors as per the Global Industry Classification Standard (GICS).

4.4. Research Variables

Introduction: The use and need for leverage ratios must be balanced in ascertaining a firm's capital structure and its use of debt. These ratios show the extent of financing of a firm's assets by borrowed funds and capture the specific risk of a firm's capital structure. Leverage is essential in analyzing a firm's strength, stability, and risks for stakeholders, thereby providing a means of measuring it. High leverage ratios are likely to indicate higher financial risk and sometimes even problems with paying debts, while low Leverage ratios suggest that firms are more conservative in financing.

Leverage ratios, including the total debt ratio, long-term debt ratio, and short-term debt ratio, are popular among financial scholars. Nursetya et al. (2021) highlight that these ratios are useful indicators of a firm's economic status and risk profile and are informative to investors or analysts. They find that leverage ratios are determined by firm-specific characteristics, such as size and profitability, as well as market conditions. Their study concluded that companies with higher leverage may opt for higher risk-growth strategies, while companies with lower leverage may prefer a sustainable financial position and a less risky approach. Therefore, these studies show the relevance of leverage ratios in examining and predicting a firm’s capital structure policy.

Variables:

- Total debt to assets ratio (level of measurement is continuous): Measured by dividing the total debt by total assets (TD_TA = Total debt / total assets).

  The total debt to assets ratio provides a clear overall picture of the firm's leverage status. It determines the extent to which the total amount of debt has been used to fund the firm's overall assets. This variable helps understand the risk and stability of the firm's financial situation. Larger amounts of cash and relatively more current assets than current liabilities point to high values, while low numbers suggest conservative operations.

Literature indicates that firms with higher total debt could be in a worse financial risk position, likely affecting their capital structure (Akram et al., 2021).

- Long-term debt to asset ratio (level of measurement is continuous): Measured by dividing the long-term debt by the total assets (LTD_TA = Long-term debt / total assets).

  The long-term debt-to-asset ratio is unique to long-term debts, usually employed to finance significant capital assets. This ratio helps evaluate the firm's long-term commitments against its underlying assets. It is highly pertinent because long-term debt alters a firm's capital structure uniquely, as short-term debt does not, and it has implications for its overall financial position and investment opportunities (Indrati et al., 2023). It helps compare risks on some liabilities over others.

- Short-term debt to asset ratio (level of measurement is continuous): Measured by dividing short-term debt by total assets. (STD_TA = Short-term debt / total assets).

  The Short-term Debt to Assets Ratio indicates the extent to which a firm funds its asset base through short-term financing. Current obligations are typically for operations and worth tracking, or they can signal potential liquidity issues. This ratio is important because it shows the measure of short-term debts and the extent to which funds are used to meet short-term operations without affecting long-term investments (Kraus & Litzenberger, 1973). Examining current and near-term obligations is crucial for understanding a firm's financial position and operational efficiency.

- COVID-19 (level of measurement is categorical): Measured as a dummy variable represented by 1 during the period when there was COVID and 0 in the period when there was no COVID.

- Firm Size (level of measurement is continuous): Measured by the logarithm of total assets. (Size = Ln Total Assets).

This variable is calculated as the size of the firm = Logarithm of Total Assets. It measures the size of the firm. It is preferable to apply the logarithm of total assets since it provides a broader view of the firm's economic position. Other scholars, such as Sari et al. (2023), have used logarithmic transformation to flatten the data in their continued search for unrevised data on the relationship between firm size on capital structure.

- Tangibility (level of measurement is continuous): Measured by dividing fixed assets to total assets and included as a control variable. (Tang = Fixed asset / total assets).

  Tangibility refers to the level of a firm's engagement in procuring fixed assets. It can be explained as the extent of fixed assets a firm has that it may use as securities, acknowledged on the balance sheet. This variable is instrumental in identifying debt financing and the firm's productivity in asset-backed funding. This is true because fixed assets participate in generating revenues through manufacturing goods and services. If the fixed assets are sold or disposed of, the firm may not be capable of delivering goods and services to meet its debt obligations, thus affecting its credit status (Titman, 1988). Hence, to diversify and mitigate biases resulting from asset-based financing, the numerical ratings for the organization's level of tangibility should be part of the control variables.

- Profitability (level of measurement is continuous): Measured by dividing net income by total assets and it is included as a control variable. (ROA = Net income / total assets).

  High profitability can positively impact mechanical risk by influencing the probability of firms meeting their obligations. Although profitability influences capital structure decisions, it still needs to be investigated. Thus, its inclusion helps establish the relationship between financial performance and appropriate leverage ratios (Lestari & Sintha, 2022).

- Asset Utilization (Efficiency) (level of measurement is continuous): Measured by dividing sales by total assets and it is included as a control variable. (Turn = Sales / total assets).

  Asset turnover indicates how much sales the firm generates from its available assets when used as a productivity formula. This variable is essential for a thesis related to the further development of procedural efficiency factors and their roles in capital composition. There is a relationship between asset management, the firm's capacity for managing debts, and its current financial health. Consequently, a second control variable, fixed assets turnover, has been incorporated into the study because operational efficiency may play a role in determining capital structure choices based on turnover differences (Lesari & Sintha, 2022).

- Growth Opportunity (level of measurement is continuous): Measured by the Compound Annual Growth Rate (CAGR = (Investment Ending balance / Investment beginning balance) $^{1/n} - 1$).

  The Compound Annual Growth Rate indicates investment growth, the firm's future prospects, and the degree of earnings. This variable assists in determining how growth expectations affect capital structure. While firms with high growth opportunities may require different funding sources than low or negative-growth firms (Urbano et al., 2019), adopting CAGR as a control variable helps determine the relationship between a firm's growth potential and its capital structure choices more effectively.

4.5. Data Analysis Strategies and Techniques

The comparison focused on the statistical significance of the variables in determining the capital structure, the sign of the relationship between the dependent variable and each independent variable, and the change in the value of the coefficients from the pre-COVID-19 period to the

during-COVID-19 period. STATA 17 was used to conduct all the statistical analyses necessary to examine the research objectives and hypotheses.

The statistical analysis began with data preprocessing, followed by descriptive statistics, diagnostic statistics where the Shapiro–Francia test to test normality, the Fisher test was used to test stationarity, the Kao Test was used to test cointegration, and Pearson's correlation test. The final step in the statistical analysis was hypothesis testing, where goodness-of-fit tests were conducted to confirm that the statistical techniques applied in the study best fit the sample data. These tests included multicollinearity, heteroskedasticity, omitted variables, and autocorrelation.

Generalized least squares (GLS) was used to test the final fitted model of the impact of COVID-19 on capital structure.

4.6. Research Models

To study the dynamics of capital structures of firms since COVID-19, this study estimates a simple empirical model connecting the capital structure of firms to time-invariant unobserved characteristics, observable characteristics, and time dummies to capture the impact of the COVID-19 period and its outcome.

The theoretical model used in this work aims to evaluate the impact of COVID-19 on the capital structure of Saudi-listed companies. It is purely mathematical in its setting, adhering to the positivist research philosophy combined with the deduction method and data gathered from secondary sources in the quarterly reports of KSA-listed non-financial firms in nine sectors.

The model equation is as follows:

$$X_{i,t} = \beta_0 \beta_1 Covid_{i,t} + \beta_2 Size_{i,t} + \beta_3 ROA_{i,t} + \beta_4 Tang_{i,t} + \beta_5 Turn_{i,t} + \beta_6 Gro\_Opp_{i,t} + \varepsilon_{i,t}$$

Where $X_{i,t}$ is a dependent variable (i. e. , LTD_TA, STD_TA , TD_TA) for the firm i during the year t.

Firm-level control variables discussed previously (i.e., size, profitability, tangibility, asset utilization, and growth opportunity). COVID is a dummy indicator for the year when COVID spread worldwide.

Expected Interactions: COVID-19 significantly affects the dependent variables, given that it is an external factor influencing all firms.

Size, Tangibility, and Profitability: These control variables eliminate the effect of other variables that influence capital structure decisions. Larger firms might have more stable capital structure provisions, high tangibility implies a firm's better collateral position for loans, and higher profitability necessitates lesser amounts of external borrowing.

Asset Utilization and Growth Opportunity: These variables assist in holding operation-related efficiency and growth prospects that would affect firms' capital structure.

5. Chapter Five: Results and Discussion

5.1. Introduction

This section tests the validity of the formulated hypotheses and models concerning the impact of COVID-19 on capital structure, as measured by interest-bearing debt. It presents data preprocessing, descriptive statistics, diagnostic statistics, and hypothesis testing. Moreover, STATA 17 is used to conduct all the statistical analyses necessary to examine the research objectives and hypotheses.

5.2. Data preprocessing

This part shows the statistical treatment of missing values. It illustrates the process of identifying and handling extreme values without impacting the fundamental statistical characteristics of the data. It also presents the reasons why some variables are transformed from their original levels and the applied transformation methods. Finally, it determines highly correlated independent variables and addresses them, if any.

5.2.1. *Missing value*

The final data used in the analysis is obtained using the following two criteria:

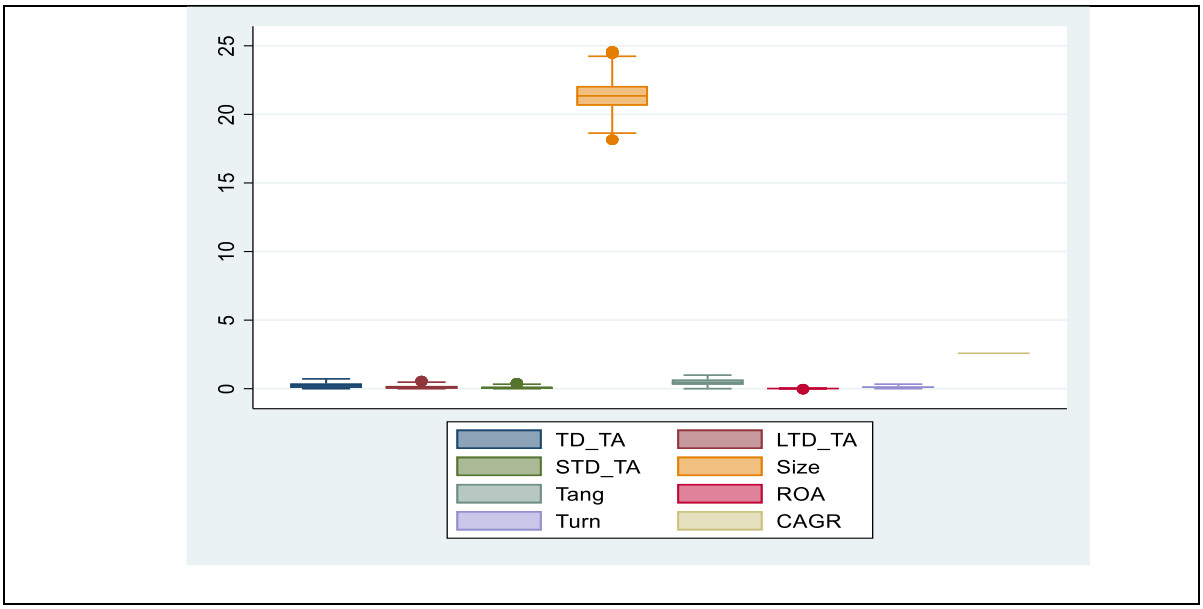
- Excluding any firm with missing values representing more than 10% of the total observations for any variable.
- The average of non-missing observations for any single variable can replace the missing values for each specific Firm only if a particular Firm has missing values representing less than 10% of the total observations for any variable.

5.2.2. *Outliers*

Aggarwal (2015) defined outliers as observations with values extending further than 1.5*IQR from the third quartile or 1.5*IQR below the first quartile. Figure 1 shows the absence of extreme values after winsorization.

Figure 1

The Box-Plot Figures for the Study Variables after Winsorization



5.2.3. *Transformation Methods*

All the variables employed to examine the impact of COVID-19 on capital structure of Saudi Arabia-listed firms are used at its original levels.

