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Article

Assessing the Impact of COVID-19 on Capital Structure Dynamics: Evidence from GCC Economies

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Abstract: This study seeks to investigate the potential effects of the recent pandemic (COVID-19) on capital structure dynamics. The Gulf Cooperation Council (GCC) is a fascinating topic for this study because of its distinct economic characteristics. The analysis draws upon a cross-country dataset covering 208 non-financial listed firms across five GCC countries, with data spanning the years 2010 to 2022. Capital structure is a dependent variable and is measured by total debt to equity, equity multiplier, and short-term debt ratios, while the COVID-19 pandemic, firm size growth, return on assets, tangibility, and growth were applied as independent variables. Using the generalized least squares (GLS) method, findings demonstrated that COVID-19 has a significant and positive influence on debt-to-equity and equity multiplier ratios but a negative one on short-term debt ratio. Thus, non-financial firms increased their debt financing and transferred debt from short-term to long-term funding. In addition, firm-specific factors, such as firm size, tangibility, and macroeconomic factors, such as GDP growth, positively and significantly impact capital financing. Conversely, profitability has a negative relationship with financial leverage. There is a lack of empirical research on how COVID-19 affects the financial structure of non-financial listed companies in GCC nations. Consequently, by filling the previously specified gaps, this study provides proof to support the idea of using debt financing to raise capital for economic recovery. GCC policymakers need to give priority to ensuring that firms have convenient access to inexpensive finance in light of the financial consequences caused by COVID-19. This will guarantee that companies have the resources necessary to bounce back and support economic growth.

Keywords: financial leverage; COVID-19; capital structure; GCC countries; non-financial firms

JEL Classification: G01; G32; J11; D24



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1. Introduction

In the last few years, Gulf Cooperation Council (GCC) countries have deepened their financial cooperation with the worldwide economy, especially with the European Union (EU). In 2021, the value of goods traded among the GCC and the EU was €151.5 billion, a 23% rise from 2020 (European Commission 2022). The GCC nations have additionally been making more investments in the EU, mainly in the fields of infrastructure, innovation, technology, and sustainable green energy (Abdmouleh et al. 2015). For instance, using the Public Investment Fund, also known as the “PIF”, Saudi Arabia has spent substantial investments in the EU, such as Uber and SoftBank Corporation. Notwithstanding their advantages in trade and investment and job opportunities, GCC nations are more vulnerable to shifts in the world economy because of their open economic systems (Al-Sartawi 2018).

However, due to global instability as a result of the subsequent effects of COVID-19, firms have to carefully assess their capital structure.

A firm financial structure, which is the combination of debt and equity, is used to acquire assets. It describes the source of financial resources the company employs to build its asset base (Ahmed et al. 2023a). After the seminal work of Modigliani and Miller (1958), discussions about capital structure have become increasingly prevalent. Several hypotheses have been established to investigate the company's capital structure. For instance, trade-off theory contends that firms seek to optimize their value by achieving the right balance between the advantages of tax avoidance and the expenses associated with insolvency (Abdullah and Tursoy 2021), while pecking order theory suggests that companies should prioritize internal funding, primarily retained earnings, for financing before resorting to debt. If this is not enough, debt can be used, followed by equity issuance as a final option (Neves et al. 2024). Agency theory also supports the optimum level of debt to minimize conflict of interests between managers and shareholders, thereby improving firm performance (Ahmed et al. 2023a).

From the empirical ground, several studies in both emerging and emerging economies explain different factors that determine the capital structure dynamic. However, the signaling hypothesis emphasizes crises that change the shape of capital structure (Bae et al. 2017). For example, Jermias and Yigit (2019); Orlova et al. (2020); and Vo (2017) argued that firm-specific factors have a significant effect on firms' capital structure whether positively or negatively. Li and Islam (2019); Liaqat et al. (2021); and Saif-Alyousfi et al. (2020) claimed that decisions regarding financial structure are significantly impacted by both firm-specific and country-specific factors. Melgarejo Duran and Stephen (2020) found that firms tend to increase the level of debt during a crisis. Conversely, Tsuruta (2023) reported that elevated debt in a crisis period can significantly increase the risk of default. Prakash et al. (2023); Turkki (2021); and Nguyen Kim (2023) argued that crises such as COVID-19 have a significant effect on capital structure decisions. The preceding discussion demonstrates that numerous factors influencing firm capital structure differed before and after the COVID-19 pandemic.