5.2.4. *Highly correlated independent variables*

The correlation coefficients in the Pearson correlation matrix are used to detect the expected multicollinearity between any two independent variables used to examine the impact of COVID-19 on capital structure of Saudi Arabia-listed firms. Anh et al. (2018) states that multicollinearity exists if the Pearson correlation coefficient is > 70% between independent variables. Hence, no multicollinearity was detected between independent variables (as shown in Table 12).

5.3. Descriptive Statistics

The significance of descriptive statistics arises from their simplicity in presenting the fundamental characteristics of numerous observations. The selection of statistical techniques for data analysis depends on the inherent properties of the data included in the study sample. The main statistical features of all continuous variables used to investigate the impact of COVID-19 on the capital structure of Saudi Arabia-listed firms are shown in Table 2.

Table 2

Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
TD_TA	overall	0.252	0.191	0.000	0.875	N = 3316
	between		0.172	0.000	0.672	n = 130
	within		0.084	-0.246	0.762	T-bar = 25.5077
LTD_TA	overall	0.140	0.145	0.000	0.558	N = 3316
	between		0.126	0.000	0.487	n = 130
	within		0.073	-0.199	0.542	T-bar = 25.5077
STD_TA	overall	0.107	0.112	0.000	0.387	N = 3316
	between		0.099	0.000	0.387	n = 130
	within		0.054	-0.229	0.403	T-bar = 25.5077
Size	overall	21.495	1.477	18.153	24.584	N = 3316
	between		1.473	18.352	24.584	n = 130
	within		0.198	20.635	22.546	T-bar = 25.5077
Tang	overall	0.461	0.242	0.000	0.992	N = 3316
	between		0.226	0.000	0.894	n = 130
	within		0.088	-0.320	1.003	T-bar = 25.5077
ROA	overall	0.008	0.019	-0.034	0.051	N = 3316
	between		0.013	-0.028	0.050	n = 130
	within		0.014	-0.060	0.073	T-bar = 25.5077
Turn	overall	0.122	0.087	-0.001	0.331	N = 3316
	between		0.081	0.000	0.331	n = 130
	within		0.035	-0.071	0.432	T-bar = 25.5077
CAGR	overall	0.374	1.256	-2.402	2.583	N = 3316
	between		0.340	-0.237	2.546	n = 130
	within		1.215	-3.230	3.193	T-bar = 25.5077

- n: Number of firms; N: is the number of observations, which should be 26 quarters × 130 = 3380 observations for each variable. However, N = 3116 in this analysis due to the statistical treatment for missing values, outliers, and transformation.
- Regarding measures of the capital structure of Saudi Arabia-listed firms, Table 2 presents the basic characteristics of the main dependent variables included in the study. Capital structure is measured by the total debt ratio, long-term debt ratio, and short-term debt ratio. The total debt ratio (TD_TA) shows an overall mean of 0.252, indicating that firms finance their long-term investment opportunities primarily through equity, with high dispersion around the mean (overall and between) of 0.191 and 0.172, respectively, reflecting high heterogeneity in the capital structure of Saudi Arabia-listed firms. In contrast, each firm has a low dispersion around the mean (within) of 0.084, reflecting high homogeneity in the total debt ratio for each firm during the research period. The long-term debt ratio (LTD_TA) shows an overall mean of 0.140, indicating that the total debt ratio is driven by the long-term debt of Saudi Arabia-listed firms, with a high dispersion around the mean (overall and between) of 0.145 and 0.126, respectively, reflecting high heterogeneity in the long-term debt of Saudi Arabia-listed firms.
- Moreover, each firm has a low dispersion around the mean (within) of 0.073, reflecting moderate homogeneity in the long-term debt ratio for each firm during the research period. Finally, the short-term debt ratio (STD_TA) shows an overall mean of 0.107, with a high dispersion around the mean (overall and between) of 0.112 and 0.099, respectively, reflecting high heterogeneity in the short-term debt of Saudi Arabia-listed firms. Additionally, each firm has a low dispersion around the mean (within) of 0.054, reflecting moderate homogeneity in the short-term debt ratio for each firm during the research period.

Two-Sample T-Test with Equal Variances

This test can be performed for one sample against a hypothesized population mean. Two-sample tests can be conducted for paired and unpaired data. The assumption of equal variances can be optionally relaxed in the unpaired two-sample case.

The two-sample t-test with equal variances is conducted to detect significant differences between pre-COVID-19 and post-COVID-19 periods, as shown in Table 3.

Table 3

Two-Sample T-Test with Equal Variances

	Pre-Covid19 Obs	Post-Covid19 Obs	Pre-Covid19	Post-Covid19	dif	p value
TD TA	1518	1798	0.242	.261	-.018	.007
LTD TA	1518	1798	0.134	.144	-.01	.042
STD TA	1518	1798	0.103	.11	-.006	.117

Firms have a total debt and long-term debt ratio mean of 0.242 and 0.134, respectively, before the COVID-19 pandemic and a mean of 0.261 and 0.144 during the COVID-19 pandemic. Moreover, the t-test for two samples assuming equal variances indicates that the means of total debt and long-term debt of Saudi Arabia-listed firms are significantly different during pre-COVID-19 and post-COVID-19 periods at 1% and 5% significance levels, respectively. In contrast, the short-term debt ratio shows insignificant differences between pre- and post-COVID-19 periods for Saudi Arabia-listed firms.

Descriptive Statistics for the Capital Structure of Different GICS Sectors

Regarding measures of the capital structure of Saudi Arabia-listed firms across different GICS Sectors, Table 4 presents the basic characteristics of the dependent variables for each GICS sector included in the study.

Table 4

Descriptive Statistics for the Capital Structure of Different GICS sectors

	N	Mean	SD	Min	Max
GICS Sector Name: Communication Services					
TD TA	156	.236	0.125	.01	.452
LTD TA	156	.158	0.107	0	.414
STD TA	156	.078	0.074	0	.372
GICS Sector Name: Consumer Discretionary					
TD TA	549	.305	0.218	0	.815
LTD TA	549	.181	0.174	0	.558
STD TA	549	.115	0.103	0	.387
GICS Sector Name: Consumer Staples					
TD TA	414	.215	0.184	0	.875
LTD TA	414	.113	0.123	0	.558
STD TA	414	.096	0.098	0	.387
GICS Sector Name: Energy					
TD TA	104	.408	0.260	0	.777
LTD TA	104	.304	0.211	0	.558
STD TA	104	.099	0.092	0	.306
GICS Sector Name: Health Care					
TD TA	208	.244	0.121	.013	.498
LTD TA	208	.148	0.089	0	.38
STD TA	208	.096	0.090	.003	.369
GICS Sector Name: Industrials					
TD TA	500	.259	0.157	0	.626
LTD TA	500	.093	0.100	0	.503
STD TA	500	.16	0.121	0	.387
GICS Sector Name: Materials					
TD TA	1087	.234	0.192	0	.763
LTD TA	1087	.127	0.140	0	.558
STD TA	1087	.1	0.123	0	.387
GICS Sector Name: Real Estate					
TD TA	246	.232	0.197	0	.6
LTD TA	246	.159	0.160	0	.536
STD TA	246	.072	0.102	0	.387
GICS Sector Name: Utility					
TD TA	52	.157	0.138	0	.347
LTD TA	52	.132	0.119	0	.299
STD TA	52	.026	0.022	0	.064

Table 4 presents the basic characteristics of the dependent variables included in the study across different sectors. All sectors have high dispersion around the mean (overall, between, and within), reflecting high heterogeneity in the capital structure of Saudi Arabia-listed firms between firms for each sector. The energy sector has the largest leverage ratio, measured by the total debt

ratio of 40.8% and long-term debt ratio of 30.4%. In contrast, the industrial sector has the largest leverage ratio as measured by the short-term debt ratio. Conversely, the utility sector has the lowest leverage ratio measured by total and short-term interest-bearing debt. In contrast, the industrial sector has the lowest leverage ratio as measured by the long-term debt ratio. Equity sources of capital drive all sectors to finance investment opportunities.

Regarding determinants of capital structure of the Saudi Arabia-listed firms, Table 2 presents the basic characteristics of the independent variables included in the study:

- The firm size (Size) score shows an overall mean of 21.495, with low dispersion around the mean (overall, between, and within) of 1.477, 1.473, and 0.198, respectively, reflecting high homogeneity in the firm size of Saudi Arabia-listed firms.
- Tangibility, as a measure of asset structure (Tang), has an overall mean of 0.461, with a high dispersion around the mean (overall and between) of 0.242 and 0.226, respectively, reflecting high heterogeneity in the asset structure of Saudi Arabia-listed firms. In contrast, each firm has a low dispersion around the mean (within) of 0.088, reflecting high homogeneity in the asset structure for each firm during the research period.
- Profitability, as measured by the annual compound growth rate of investment on assets (ROA), shows an overall mean of 0.008, indicating that firm assets generate low profitability. With a high dispersion around the mean (overall, between, and within) of 0.019, 0.013, and 0.014, respectively, reflecting high heterogeneity in the profitability of
- Firm efficiency, as measured by the total assets' turnover (Turn), shows an overall mean of (0.122), with a high dispersion around the mean (overall and between) (0.087 and 0.081) respectively, reflecting high heterogeneity in the firm efficiency of Saudi Arabia listed firms. In contrast, each firm has a low dispersion around the mean (within) 0.035, reflecting high homogeneity in firm efficiency for each firm during the research period.

- Growth opportunities, as measured by the compound annual growth rate of capital investments (CAGR), show an overall mean of 0.374, with a high dispersion around the mean (overall, between, and within) (1.256, 0.340, and 1.215), reflecting significant heterogeneity in the growth opportunities of Saudi Arabia listed firms.

The frequencies of discrete variables (COVID-19) used to test the impact of COVID-19 on capital structure decisions are shown in Table 5.

Table 5

Tabulation of COVID-19 Variables

	Freq.	Percent	Cum.
0	1518	45.78	45.78
1	1798	54.22	100.00
Total	**3316**	**100.00**	

Table 5 reports that 54.22% of the firm-quarter observations occurred during the COVID-19 pandemic (2020Q1: 2023Q2). Moreover, 45.78% of the firm-quarter observations occurred before the COVID-19 pandemic (2017Q1: 2019Q4).

5.4. Normality test

The Shapiro-Francia normality test examines the normal distribution of the dependent variables of capital structure measures: total debt ratio, long-term debt ratio, and short-term debt ratio. The null hypothesis that the data follow a normal distribution, while the alternative hypothesis states that the data are not normally distributed. The null hypothesis is accepted when the *p*-value is > 5%. However, the alternative hypothesis is accepted when the *p*-value is < 5%.

Table 6

Shapiro–Francia W' Test for Normal Data

Variable	Obs.	W	V	Z	Prob>z
TD_TA	3,316	0.964	68.435	10.942	0.000
LTD_TA	3,316	0.894	198.996	13.706	0.000
STD_TA	3,316	0.862	258.417	14.382	0.000

Table 6 shows that the null hypothesis of normally distributed data is rejected because the *p*-values are < 5% for all dependent variables. Therefore, the alternative hypothesis is supported for all variables.

Parametric procedures can still be used whenever the sample size is large, n > 30 (n = 130 and N = 3316) (Elliott & Woodward, 2007; Vrbin, Colleen M, 2022).

5.5. Stationarity test

The stationarity test examines the time series of each variable used in testing the impact of COVID-19 on capital structure of Saudi Arabia-listed firms. A variable has a stationary time series if its statistical features, such as mean and variance, remain constant over time. Thus, the time series of stationary variables demonstrates a tendency to return to their mean value. The impact of shocks diminishes progressively when the time trend returns to its mean and variance. Conversely, a variable is considered to have a non-stationary time series when its statistical features exhibit time variation or change over time. Therefore, the series exhibits a unit root. Consequently, the outcomes of models that contain non-stationary variables cannot be generalized to future time periods.

A Fisher-type unit-root test is performed to determine whether the time series of each variable in unbalanced panel data is stationary or exhibits a unit root. The null hypothesis asserts that the series possesses a unit root. In contrast, the alternative hypothesis posits that the series exhibits stationarity. The null hypothesis is deemed valid when the *p*-value exceeds 5%. However, the alternative hypothesis is deemed valid when the *p*-value is below 5%.

Table 7

Fisher-type Unit-root Test

Variables	P-Value
TD TA	0.0017***
LTD TA	0.0006***
STD TA	0.0000***
Size	0.9501
Tang	0.0000***
ROA	0.0000***
Turn	0.0000***
CAGR	0.0000***

Table 7 shows that firm size has a unit root at their original levels because their corresponding *p*-values are > 5%. However, the remaining variables have a stationary time series at their original levels because their corresponding *p*-values are < 5%. Nonetheless, the stationarity of the non-stationary variables can be obtained by taking their first difference.

Table 8

Fisher-type unit-root test after transformation of non-stationary variables

Variables	P-Value
D.Size	0.0000***

Concerning firm size, the first differencing transformation is taken. Hence, the stationarity of the time series of all dimensions of firm size after taking the first differencing transformation, as shown in Table 8, the *p*-values reveal that there is no unit root, and all the study variables are stationary.

5.6. Cointegration test

The cointegration test extends the stationarity test as the cointegration test examines the stationarity among more than one series. Therefore, the cointegration test evaluates the stationarity of the time series of several variables in a specific model. However, each single time series of these variables has proven stationary using the unit root test. However, the unit root test does not assess

the long-run stochastic trends among many time series. Therefore, the cointegration test is used to examine the existence of an equilibrium phenomenon, that is, a constant long-run structural association among a set of variables.

Table 9

Kao Test for Cointegration

Model	P-value
TD_TA	0.0020***
LTD_TA	0.0000***
STD_TA	0.0000***

Table 9 shows that there is cointegration among all variables embedded in the capital structure models, based on the results of the Unadjusted Modified Dickey-Fuller and the Unadjusted Dickey-Fuller tests, because the p-values are less than 5%. Therefore, the alternative hypothesis is accepted, which states that the variables are cointegrated among all panels.

5.7. Pearson's Correlation Test

Pearson's correlation coefficient shows the direction and strength of the linear association between any two variables included in the current research. Moreover, Pearson's correlation coefficients are used to detect possible multicollinearity between any two independent variables included in the same regression model. Table 10 shows Pearson's correlation coefficients for all the study variables.

Table 10

Pearson's Correlation Coefficients for all the Study Variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) TD_TA	1.000								
(2) LTD_TA	0.740***	1.000							
	(0.000)								
(3) STD_TA	0.652***	-0.006	1.000						
	(0.000)	(0.718)							
(4) Covid19	0.047***	0.035**	0.027	1.000					
	(0.006)	(0.042)	(0.117)						
(5) Size	0.265***	0.408***	-0.060***	0.021	1.000				
	(0.000)	(0.000)	(0.001)	(0.216)					
(6) Tang	0.227***	0.420***	-0.140***	-0.019	0.180***	1.000			
	(0.000)	(0.000)	(0.000)	(0.285)	(0.000)				
(7) ROA	-0.258***	-0.134***	-0.229***	-0.002	0.135***	0.024	1.000		
	(0.000)	(0.000)	(0.000)	(0.912)	(0.000)	(0.159)			
(8) Turn	0.119***	-0.045***	0.253***	-0.018	-0.181***	-0.141***	0.344***	1.000	
	(0.000)	(0.009)	(0.000)	(0.301)	(0.000)	(0.000)	(0.000)		
(9) CAGR	-0.048***	-0.048***	-0.026	-0.076***	-0.100***	-0.019	0.042**	-0.001	1.000
	(0.006)	(0.006)	(0.137)	(0.000)	(0.000)	(0.267)	(0.016)	(0.960)	

**** p<0.01, ** p<0.05, * p<0.1*

From Table 10, the following can be concluded:

Total debt ratio model:

- There is a significant positive direct association between the COVID-19 pandemic on capital structure, as measured by the total debt ratio (r = 0.047, p-value = 0.006), meaning that firms increased their total debt ratio to finance their investment opportunities during the COVID-19 pandemic for Saudi Arabia-listed firms.
- There is a significant positive significant direct association between firm size on capital structure, as measured by the total debt ratio (r = 0.265, p-value = 0.000), meaning that larger firms have a greater ability to finance their investments through total debt for Saudi Arabia-listed firms.
- There is a significant positive significant direct association between asset structure as measured by tangibility, and capital structure, as measured by the total debt ratio (r = 0.227, p-value = 0.000), meaning that more efficient firms with a higher percentage of tangible assets had a greater ability to finance their investments through total debt ratio for Saudi Arabia-listed firms.
- There is a significant negative direct association between profitability, as measured by return on assets, and capital structure, as measured by the total debt ratio (r = -0.258, p-value =

0.000), meaning that higher profitability leads firms to finance their investments from internal sources for Saudi Arabia-listed firms.

- There is a significant positive significant direct association between firm efficiency, as measured by asset turnover and capital structure, as measured by the total debt ratio (r = 0.119, p-value = 0.000), meaning that firms with higher efficiency have a greater ability to finance their investments through total debt ratio for Saudi Arabia-listed firms.
- There is a significant negative significant direct association between investment opportunities, as measured by the compound annual growth rate of investments, and capital structure, as measured by the total debt ratio (r = -0.048, p-value = 0.006). This indicates that a higher growth rate of investment leads firms to finance their investments from internal sources of finance for Saudi Arabia-listed firms.

Long-term debt ratio model:

- There is a significant positive significant direct association between the COVID-19 pandemic on capital structure, as measured by the long-term debt ratio (*r* = 0.035, *p*-value = 0.042), meaning that firms increased their long-term debt to finance their investment opportunities during the COVID-19 pandemic for Saudi Arabia-listed firms.
- There is a significant positive significant direct association between firm size and capital structure, as measured by the long-term debt ratio (*r* = 0.408, *p*-value = 0.000), meaning that larger firms have a greater ability to finance their investments through long-term debt for Saudi Arabia-listed firms.
- There is a significant positive significant direct association between asset structure, as measured by tangibility, on capital structure, as measured by the long-term debt ratio (*r* = 0.420, *p*-value = 0.000), meaning that firms with a higher percentage of tangible assets have

a greater ability to finance their investments with long-term debt for Saudi Arabia-listed firms.

- There is a significant negative significant direct association between profitability as measured by return on assets, on capital structure, as measured by the long-term debt ratio (r = -0.134, p-value = 0.000). This implies that higher profitability leads firms to finance their investments from internal sources of finance for Saudi Arabia-listed firms.
- There is a significant negative significant direct association between firm efficiency as measured by asset turnover and capital structure, as measured by the long-term debt ratio (r = -0.045, p-value = 0.000), meaning that firms with higher efficiency tend to finance their investments from internal sources of finance for Saudi Arabia listed firms.
- There is a significant negative significant direct association between investment opportunities, as measured by the compound annual growth rate of investments, and capital structure, as measured by the long-term debt ratio (r = -0.048, p-value = 0.006), meaning that a higher growth rate of investment leads firms to finance their investments from internal sources of finance for Saudi Arabia listed firms.

Short-term debt ratio model:

- There is an insignificant direct association between the COVID-19 pandemic on capital structure, as measured by the short-term debt ratio (r = 0.027, p-value = 0.117). This means there is no significant difference in capital structure pre- and post-COVID-19 pandemic for Saudi Arabia listed firms.
- There is a significant negative significant direct association between firm size and capital structure, as measured by the short-term debt ratio (r = -0.060, p-value = 0.001). This indicates that larger firms have a lower tendency to finance their investments through short-term debt for Saudi Arabia listed firms.

- There is a significant negative significant direct association between asset structure, as measured by tangibility, on capital structure, as measured by the short-term debt ratio (r = -0.140, p-value = 0.000). This suggests that firms with a higher percentage of tangible assets do not need to finance their investments through short-term debt for Saudi Arabia listed firms.
- There is a significant negative significant direct association between profitability as measured by return on assets, on capital structure, as measured by the short-term debt ratio (r = -0.134, p-value = 0.000), meaning that higher profitability leads firms to finance their investments from internal sources of finance for Saudi Arabia listed firms.
- There is a significant positive significant direct association between firm efficiency as measured by asset turnover, and capital structure, as measured by the short-term debt ratio (r = -0.253, p-value = 0.000). This indicates that firms with a higher efficiency tend to finance their investments through short-term debt ratio for Saudi Arabia listed firms.
- There is an insignificant direct association between investment opportunities as measured by the compound annual growth rate of investments, on capital structure, as measured by the short-term debt ratio (r = -0.026, p-value = 0.137) for Saudi Arabia listed firms.

5.8. Testing hypotheses

5.8.1. *The impact of COVID-19 on capital structure, as measured by the total debt ratio*

Several goodness-of-fit tests should be conducted to confirm that the statistical techniques applied in the current study best fit the sample data. These tests include multicollinearity, heteroskedasticity, omitted variables, and autocorrelation.

If any of these problems (multicollinearity, heteroskedasticity, omitted variables, and autocorrelation) are evidenced, they should be considered while estimating the impact of COVID-19 on capital structure for Saudi Arabia-listed firms as follows:

Table 11

OLS Goodness of Fit (Models of TD_TA)

Variable		VIF
Turn		1.227
ROA		1.197
Size		1.121
Tang		1.05
CAGR		1.021
Covid19		1.007
Mean VIF		1.104
Heteroskedasticity	Chi2 Statistics	17.03
	Prob>Chi2	0.0000
Omitted variables	F Statistics	12.08
	Prob>F	0.0000
Autocorrelation	F Statistics	84.436
	Prob>F	0.0000

Table 11 shows the goodness-of-fit tests to assess the validity of the pooled OLS regression results. Table 11 reveals that there is no multicollinearity among the regressors for the model of capital structure, as measured by the total debt ratio. According to Landau and Everitt (2004) and Field (2005), multicollinearity exists when the variance inflation factor (VIF) of any independent variable exceeds 10 and when the tolerance factor (1/VIF) is less than 0.10. Therefore, there is no multicollinearity among the explanatory variables included in the model because all explanatory variables show a VIF coefficient < 10 and a tolerance coefficient > 0.10.

Moreover, Table 11 reveals a heteroskedasticity problem, meaning that the error variances are not constant for the research models. Therefore, the null hypothesis is rejected because the *p*-value is < 5%, supporting the alternative hypothesis states that the variances of errors are non-constant across observations for the model of capital structure, as measured by the total debt ratio.

Gujarati (2015) explained that model specification mistakes can occur due to the exclusion of necessary explanatory factors, the addition of irrelevant explanatory variables, or the incorrect

functional form of independent and dependent variables. As shown in Table 11, the *p*-value of the omitted variables test is < 5%. Therefore, the null hypothesis is rejected, indicating that the functional form is incorrect and that there are omitted variables in the model of capital structure, as measured by the total debt ratio.

In addition, autocorrelation exists, meaning that the model's residuals are serially correlated because the *p*-value is < 5%.

In conclusion, the researcher added a year fixed effect to address the problem of autocorrelation and to treat model specification errors using generalized least squares (GLS) to test the final fitted model of the impact of COVID-19 on capital structure, as measured by the total debt ratio, as follows:

Table 12

Final Fitted Model of the Impact of COVID-19 on Capital Structure, as Measured by the Total Debt Ratio (Models of TD_TA)

TD_TA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Covid19	.019	.006	3.48	.001	.009	.03	***
Size	.045	.002	20.92	0	.041	.049	***
Tang	.18	.013	14.05	0	.155	.205	***
ROA	-4.368	.17	-25.62	0	-4.702	-4.034	***
Turn	.799	.035	22.86	0	.73	.867	***
CAGR	.002	.002	0.91	.362	-.002	.007	
Constant	-.878	.046	-19.29	0	-.968	-.789	***
Mean dependent var			0.252	SD dependent var			0.191
R^2			0.303	Number of obs			3316
F-test			280.308	Prob > F			0.000
Akaike crit. (AIC)			-2753.261	Bayesian crit. (BIC)			-2710.516

**** p<.01, ** p<.05, * p<.1*

- The overall model can be accepted as a reliable capital structure model, as measured by the total debt ratio (TD_TA), because the Prob > *F* is < 5%.