The nations of the GCC have recognized the pivotal role that non-financial firms play in their economic success. These nations actively strive to increase the proportion of this sector within their capital markets, acknowledging that these companies offer a diverse range of products and services to consumers while generating profit, contributing to national economic growth (Akkas and Altiparmak 2023; Kingdom of Saudi Arabia Vision (2030) 2018; Ministry of Finance, State of Kuwait 2020; Supreme Council for Planning of Oman 2016). These entities represent the most critical sources of demand for capital within the economy. It is their capital needs that drive the development and expansion of financial activities and the broader financial sector. In addition to providing the framework for the smooth operation of the overall economic structure, non-financial firms improve the operational environment of financial institutions and lower the possible occurrence of risks (Saif-Alyousfi et al. 2020).

Government assistance programs, low interest rates, expansion, and the requirement for instant cash flow all promote debt. On the other hand, leverage above the optimum level is costly and endangers the stability of finances over the long run (Bui et al. 2021). Some companies, especially those in robust industries, were even taking advantage of the crisis to make intelligent acquisitions, which additionally changed their financial policy. Although it is evident that the crisis disrupted the environment of financial decisions, nevertheless, the long-term impacts of the global epidemic on ideal capital levels and managing risks for non-financial firms are still being felt. Therefore, the purpose of this study is to peacefully explain the effect of COVID-19 on capital structure dynamics.

While prior research has shed light on the impact of crises on capital structure determinants (Prakash et al. 2023; Nguyen Kim 2023; Tsuruta 2023; Turkki 2021), a dearth of empirical studies exists regarding the effect of COVID-19 on capital structure within non-financial listed firms in GCC countries. Therefore, by addressing the aforementioned

gaps, this research contributes to the current literature and offers empirical support for the above concept. What distinguishes the GCC from other regions is that most GCC governments have planned Vision 2030; second, they have strong sovereign wealth funds compared to other Middle Eastern countries; and lastly, they have become a destination for investment by foreigners. Hence, this area provides a useful sample for study.

After an informative introduction, this paper reviews the relevant literature and formulates hypotheses. The specifics of the instruments and techniques used are then provided in the materials and methods section. The main results and their interpretation are provided in Section 4. The conclusions are summed up in Section 5 along with some recommendations.

2. Literature Review

2.1. Theoretical Lens

Finance researchers have examined the structure of capital and its factors extensively, but there are still unanswered questions about this contentious subject. [Modigliani and Miller \(1958\)](#), who developed the “capital structure irrelevance” theory, contend that, under certain circumstances, a company’s financing decisions have no bearing on its entire value. However, this theory was suggested based on the assumption that the capital market is efficient, with no agency costs, no information asymmetry, no crisis, no taxes, and no risk of bankruptcy. Five years later, they revised their work with [Kraus and Litzenberger \(1973\)](#) and announced a trade-off theory based on the hypothesis of taxes. According to this theory, the corporate leverage level is calculated by weighing the bankruptcy costs versus the advantages of reducing taxes in borrowing. To maximize corporate value while addressing the crisis, the firm will weigh both the advantages and the disadvantages of bringing on debt concerning tax shields ([Turkki 2021](#); [Ahmed et al. 2023b](#)).

The pecking order theory, as established by [Myers \(1977\)](#) and expanded further by [Myers and Majluf \(1984\)](#), asserts that the volume of information asymmetry influences funding expense. Equipped with confidential knowledge, insiders have a substantial benefit over external parties when comprehending the organization’s actual condition. Moreover, insiders are better informed about the economic value of the firm’s resources. Hence, according to this theory, firms would like to utilize their resources, such as retained earnings, as this prevents issues brought about by asymmetric information. Then, when internal financing is not sufficient, firms tend to use debt over equity as the existence of information asymmetry concerning asset valuation ([Boshnak 2023](#)). This means that firms use equity issuance to fund their investments as a last option ([Anozie et al. 2023](#); [Dang et al. 2021](#); [Ting et al. 2021](#); [Turkki 2021](#)).