- Additionally, the models of the impact of COVID-19 on capital structure, as measured by the total debt ratio, can explain 30.3% of the variance using GLS. This implies that capital structure decisions are influenced by the COVID-19 pandemic.
- There is a significant positive impact of the COVID-19 pandemic on capital structure, as measured by the total debt ratio. This means that firms increased their total debt to finance their investment opportunities during the COVID-19 pandemic for Saudi Arabia listed firms.
- There is a significant positive significant impact of firm size and capital structure, as measured by the total debt ratio. This indicates that larger firms have a greater ability to finance their investments through total debt for Saudi Arabia listed firms.
- There is a positive significant impact of asset structure, as measured by tangibility, on capital structure, as measured by the total debt ratio. This suggests that firms with a higher percentage of tangible assets have a greater ability to finance their investments through total debt for Saudi Arabia listed firms.
- There is a negative impact of profitability, as measured by return on assets, on capital structure, as measured by the total debt ratio. This implies that higher profitability leads firms to finance their investments from internal sources of finance for Saudi Arabia listed firms.
- There is a positive significant impact of firm efficiency, as measured by asset turnover, on capital structure, as measured by the total debt ratio. This indicates that firms have a greater ability to finance their investments through total debt for Saudi Arabia listed firms.
- There is no significant impact of investment opportunities, as measured by the compound annual growth rate of investments, on capital structure, as measured by the total debt ratio for Saudi Arabia listed firms.

5.8.2. *The impact of COVID-19 on capital structure, as measured by the long-term debt ratio*

There is some goodness of fit tests that should be conducted to confirm that the statistical techniques applied in the current study best fit the sample data. These tests include multicollinearity, heteroskedasticity, omitted variables, and autocorrelation.

If any of these problems (multicollinearity, heteroskedasticity, omitted variables, and autocorrelation) are evidenced, they should be considered while estimating the impact of COVID-19 on capital structure for Saudi Arabia-listed firms as follows:

Table 13

OLS Goodness of Fit (Models of LTD_TA)

Variable		VIF
Turn		1.227
ROA		1.197
Size		1.121
Tang		1.05
CAGR		1.021
Covid19		1.007
Mean VIF		1.104
Heteroskedasticity	Chi2 Statistics	147.69
	Prob>Chi2	0.000
Omitted variables	F Statistics	77.55
	Prob>F	0.000
Autocorrelation	F Statistics	88.189
	Prob>F	0.000

Table 13 shows there is no multicollinearity among the explanatory variables included in the model because all explanatory variables show a VIF coefficient < 10 and a tolerance coefficient > 0.10.

Moreover, Table 13 reveals a heteroskedasticity problem, meaning that the error variances are not constant for the research models. Therefore, the null hypothesis is rejected because the *p*-value is less than 5%, supporting the alternative hypothesis states that the variances of errors are

non-constant across observations for the model of capital structure as measured by the long-term debt ratio.

Concerning the specifications, Gujarati (2015) stated that model specification errors may arise from the omission of essential explanatory variables from the model, the inclusion of irrelevant explanatory variables, or the incorrect functional form of independent and dependent variables. As shown in Table 13, the *p*-value of the omitted variables test is less than 5%. Therefore, the null hypothesis is rejected, indicating that the functional form is incorrect and has omitted variables in the model of capital structure as measured by the long-term debt ratio.

In addition, autocorrelation exists, indicating that the model's residuals are serially correlated because the *p*-value is < 5%.

In conclusion, the researcher added a year fixed effect to address the problem of autocorrelation and to treat model specification errors using generalized least squares (GLS) to test the final fitted model of the impact of COVID-19 on capital structure, as measured by the long-term debt ratio, as follows:

Table 14

OLS Goodness of Fit (Models of LTD_TA)

LTD_TA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Covid19	.011	.004	2.65	.008	.003	.019	***
Size	.04	.002	24.77	0	.037	.043	***
Tang	.227	.01	23.56	0	.208	.245	***
ROA	-1.95	.117	-16.71	0	-2.178	-1.721	***
Turn	.283	.026	10.88	0	.232	.334	***
CAGR	.002	.002	0.92	.358	-.002	.005	
Constant	-.847	.034	-25.10	0	-.913	-.781	***
Mean dependent var			0.140	SD dependent var			0.145
R-squared			0.352	Number of obs			3316
F-test			291.169	Prob > F			0.000
Akaike crit. (AIC)			-4836.617	Bayesian crit. (BIC)			-4793.871

**** p<.01, ** p<.05, * p<.1*

- The overall model can be accepted as a reliable capital structure model, as measured by the long-term debt ratio (LTD_TA) because the Prob > *F* is < 5%.
- In addition, the models of the impact of COVID-19 on capital structure, as measured by the long-term debt ratio, can be explained 35.2% by using GLS. This implies that capital structure decisions are influenced by the COVID-19 pandemic.
- There is a positive significant impact of the COVID-19 pandemic periods on capital structure, as measured by the long-term debt ratio, meaning that firms increased long-term debt to finance their investment opportunities during the times of the COVID-19 pandemic for Saudi Arabia listed firms.
- There is a positive significant impact of firm size and capital structure as measured by the long-term debt ratio, indicating that larger firms have a greater ability to finance their investments with long-term debt for Saudi Arabia listed firms.
- There is a positive significant impact of asset structure, as measured by tangibility and capital structure as measured by the long-term debt ratio, meaning that firms with a higher percentage of tangible assets have a greater ability to finance their investments with long-term debt for Saudi Arabia listed firms.
- There is a negative significant impact of profitability, as measured by return on assets and capital structure as measured by the long-term debt ratio, meaning that higher profitability leads firms to finance their investments from internal sources of finance for Saudi Arabia listed firms.
- There is a positive significant impact of firm efficiency, as measured by asset turnover, on capital structure as measured by the long-term debt ratio, meaning that firms with a higher efficiency have a greater ability to finance their investments from long-term debt for Saudi Arabia listed firms.

- There is no significant impact of investment opportunities, as measured by the compound annual growth rate of investments, on capital structure as measured by the long-term debt ratio for Saudi Arabia listed firms.

5.8.3. *The impact of COVID-19 on capital structure, as measured by the short-term debt ratio*

There is some goodness of fit tests that should be conducted to confirm that the statistical techniques applied in the current study best fit the sample data. These tests are multicollinearity, heteroskedasticity, omitted variables, and autocorrelation.

If any of these problems (multicollinearity, heteroskedasticity, omitted variables, and autocorrelation) are evidenced, they should be considered while estimating the impact of COVID-19 on capital structure for Saudi Arabia listed firms as follows:

Table 15

OLS Goodness of Fit (Models of STD_TA)

Variable		VIF
Turn		1.227
ROA		1.197
Size		1.121
Tang		1.05
CAGR		1.021
Covid19		1.007
Mean VIF		1.104
Heteroskedasticity	Chi2 Statistics	336.40
	Prob>Chi2	0.000
Omitted variables	F Statistics	31.26
	Prob>F	0.000
Autocorrelation	F Statistics	145.128
	Prob>F	0.000

Table 15 shows there is no multicollinearity among the explanatory variables included in the model because all explanatory variables show a VIF coefficient < 10 and a tolerance coefficient > 0.10.

Moreover, Table 15 reveals there is heteroskedasticity problem, which means that the error variances are not constant for the research models. Therefore, the null hypothesis is rejected because the *p*-value is < 5%, supporting the alternative hypothesis states that the variances of errors are non-constant across observations for the model of capital structure as measured by the short-term debt ratio.

Concerning the specifications, Gujarati (2015) stated that model specification errors may arise from the omission of essential explanatory variables from the model, the inclusion of irrelevant explanatory variables, or the incorrFect functional form of independent and dependent variables. As shown in Table 15, the *p*-value of the omitted variables test is < 5%. Therefore, the null hypothesis is rejected, indicating that the functional form is incorrect and has omitted variables in the model of capital structure as measured by the short-term debt ratio.

In addition, autocorrelation exists, indicating that the model's residuals are serially correlated because the *p*-value is < 5%.

Quadratic test: non-linear test

This research reveals that a quadratic curvilinear relationship exists between firm size and capital structure as measured by the short-term debt ratio. Moreover, a quadratic curvilinear relationship exists between firm efficiency and capital structure as measured by the short-term debt ratio, indicating the existence of an optimal level of these determinants in association with capital structure. Any deviation will negatively impact capital structure; there is an inverted U shape between these determinants and STD_TA. These dimension parameters are positive (> 0) and significant, and their squared scores are negative and significant, as shown:

Table 16

Quadratic Test

between Size and STD_TA		between Turn and STD_TA	
Variable	**Quadratic**	**Variable**	**Quadratic**
b1		b1	
_cons	0.238	_cons	1.073
	8.400		15.290
	0.000		0.000
b2		b2	
_cons	-0.006	_cons	-2.358
	-8.570		-11.170
	0.000		0.000
Statistics		Statistics	
N	3316	N	3316
r2_a	0.025	r2_a	0.098

In conclusion, the researcher added a year fixed effect to address the problem of autocorrelation and add a quadratic term for some firm size (Size) and firm efficiency (Turn) to treat model specification errors using generalized least squares (GLS) to test the final fitted model of the impact of COVID-19 on capital structure, as measured by the short-term debt ratio, as follows:

Table 17

Final Fitted Model of the Impact of COVID-19 on Capital Structure, as Measured by the Short-term Debt Ratio (Models of STD_TA)

STD_TA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Covid19	.007	.003	2.09	.037	0	.014	**
SSize	.011	.002	5.30	0	.007	.015	***
SSize2	-.014	.001	-9.77	0	-.016	-.011	***
Tang	-.04	.008	-5.28	0	-.055	-.025	***
ROA	-2.252	.107	-21.02	0	-2.462	-2.042	***
Turn	1.178	.07	16.92	0	1.042	1.315	***
Turn2	-2.17	.211	-10.27	0	-2.585	-1.756	***
CAGR	.002	.001	1.10	.273	-.001	.004	

Constant	.057	.006	9.41	0	.045	.069	***
Mean dependent var		0.107		SD dependent var		0.112	
R-squared		0.248		Number of obs		3316	
F-test		108.941		Prob > F		0.000	
Akaike crit. (AIC)		-6018.984		Bayesian crit. (BIC)		-5964.026	

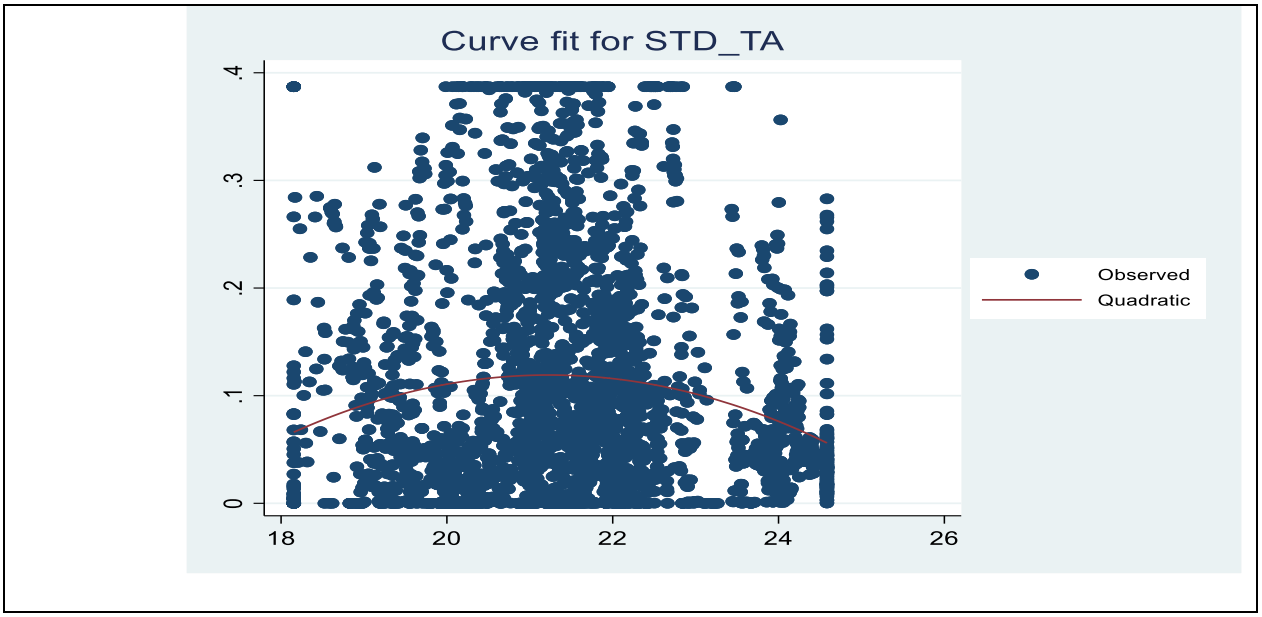
*** p<.01, ** p<.05, * p<.1

- The overall model can be accepted as a reliable capital structure model as measured by the short-term debt ratio (STD_TA) because the Prob > *F* is < 5%.
- In addition, the models of the impact of COVID-19 on capital structure, as measured by the short-term debt ratio, can be explained 24.8% by using GLS. This implies that capital structure decisions are influenced by the COVID-19 pandemic.
- There is a positive significant impact of the COVID-19 pandemic periods on capital structure, as measured by the short-term debt ratio, meaning that firms increased short-term debt to finance their investment opportunities during the times of the COVID-19 pandemic for Saudi Arabia listed firms.
- This research reveals that a curvilinear relationship exists between firm size and capital structure as measured by the short-term debt ratio; there is an inverted U shape between them. The Size parameter is positive (> 0) and significant, while the $size^2$ is negative and significant.

The turning point of firm size in association with STD_TA is 21.23, equivalent to 1,659,861,497, as follows:

Figure 2

Curve Fit for STD_TA and Firm Size

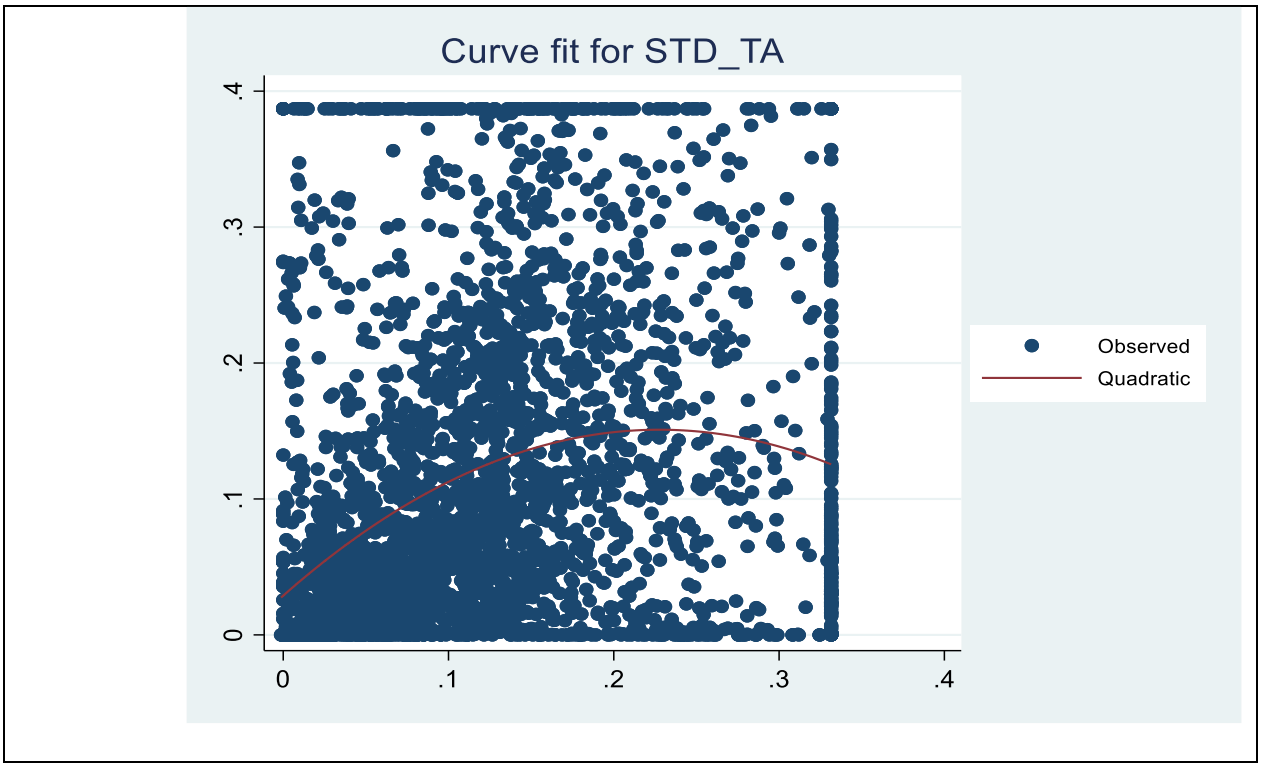


- There is a negative significant impact of asset structure, as measured by tangibility and capital structure as measured by the short-term debt ratio for Saudi Arabia listed firms.
- There is a negative significant impact of profitability, as measured by return on assets and capital structure as measured by the short-term debt ratio, meaning that higher profitability leads firms to finance their investments from internal sources of finance for Saudi Arabia listed firms.
- This research reveals that a curvilinear relationship exists between firm efficiency (Turn) and capital structure as measured by the short-term debt ratio; there is an inverted U shape between them. The Turn parameter is positive (> 0) and significant, while the Turn2 squared is negative and significant.

Turning point of firm efficiency (Turn) in association with STD_TA is 0.27, as follows:

Figure 3

Curve Fit for STD_TA and Firm Efficiency



- There is no significant impact of investment opportunities, as measured by the compound annual growth rate of investments and capital structure as measured by the short-term debt ratio for Saudi Arabia-listed firms.

5.8.4. *The impact of COVID-19 on capital structure, as measured by the total debt ratio, varies by sector*

If any of the following problems—multicollinearity, heteroskedasticity, omitted variables, or autocorrelation—are evidenced, they should be considered while estimating the impact of COVID-19 on capital structure for Saudi Arabia-listed firms for each sector as follows:

Table 18

OLS Goodness of Fit (Models of TD_TA) for Each Sector

TD_TA	Sec1	Sec2	Sec3	Sec4	Sec5	Sec6	Sec7	Sec8	Sec9
					VIF				
Size	2.477	1.435	2.036	4.223	1.942	1.666	1.319	2.354	4.481
ROA	2.326	1.378	1.576	9.508	1.675	1.582	1.169	2.081	6.093
Tang	1.664	1.14	1.576	3.715	1.579	1.289	1.135	1.246	3.927
Turn	1.578	1.095	1.095	1.266	1.264	1.162	1.09	1.088	2.198
CAGR	1.061	1.042	1.051	1.085	1.105	1.051	1.026	1.085	1.317
Covid19	1.057	1.032	1.028	1.019	1.026	1.018	1.017	1.032	1.229
Mean VIF	1.694	1.187	1.394	5.136	1.432	1.295	1.126	1.481	3.21
Heteroskedasticity	8.87	6.95	16.38	12.58	25.35	4.15	17.27	0.98	1.63
	0.003	0.008	0.000	0.000	0.000	0.042	0.000	0.323	0.2016
Omitted variables	4.35	1.68	19.32	27.62	5.47	20.35	15.72	29.35	28.68
	0.006	0.1699	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Autocorrelation	4.584	15.839	19.480	0.846	36.245	44.175	25.884	20.92	508.12
	0.0852	0.0007	0.000	0.4255	0.000	0.000	0.000	0.001	0.0282

Table 18 shows there is no multicollinearity among the explanatory variables included in the model because all explanatory variables show a VIF coefficient < 10 and a tolerance coefficient > 0.10 for all models.

Moreover, Table 18 reveals there is a heteroskedasticity problem, indicating that the error variances are not constant for the research models. Therefore, the null hypothesis is rejected because the *p*-value is < 5%, supporting the alternative hypothesis states that the variances of errors are non-constant across observations for the model of capital structure as measured by the total debt ratio, for the communication service (Sec1), consumer discretionary (Sec2)., consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), and material (Sec7). In contrast, Table 20 reveals there is no heteroskedasticity problem, indicating that the error variances are constant for the research model for the real estate (Sec8) and utility (Sec9) sectors.

Gujarati (2015) explained that model specification mistakes can occur due to the exclusion of necessary explanatory factors, the addition of irrelevant explanatory variables, or the incorrect functional form of independent and dependent variables. As shown in Table 18, the *p*-value of the omitted variables test is < 5%. Therefore, the null hypothesis is rejected, indicating that the functional form is incorrect and has omitted variables in the model of capital structure as measured by the total debt ratio, for the communication service (Sec1), consumer staples (Sec3), energy

(Sec4), healthcare (Sec5), industrial (Sec6), material (Sec7), real estate (Sec8), and utility (Sec9) sectors. In contrast, the null hypothesis is supported, indicating that the functional form is correct and has no omitted variables in the model of capital structure as measured by the total debt ratio for the consumer discretionary (Sec2)

In addition, autocorrelation exists, meaning that the model's residuals are serially correlated because the *p*-value is < 5% for consumer discretionary (Sec2), consumer staples (Sec3), healthcare (Sec5), industrial (Sec6), material (Sec7), real estate (Sec8), and utility (Sec9) sectors. In contrast, the model's residuals are not serially correlated because the *p*-value is greater than 5% for communication service (Sec1) and energy (Sec4).

In conclusion, the researcher uses generalized least squares (GLS) to test the final fitted model of the impact of COVID-19 on capital structure, as measured by the total debt ratio for each sector as follows:

Table 19 *Final Fitted Model of the Impact of COVID-19 on Capital Structure, as Measured by the Total Debt Ratio (Models of TD_TA) for Each Sector*

Variable	Sec1	Sec2	Sec3	Sec4	Sec5	Sec6	Sec7	Sec8	Sec9
Covid19	0.014	0.0345**	0.0473***	-0.006	0.0390***	0.0416***	-0.0201**	0.009	-0.0380**
Size	0.011	0.0477***	0.0509***	0.0694***	0.1081***	0.0580***	0.0350***	0.1714***	0.1025**
Tang	0.2652***	0.3455***	0.1155***	0.3407***	0.2996***	0.048	0.2406***	-0.3496***	-0.158
ROA	-2.8049***	-4.9153***	-3.0991***	-1.4401*	-4.8089***	-2.6393***	-4.7257***	-3.5362***	0.280
Turn	-0.6260*	0.9901***	0.4617***	0.4180***	0.8501***	0.068	1.1452***	1.0530***	-0.174
CAGR	-0.003	-0.002	0.003	0.004	-0.001	0.0097**	0.004	-0.005	0.003
_cons	-0.038	-0.9973***	-0.9952***	-1.3962***	-2.3065***	-0.9924***	-0.7075***	-3.5538***	-2.0668**
Obs	156	549	414	104	208	500	1087	246	52
R2	0.511	0.589	0.434	0.849	0.666	0.232	0.333	0.415	0.902
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Legend: * p<.1; ** p<.05; *** p<.01

- The overall model can be accepted as a reliable capital structure model as measured by the total debt ratio (TD_TA), because the Prob > *F* is < 5% for all models.
- In addition, the models of the impact of COVID-19 on capital structure, as measured by the total debt ratio, can be explained (0.51, 0.59, 0.43, 0.85, 0.67, 0.232, 0.33, 0.42, 0.90) respectively for each sector by using GLS. This implies that capital structure decisions are influenced by the COVID-19 pandemic for each sector.
- There is a positive significant impact of the COVID-19 pandemic periods on capital structure, as measured by the total debt ratio, for the following sectors: consumer discretionary (Sec2), consumer staples (Sec3), healthcare (Sec5), and industrial (Sec6) sectors. In contrast, there was a negative significant impact of the COVID-19 pandemic periods and capital structure as measured by the total debt ratio, for the material (Sec7) and utility (Sec9) sectors. On the other hand, there is no significant impact of the COVID-19 pandemic periods on capital structure, as measured by the total debt ratio, for the communication service (Sec1), energy (Sec4), and real estate (Sec8) sectors.
- There is a positive significant impact of firm size on capital structure, as measured by the total debt ratio, for the following sectors: consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), material (Sec7), real estate (Sec8), and utility (Sec9) sectors. On the other hand, there is no significant impact of firm size on capital structure, as measured by the total debt ratio for communication service sector (Sec1).
- There is a positive significant impact of asset structure, as measured by tangibility, on capital structure, as measured by the total debt ratio, for the following sectors: communication service (Sec1), consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), material (Sec7), and real estate (Sec8) sectors. Conversely, there is no significant

impact of asset structure as measured by tangibility, on capital structure, as measured by the total debt ratio, for the industrial (Sec6) and utility (Sec9).

- There is a negative significant impact of profitability, as measured by return on assets, on capital structure, as measured by the total debt ratio, for the following sectors: communication service (Sec1), consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), material (Sec7), and real estate (Sec8) sectors. Conversely, there is no significant impact of profitability, as measured by return on assets, on capital structure as measured by the total debt ratio, for the utility (Sec9).
- There is a positive significant impact of firm efficiency, as measured by asset turnover, on capital structure as measured by total debt ratio, for the following sectors: consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), material (Sec7), and real estate (Sec8) sectors. In contrast, there was a negative significant impact of the firm efficiency, as measured by asset turnover, on capital structure as measured by total debt ratio for communication service sector (Sec1). On the other hand, there is no significant impact of the firm efficiency, as measured by asset turnover, on capital structure as measured by total debt ratio, for the industrial (Sec6) and utility (Sec9).
- There is a positive significant impact of investment opportunity, as measured by the annual compound growth rate of investment, on capital structure as measured by total debt ratio, for the industrial (Sec6) sector. On the other hand, there is no significant impact of profitability, as measured by return on assets, on capital structure as measured by total debt ratio, for the following sectors: communication service (Sec1), consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), material (Sec7), real estate (Sec8), and utility (Sec9) sectors.

5.8.5. *The impact of COVID-19 on capital structure as measured by total debt ratio, varies by sector*

If any of the following problems—multicollinearity, heteroskedasticity, omitted variables, or autocorrelation—are evidenced, they should be considered while estimating the impact of COVID-19 on capital structure for Saudi Arabia-listed firms for each sector as follows:

Table 20

OLS Goodness of Fit (Models of LTD_TA) for Each Sector

LTD_TA	Sec1	Sec2	Sec3	Sec4	Sec5	Sec6	Sec7	Sec8	Sec9
					VIF				
Size	2.477	1.435	2.036	4.223	1.942	1.666	1.319	2.354	4.481
ROA	2.326	1.378	1.576	9.508	1.675	1.582	1.169	2.081	6.093
Tang	1.664	1.14	1.576	3.715	1.579	1.289	1.135	1.246	3.927
Turn	1.578	1.095	1.095	1.266	1.264	1.162	1.09	1.088	2.198
CAGR	1.061	1.042	1.051	1.085	1.105	1.051	1.026	1.085	1.317
Covid19	1.057	1.032	1.028	1.019	1.026	1.018	1.017	1.032	1.229
Mean VIF	1.694	1.187	1.394	3.469	1.432	1.295	1.126	1.481	3.208
Heteroskedasticity	0.03	23.59	5.50	4.29	42.08	58.61	100.37	0.42	2.69
	0.8706	0.000	0.019	0.0383	0.000	0.000	0.000	0.517	0.1013
Omitted variables	7.72	16.61	23.88	35.99	3.30	6.52	43.47	17.43	24.73
	0.000	0.000	0.000	0.000	0.021	0.000	0.000	0.000	0.000
0Autocorrelation	253.8	21.28	53.10	180.45	26.605	80.967	18.897	63.506	187.51
	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.0464

Table 20 shows there is no multicollinearity among the explanatory variables included in the model because all explanatory variables show a VIF coefficient < 10 and a tolerance coefficient > 0.10 for all models.

Moreover, Table 20 reveals there is a heteroskedasticity problem, indicating that the error variances are not constant for the research models. Therefore, the null hypothesis is rejected because the *p*-value is less than 5%, supporting the alternative hypothesis states that the variances of errors are non-constant across observations for the model of capital structure as measured by the long-term debt ratio for consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), and material (Sec7). In contrast, Table 20 reveals

there is no heteroskedasticity problem, indicating that the error variances are constant for the research model for communication service (Sec1), real estate (Sec8), and utility (Sec9).

Concerning the specifications, Gujarati (2015) stated that model specification errors may arise from the omission of essential explanatory variables from the model, the inclusion of irrelevant explanatory variables, or the incorrect functional form of independent and dependent variables. As shown in Table 20, the *p*-value of the omitted variables test is < 5%. Therefore, the null hypothesis is rejected, which states that the functional form is incorrect and has omitted variables in the model of capital structure as measured by the long-term debt ratio for communication service (Sec1), consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), material (Sec7), real estate (Sec8), and utility (Sec9).

In addition, autocorrelation exists, which means that the model's residuals are serially correlated because the *p*-value is < 5% for all models.

In conclusion, the researcher uses generalized least squares (GLS) to test the final fitted model of the impact of COVID-19 on capital structure as measured by the long-term debt ratio for each sector as follows:

Table 21

Final Fitted Model of the Impact of COVID-19 on Capital Structure as Measured by the Long-term Debt Ratio (Models of LTD_TA) for Each Sector

Variable	Sec1	Sec2	Sec3	Sec4	Sec5	Sec6	Sec7	Sec8	Sec9
Covid19	0.020	0.064***	0.007	0.010	0.015**	0.026***	-0.024***	-0.008	-0.039**
Size	0.016***	0.025***	0.051***	0.032**	0.040***	0.020***	0.035***	0.116***	0.098**
Tang	0.340***	0.445***	0.083***	0.470***	0.375***	0.088***	0.290***	-0.127***	-0.167
ROA	-1.538***	-2.153***	-1.467***	0.449	-1.688***	-0.754***	-1.786***	-0.871**	0.171
Turn	-0.765***	0.516***	0.133**	-0.122	-0.062	-0.279***	0.274***	0.504***	-0.078
CAGR	-0.006	0.001	0.000	0.004	-0.002	0.007**	0.002	-0.001	0.004

_cons	-0.229**	-0.651***	-1.009***	-0.662**	-0.873***	-0.324***	-0.788***	-2.413***	-1.984**
Obs	156	549	414	104	208	500	1087	246	52
R2	0.511	0.589	0.434	0.849	0.666	0.232	0.333	0.415	0.902
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Legend: * p<.1; ** p<.05; *** p<.01

- The overall model can be accepted as a reliable capital structure model as measured by the long-term debt ratio (LTD_TA) because the Prob > *F* is < 5% for all models.
- In addition, the models of the impact of COVID-19 on capital structure as measured by the long-term debt ratio can be explained (0.51, 0.59, 0.43, 0.85, 0.67, 0.232, 0.33, 0.42, 0.90) respectively for each sector by using GLS. This implies that capital structure decisions are driven by the COVID-19 pandemic times for each sector.
- There is a positive significant impact of the COVID-19 pandemic periods on capital structure as measured by the long-term debt ratio for the consumer discretionary (Sec2), healthcare (Sec5), and industrial (Sec6) sectors. In contrast, there was a negative significant impact of the COVID-19 pandemic periods and capital structure as measured by the long-term debt ratio for these sectors: material (Sec7) and utility (Sec9) sectors. No significant impact of the COVID-19 pandemic periods on capital structure as measured by the long-term debt ratio for the communication service (Sec1), consumer staples (Sec3), energy (Sec4), and real estate (Sec8) sectors.
- There is a positive significant impact of firm size on capital structure as measured by the long-term debt ratio for all models of different sectors.
- There is a positive significant impact of asset structure as measured by tangibility on capital structure as measured by the long-term debt ratio for the communication service (Sec1), consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), and material (Sec7). In contrast, there is a negative significant impact of

asset structure as measured by tangibility on capital structure as measured by the long-term debt ratio for real estate sector (Sec8). On the other hand, there is no significant impact of asset structure as measured by tangibility on capital structure as measured by the long-term debt ratio for the utility sector (Sec9).

- There is a negative significant impact of investment opportunity as measured by return on capital structure as measured by the long-term debt ratio for the communication service (Sec1), consumer discretionary (Sec2), consumer staples (Sec3), healthcare (Sec5), industrial (Sec6), material (Sec7), and real estate (Sec8) sectors. Conversely, there is no significant impact of profitability as measured by return on assets on capital structure as measured by long-term debt ratio for these sectors: energy (Sec4) and utility (Sec9) sectors.
- There is a positive significant impact of the firm efficiency as measured by asset turnover on capital structure as measured by long-term debt ratio for the consumer discretionary (Sec2), consumer staples (Sec3), material (Sec7), and real estate (Sec8). In contrast, there is a negative significant impact of the firm efficiency as measured by asset turnover on capital structure as measured by long-term debt ratio for the communication service (Sec1) and industrial (Sec6). On the other hand, there is no significant impact of the firm efficiency as measured by asset turnover on capital structure as measured by long-term debt ratio for these sectors: energy (Sec4), healthcare (Sec5), and utility (Sec9).
- There is a positive significant impact of investment opportunity as measured by the annual compound growth rate of investment on capital structure as measured by long-term debt ratio for the industrial (Sec6) sector. On the other hand, there is no significant impact of profitability as measured by return on assets on capital structure as measured by long-term debt ratio for these sectors: communication service (Sec1), consumer discretionary (Sec2), consumer staples

(Sec3), energy (Sec4), healthcare (Sec5), material (Sec7), real estate (Sec8), and utility sector (Sec9).

5.8.6. *The impact of COVID-19 on capital structure as measured by the short-term debt ratio for each sector*

If any of the problems (multicollinearity, heteroskedasticity, omitted variables, and auto-correlation) are evidenced, they should be considered while estimating the impact of COVID-19 on capital structure for Saudi Arabia listed firms for each sector as follows:

Table 22

OLS Goodness of Fit (Models of STD_TA) for Each Sector

STD_TA	Sec1	Sec2	Sec3	Sec4	Sec5	Sec6	Sec7	Sec8	Sec9
					VIF				
Size	2.477	1.435	2.036	4.223	1.942	1.666	1.319	2.354	4.481
ROA	2.326	1.378	1.576	9.508	1.675	1.582	1.169	2.081	6.093
Tang	1.664	1.14	1.576	3.715	1.579	1.289	1.135	1.246	3.927
Turn	1.578	1.095	1.095	1.266	1.264	1.162	1.09	1.088	2.198
CAGR	1.061	1.042	1.051	1.085	1.105	1.051	1.026	1.085	1.317
Covid19	1.057	1.032	1.028	1.019	1.026	1.018	1.017	1.032	1.229
Mean VIF	1.694	1.187	1.394	3.469	1.432	1.295	1.126	1.481	3.208
Heteroskedasticity	0.03	23.59	5.50	4.29	42.08	58.61	100.37	0.42	2.69
	0.8706	0.000	0.019	0.0383	0.000	0.000	0.000	0.517	0.1013
Omitted variables	7.72	16.61	23.88	35.99	3.30	6.52	43.47	17.43	24.73
	0.000	0.000	0.000	0.000	0.021	0.000	0.000	0.000	0.000
0Autocorrelation	253.8	21.28	53.10	180.45	26.605	80.967	18.897	63.506	187.51
	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.0464

Table 22 shows there is no multicollinearity among the explanatory variables included in the model because all explanatory variables show a VIF coefficient less than 10 and a tolerance coefficient greater than 0.10 for all models.

Moreover, Table 22 reveals there is a heteroskedasticity problem, indicating that the error variances are not constant for the research models. Therefore, the null hypothesis is rejected because the *p*-value is < 5%, supporting the alternative hypothesis states that the variances of

errors are non-constant across observations for the model of capital structure as measured by the short-term debt ratio for consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), and material (Sec7). In contrast, Table 24 reveals there is no heteroskedasticity problem, indicating that the error variances are constant for the research model for communication service (Sec1), real estate (Sec8), and utility (Sec9).

Concerning the specifications, Gujarati (2015) stated that model specification errors may arise from the omission of essential explanatory variables from the model, the inclusion of irrelevant explanatory variables, or the incorrect functional form of independent and dependent variables. As shown in Table 22, the *p*-value of the omitted variables test is < 5%. Therefore, the null hypothesis is rejected, which states that the functional form is incorrect and has omitted variables in the model of capital structure as measured by the short-term debt ratio for communication service (Sec1), consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), material (Sec7), real estate (Sec8), and utility (Sec9).

In addition, autocorrelation exists, which means that the model's residuals are serially correlated because the *p*-value is < 5% for all models.

In conclusion, the researcher uses generalized least squares (GLS) to test the final fitted model of the impact of COVID-19 on capital structure as measured by the short-term debt ratio for each sector as follows:

Table 23

Final Fitted Model of the Impact of COVID-19 on Capital Structure as Measured by the Short-term Debt Ratio (Models of STD_TA) for Each Sector

Variable	Sec1	Sec2	Sec3	Sec4	Sec5	Sec6	Sec7	Sec8	Sec9
Covid19	-0.006	-0.020**	0.027***	-0.011	0.024***	0.010	0.001	0.015	0.001
Size	-0.004	0.015***	0.005*	0.027*	0.068***	0.037***	-0.001	0.053***	0.005
Tang	-0.074*	-0.057***	-0.015	-0.082	-0.076***	-0.025	-0.033**	-0.209***	0.009
ROA	-1.267*	-2.265***	-1.560***	-1.858***	-3.120***	-1.814***	-2.497***	-2.608***	0.109
Turn	0.139	0.390***	0.324***	0.491***	0.912***	0.405***	0.807***	0.545***	-0.096
CAGR	0.003	-0.001	0.002	-0.002	0.000	0.001	0.001	-0.005	-0.001
_cons	0.190	-0.203***	-0.059	-0.520*	-1.433***	-0.667***	0.079*	-1.086***	-0.082
Obs	156	549	414	104	208	500	1087	246	52
R2	0.199	0.214	0.115	0.481	0.707	0.139	0.295	0.344	0.82
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Legend: * p<.1; ** p<.05; *** p<.01

- The overall model can be accepted as a reliable capital structure model as measured by the short-term debt ratio (STD_TA) because the Prob > *F* is < 5% for all models.
- In addition, the models of the impact of COVID-19 on capital structure as measured by the short-term debt ratio can be explained (0.20, 0.21, 0.115, 0.481, 0.707, 0.139, 0.295, 0.344, 0.82) respectively for each sector by using GLS. This implies that capital structure decisions are driven by the COVID-19 pandemic times for each sector.
- There is a positive significant impact of the COVID-19 pandemic periods on capital structure as measured by the short-term debt ratio for the consumer staples (Sec3) and healthcare (Sec5) sectors. In contrast, there is a negative significant impact of the COVID-19 pandemic periods and capital structure as measured by the short-term debt ratio for consumer discretionary (Sec2) sector. On the other hand, there is no significant impact of the COVID-19 pandemic periods on capital structure as measured by the short-term debt ratio for these sectors: communication service (Sec1), energy (Sec4), industrial (Sec6), material (Sec7), real estate (Sec8), and utility (Sec9).

- There is a positive significant impact of firm size on capital structure as measured by the short-term debt ratio for these sectors: consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), and real estate (Sec8) sectors. Conversely, there is no significant impact of firm size on assets on capital structure as measured by short-term debt ratio for the communication service (Sec1), material (Sec7), and utility sector (Sec9).
- There is a negative significant impact of asset structure as measured by tangibility on capital structure as measured by short-term debt ratio for these sectors: communication service (Sec1), consumer discretionary (Sec2), healthcare (Sec5), material (Sec7), and real estate (Sec8). On the other hand, there is no significant impact of asset structure as measured by tangibility on assets on capital structure as measured by short-term debt ratio for the consumer staples (Sec3), energy (Sec4), industrial (Sec6), and utility sector (Sec9).
- There is a negative significant impact of profitability as measured by return on assets on capital structure as measured by short-term debt ratio for these sectors: communication service (Sec1), consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), material (Sec7), and real estate (Sec8). On the other hand, there is no significant impact of profitability as measured by return on assets on capital structure as measured by short-term debt ratio for the utility sector (Sec9).
- There is a positive significant impact of the firm efficiency as measured by asset turnover on capital structure as measured by short-term debt ratio for these sectors: consumer discretionary (Sec2), consumer staples (Sec3), energy (Sec4), healthcare (Sec5), industrial (Sec6), material (Sec7), and real estate (Sec8). On the other hand, there is no significant impact of the firm efficiency as measured by asset turnover on capital structure as measured by the short-term debt ratio for these sectors: communication service (Sec1) and utility (Sec9).

- There is no significant impact of investment opportunity as measured by the annual compound growth rate of investment on capital structure as measured by the short-term debt ratio for all models of different sectors.

5.8.7. *Hypothesis testing summary*

Table 24

Hypothesis Testing Summary- Capital Structure Measured by Total Debt

	sample	Sec1	Sec2	Sec3	Sec4	Sec5	Sec6	Sec7	Sec8	Sec9
COVID-19	+	×	+	+	×	+	+	-	×	-
Size	+	×	+	+	+	+	+	+	+	+
Tang	+	+	+	+	+	+	×	+	-	×
ROA	-	-	-	-	-	-	-	-	-	×
Turn	+	-	+	+	+	+	×	+	+	×
CAGR	×	×	×	×	×	×	+	×	×	×

Table 25

Hypothesis Testing Summary- Capital Structure Measured by Long-Term Debt

	sample	Sec1	Sec2	Sec3	Sec4	Sec5	Sec6	Sec7	Sec8	Sec9
COVID-19	+	×	+	×	×	+	+	-	×	-
Size	+	+	+	+	+	+	+	+	+	+
Tang	+	+	+	+	+	+	+	+	-	×
ROA	-	-	-	-	×	-	-	-	-	×
Turn	+	-	+	+	×	×	-	+	+	×
CAGR	×	×	×	×	×	×	+	×	×	×

Table 26

Hypothesis Testing Summary- Capital Structure Measured by Short-Term Debt

	sample	Sec1	Sec2	Sec3	Sec4	Sec5	Sec6	Sec7	Sec8	Sec9
COVID-19	+	×	-	+	×	+	×	×	×	×
Size	Inverted (U)	×	+	+	+	+	+	×	+	×
Tang	-	-	-	×	×	-	×	-	-	×
ROA	-	-	-	-	-	-	-	-	-	×
Turn	Inverted (U)	×	+	+	+	+	+	+	+	×
CAGR	×	×	×	×	×	×	×	×	×	×

Table 27

GICS Sectors

GICS Sector Name	Sec.
Communication Services	1
Consumer Discretionary	2
Consumer Staples	3
Energy	4
Health Care	5
Industrials	6
Materials	7
Real Estate	8
Utilities	9

This research analyzed the effects of the COVID-19 pandemic on Saudi Arabia's non-financial listed firms in nine different sectors. The study's findings indicated significantly different patterns of firm adjustment depending on the industry. All the statistical analyses used STATA 17, and descriptive and diagnostic tests were conducted after the data-cleaning process to ensure the results' reliability. The formulated hypotheses included the impact of the pandemic on the total debt-to-assets ratio (TD_TA), the long-term debt-to-assets ratio (LTD_TA), and the short-term debt-to-assets ratio (STD_TA). COVID-19 positively affected TD_TA in the consumer discretionary, consumer staples, healthcare, and industrial sectors, with adverse effects on the

materials and utilities sectors. The communication services, energy, and real estate sectors recorded an insignificant impact.

For LTD_TA, the consumer discretionary, healthcare, and industrial sectors showed positive significant results, while the materials and utilities sectors showed negative significant results. Once again, there were no noteworthy outcomes in the communication services, consumer staples, energy, and real estate sectors. All the portfolios significantly affected the STD_TA, with the consumer staples and healthcare sectors presenting positive significance, while the consumer discretionary sector's significance was negative. The statistical tests showed that the capital structure model was valid, with a Prob > *F* value of < 0.05, implying the model's relevance. The findings also revealed that firm size, tangibility, and efficiency were positively significant, while profitability negatively impacted capital structure. Regarding capital structure, there was little change during the pandemic, as observed by the compound annual growth rate (CAGR) of investments.

6. Chapter Six: Conclusion and Recommendations

6.1. Conclusion

The main objective of this research is to examine the impact of COVID-19 on the capital structure of listed firms in the non-financial sector in Saudi Arabia. The literature review begins with a discussion of early and modern capital structure theories, which together provide the theoretical foundation of the research. Some firm-specific variables are used to assess the performance of the firms and whether variations in the capital structure during the COVID-19 pandemic affect the performance of the firms. This empirical study consists of firms from nine non-financial sectors publicly listed on the Saudi Arabia Stock Market, for the period of Q1 2017 to Q2 2023.

The study finds that during the COVID-19 outbreak, the total debt, long-term debt, and short-term debt ratios of listed firms in Saudi Arabia increased. Due to the effects and profit reduction from COVID-19, firms significantly affected by the pandemic chose to finance themselves externally through methods such as borrowing to meet cash flow requirements and overcome the pandemic's impact. The companies' leverage increased after the outbreak as firms opted for short-term and long-term borrowing to sustain their businesses post-crisis. Thus, it is viable not to reject the H1 hypothesis and conclude that COVID-19 significantly impacted the capital structure of listed firms in Saudi Arabia.

Furthermore, other firm-related factors influenced the performance of the firms. During COVID-19, large firms had the ability to increase total and long-term financing, consistent with the empirical studies of Yildiz et al. (2009), who concluded that capital structure and firm size are positively related. This is explained by Cowling et al. (2012), who stated that banks prefer issuing loans to large firms with a higher capability to repay. In contrast, the study finds that large firms do not finance their investments with short-term debts. Thus, the H2 hypothesis is not rejected, and it is

concluded that during the COVID-19 period, SMEs faced more difficulties than large firms in raising debt financing.

The tangibility of firms in short-term debt shows negative and significant results, but in long-term debt and total debt, the results were positive and significant. This means that firms with a higher percentage of tangible assets have a greater ability to finance their investments with total and long-term debts and do not need to rely on short-term debts. Large companies utilize their collateral to secure long-term loans. The findings were negative and significant, meaning that firms with high levels of tangible assets do not need to finance their investments from short-term debts and that significant levels of tangible assets can also serve as an indication of a consistent and reliable stream of income, generating internal finances that diminish the need for short-term borrowing. The result is in consistent with both the pecking order theory and the trade-off theory and are supported by the findings of Degryse et al., 2012, Hall et al. (2000), and Sogorb-Mira (2005), who posit a positive correlation between asset tangibility and long-term debt, while a negative correlation is observed between asset tangibility and short-term leverage. Thus, the H3 hypothesis is not rejected, and it is concluded that during the COVID-19 period, firms with a high percentage of tangible assets have a greater ability to raise debt financing than firms with a low percentage of tangible assets

In total debt, short-term debt, and long-term debt, the profitability of the firms shows negative and significant results, which are theoretically explained by the pecking order theory. This is supported by Caselli & Negri (2021), who stated that firms should first consider financing internally from retained earnings, and if there is a lack of internal resources, then consider financing through debts. If that is not possible, the last option is to finance through new equity issues. Thus, it is viable not to reject the H4 hypothesis and conclude that during the COVID-19 period, firms with high profitability raised debt financing less than firms with low profitability.

Firm efficiency in the case of long-term debt and total debt shows positive and significant results, meaning that firms with higher efficiency have a large ability to finance their investments with long-term debt. Thus, it is viable not to reject the H5 hypothesis and conclude that during the COVID-19 period, firms with high efficiency had more ability to raise debt financing than firms with low efficiency.

Growth opportunity shows insignificant results in total debts, long-term debts, and short-term debts. The results are consistent with Leeuwen (2011), who posited that growth opportunities are limited during a financial crisis. Consequently, firms will prioritize preserving their current assets rather than pursuing new growth prospects. Thus, the H6 hypothesis is rejected, and it is concluded that during COVID-19, the relationship between growth opportunity and capital structure is insignificant.

In addition, the study found that the impact of the pandemic on capital structure differs from one sector to another, and the H7 hypothesis is not rejected.

During COVID-19 significant positive impact was found on the total debt-to-assets ratio in consumer discretionary (Sec2), consumer staples (Sec3), healthcare (Sec5), and industrial (Sec6). In contrast, there is a negative significant impact for the material (Sec7) and utility (Sec9) sectors, while no significant result was found in communication service (Sec1), energy (Sec4), and real estate (Sec8).

The study found that COVID-19 had a significant positive impact on long-term debt in the consumer discretionary (Sec2), healthcare (Sec5), and industrial (Sec6). In contrast, there is a negative significant impact on the material (Sec7) and utility (Sec9). On the other hand, there is no significant impact was observed in the communication service (Sec1), consumer staples (Sec3), energy (Sec4), and real estate (Sec8).

A significant positive impact of COVID-19 on short-term debt was observed in the consumer staples (Sec3) and healthcare (Sec5) sectors. In contrast, there is a negative significant

impact in the consumer discretionary (Sec2) sector. The other sectors showed an insignificant impact of COVID-19 on capital structure.

Since uncertainty and economic shocks following COVID-19 have been used as a natural experiment, the method of this research is applicable for testing any external shock that may arise from future crises. Furthermore, the results of this study are beneficial for the listed companies and also their management in identifying and responding to shocks arising from future pandemics and preventing financial risks.

6.2. Research Limitations

This study faced several limitations that should be considered when interpreting the results. Some limitations of this study may affect the results, which are:

Limited literature on COVID-19 impact in Saudi Arabia: When the study was conducted, the number of publications concerning COVID-19 in Saudi Arabia was still limited. The study based its understanding on existing literature on previous crises and the impact of COVID-19 in other countries. This makes the comparison less direct because the Saudi context could differ in many respects.

Focus on Saudi Arabia limits generalizability: One of the primary limitations in generalizing these findings is that this study only examines the impact of the COVID-19 outbreak on the financial structure in Saudi Arabia. To assess the impact of the COVID-19 epidemic on the financial structure, it is recommended that future research incorporates data from several countries. This would resolve the issue of generalization.

Short-term nature of the analysis: While the study fully assumes the COVID-19 effects on organizations, there is a possibility that the changes are short-term without showing structural shifts. Ding et al. (2021) noted that it would be several years before the relative losses on various economic indicators caused by the pandemic are revealed.

Reliance on secondary financial data: The study only uses secondary financial data that are legally available to the public; therefore, the data may not fully reflect firms' financial decisions during the crisis. Other studies involving interviews with financial managers could provide additional information (Khatib & Nour, 2021).

A limited set of variables: The research utilizes several major financial indicators; nonetheless, it could design a structure that does not include all the factors influencing firms' financing contingency during the pandemic. Other characteristics may include shifts in the supply chain or customer trends as critical initiatives (Goodell, 2020).

6.3. Research Recommendations

6.3.1. Recommendations to Policymakers and Government

Companies play a crucial role in the economy of any country and are significant contributors to its recovery following a financial crisis. In addition to mitigating any future pandemics, it is imperative for governments to provide support to businesses and establish comprehensive policies to ensure the seamless functioning and performance of corporations during periods of financial crisis.

The results of this study also affirm the need for a particularistic approach in formulating strategies and policies that enable different sectors to invest heavily in suitable capital structures during a crisis. Regarding the consumer discretionary and staple sectors, policy intervention is needed to encourage firms to tap long-term debt funds to finance investment opportunities during crises. Policies should offer long-term credit and assist in adequately utilizing guaranteed loans and subsidies for interest (Mouton & Pelcher, 2023). Management should also recognize and implement activities that enhance operational efficiency, including technological applications and efficient processes. Government incentives may support the acquisition of new technologies, helping firms be more prepared for economic issues.

The funding, financial, and resource policies established public and private partnerships that provided a solid foundation for joint ventures and co-investment mechanisms to boost healthcare delivery's overall capacity and efficiency. For the industrial sector, understanding how to achieve supply-chain elasticity is crucial. It can benefit from a variety of suppliers and additional inventory stock to overcome the adverse effects of supply interruptions (Lestari & Sintha, 2022). Policies promoting the use of local suppliers and investments in the supply chain are beneficial, provided that key players in the supply chain remain operational during such occurrences. Increasing expenditures on R&D is also advantageous as it encourages innovation.

Companies should engage in R&D to leverage government incentives such as tax credits and grants, thereby increasing competitiveness and setting the stage for future technological advancements. Regarding materials and utilities, continued debt restructuring programs can help organizations manage accumulating credit loads. This explains why the government can assist firms and creditors in rescheduling debt payment terms and conditions as needed. Making emission reduction an attractive activity by highlighting that it can also reduce operating expenses is another beneficial approach (Akram et al., 2021).

Supporting the digitalization of these sectors can effectively reduce inefficiency. To facilitate this transition, government grants and training courses for developing new digital skills should help firms adapt to the digital economy. Additionally, governments can provide further support during challenging business periods through subsidies, flexible low-interest loans, and grants. These measures help firms maintain liquidity and continue operations during difficult times. This is why governments often implement tax relief measures, such as tax deferment, reduced tax rates, and tax credits for specific expenses. Such measures alleviate the pressure of taxation, aiding firms' recovery (Casula et al., 2020). Regulatory authorities can also reduce the regulatory burden by suspending compliance requirements under certain conditions and accelerating the processing of project and

expansion plans. These strategies ensure that firms do not fail during downturns and are well-positioned for future business opportunities. This approach also ensures that business organizations are adequately prepared to address the consequences of catastrophes and enhance resilience, recovery, and future growth.

6.3.2. *Recommendations to Management*

One of the main factors affecting firm performance is the capital structure decision, which involves financing the firm through debt or equity and choosing between long-term and short-term debts. During crises, the importance of capital structure decisions is heightened to avoid leading the firm to bankruptcy. Therefore, firms need to strengthen the management responsible for capital structure decisions and ensure that growth opportunities are financed through long-term debt or equity, not short-term debt.

According to the study, the effect of COVID-19 varied across sectors, with some sectors being more severely impacted than others. One reason is that the capital structure of listed firms varies across sectors.

The elements that significantly influence their capital structure will also vary. Enterprises should adjust their capital structure according to their sector's unique circumstances, considering factors such as the enterprise's developmental stage, operational attributes, and other industry-specific characteristics. This approach aims to achieve an optimal capital structure tailored to the firm's specific situation.

Managers must prioritize examining both the external and internal environments of their organization during a financial crisis and formulate strategies that align with the dynamic nature of the environment.

During financial crises like COVID-19, certain sectors are more severely impacted than others. Managers handling mixed investment portfolios across different sectors should consider this risk when conducting strategic planning and risk management.

6.3.3. *Recommendations to Investors*

In addition to diversifying investments across sectors and focusing on firms with strong capital structures, investors are advised to engage in market analysis, monitor return volatility during financial crises, and effectively manage the risks associated with their financial investments.

6.3.4. *Suggestions for Future Work*

Since the study focused on the listed companies in Saudi Arabia, future research could be applied to non-listed companies.

Additionally, this research examines the impact of COVID-19 on the capital structure of nine non-financial sectors in Saudi Arabia. Future research could examine the impact of COVID-19 on the financial sector in Saudi Arabia and compare the results with those of the non-financial sectors or focus on a specific sector.

Furthermore, the study examined the impact of COVID-19 on listed firms from a capital structure perspective. However, COVID-19 has also impacted other aspects such as firm performance, operations, and executive management behaviors. Further research could examine the impact on these areas in Saudi Arabia.

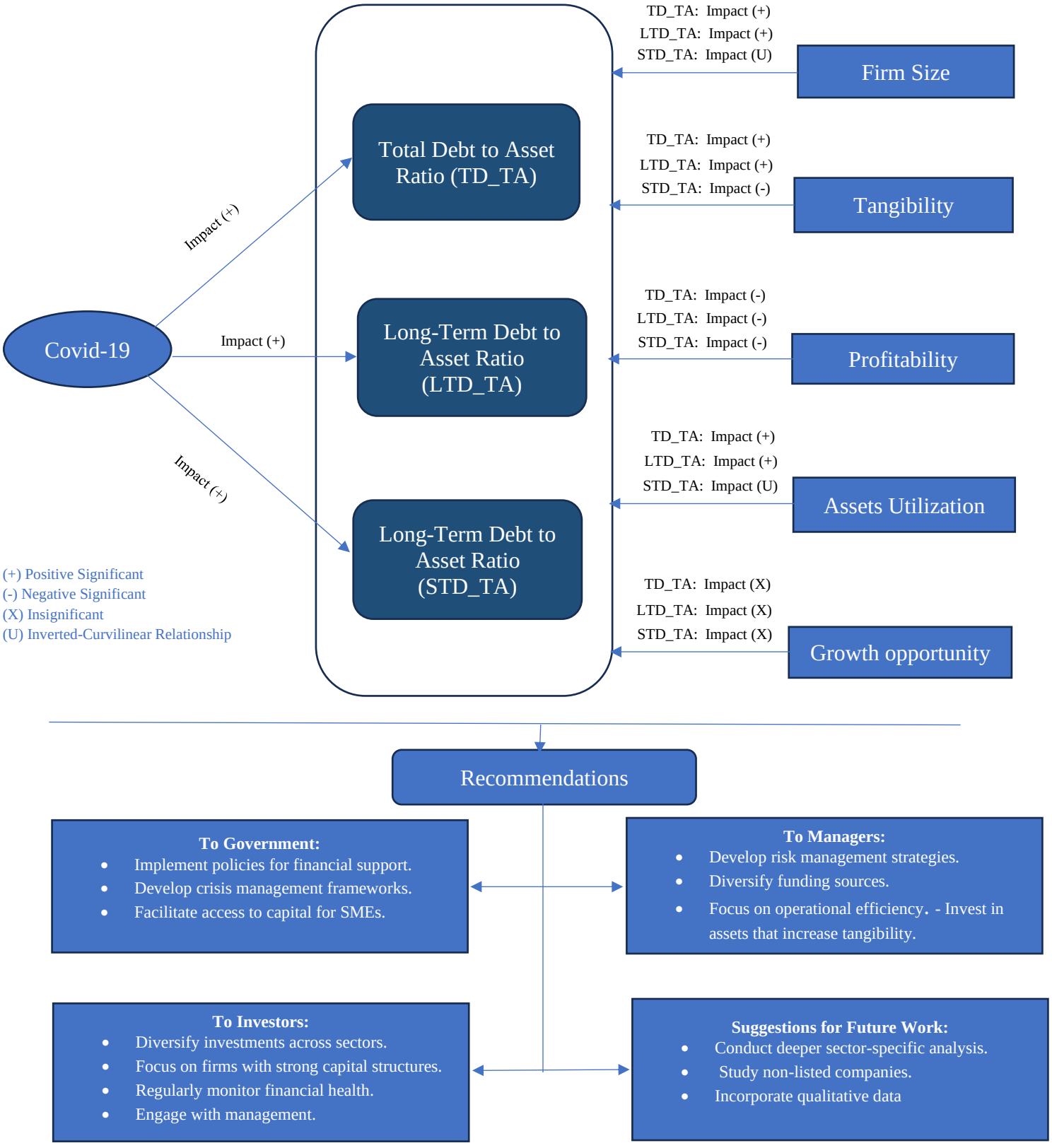
The overall conclusion is that since uncertainty and economic shocks in the economy following COVID-19 have been used as a natural experiment, the method of this research is applicable for testing any external shock that may arise from future crises. Furthermore, the results of this study are beneficial for the listed companies and also their management in identifying and responding to shocks from future pandemics and preventing financial risks.

The following diagram makes the effect of COVID-19 or other factors specific to a firm on the capital structure of a Saudi-listed firm far more understandable, and the conclusions and recommendations derived from the study more persuasive.

In this context, the dependent variables lie in the COVID-19 impact on the financial structure, namely the Total Debt to Assets ratio, Long-Term Debt to Assets ratio, and Short-Term Debt to Assets ratio. The control variables are Firm Size, Profitability, Tangibility, Asset Utilization, and Growth Opportunity. The arrows show how a particular variable is expected to affect the dependent variables.

Figure 4

Research Model and Findings Diagram



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