Last but not least, [Ross \(1977\)](#) developed signaling theory and posits that firms use their balanced capital structure (debt and equity) to signal future growth prospects to shareholders, even when detailed information for potential investors is limited. The theory also claims that firms that have great prospects for future profits are more inclined to borrow money because they believe that they are capable of paying back the predetermined interest ([Al-Sartawi 2016](#); [Komara et al. 2020](#)). However, as a consequence of the crisis, excessive levels of debt increase risks due to difficulties in predicting future earnings ([Mohammad et al. 2021](#)).

2.2. Hypothesis Construction

Empirical studies consistently link internal firm characteristics and external environmental factors to the capital structure determinants. A synopsis of the empirical research on capital structure and its factors is provided in this part.

2.2.1. Impact of the Crisis on Corporate Debt Levels

Financial distress is the primary concern for corporations during unexpected crises ([Mohammad et al. 2021](#); [Prakash et al. 2023](#)). According to [Sautner and Vladimirov \(2018\)](#) one of the main causes of the differences in level of debt among companies was the costs

associated with bankruptcy proceedings. Signaling theory as elaborated by Ross (1977) argues that in periods of economic instability, such as crisis, companies are less willing to borrow, as they are unable to pay it back. However, the trade-off theory claims that a company will assess the benefits and drawbacks of implementing a debt tax shelter to optimize firm value while dealing with the economic recession (Kraus and Litzenberger 1973; Modigliani and Miller 1963). From empirical evidence, Nguyen Kim (2023) and Prakash et al. (2023) found that financial leverage was inversely affected by the COVID-19 pandemic. D'Amato (2020) and Proença et al. (2014) showed a decrease in debt ratios during the crisis among Italian and Portuguese SMEs. On the other hand, Mouton and Pelcher (2023) and Turkki (2021) claimed that COVID-19 has had a significant and positive effect on capital financing, and Mohd Azhari et al. (2022) and Melgarejo Duran and Stephen (2020) found that crisis, such as COVID-19, has a positive effect on long-term financing only. Huang and Ye (2021) support maintaining debt below optimal levels during economic downturns. The above discussion establishes the first hypothesis as follows:

Hypothesis 1. *COVID-19 significantly affects capital structure.*

2.2.2. Firm Size

In contrast to smaller enterprises, bigger companies typically exhibit greater diversification and have a lower risk of bankruptcy. According to the trade-off theory, larger companies typically have fewer borrowing costs because they are well known in capital markets (Jermias and Yigit 2019). As a result, they employ funding through debt frequently. Various perspectives have reported that firm size plays a significant role in determining its financial structure. Prakash et al. (2023); Barbarski and Holda (2023); Demirgüç-Kunt et al. (2020); Ahmed (2022); and Saif-Alyousfi et al. (2020) found a positive and significant association between firm size and financial structure. Ahmed et al. (2023b) and Vo and Ellis (2017) claimed that firm size affects the connection between financial leverage and performance positively. Considering the crisis, Demirgüç-Kunt et al. (2020); Jermias and Yigit (2019); and Mohd Azhari et al. (2022) evidenced that firm size had a positive effect on financial decisions before and during COVID-19. Demirgüç-Kunt et al. (2020) and Turkki (2021) found a positive relationship between size and long-term debt during COVID-19. However, this connection turned negative for short-term debt, and Nguyen Kim (2023) observed a non-significant linkage between size and financial leverage. Based on the above arguments, the second hypothesis is proposed as follows:

Hypothesis 2. *Firm size significantly affects capital structure.*

2.2.3. Growth

Previous research has examined the connection between capital structure and growth opportunities (Rehan et al. 2023). The relationship between capital structure and growth is complex, with different measurements and theories showing positive, negative, and non-existent relationships (Vo and Ellis 2017). According to the pecking order theory, companies prefer internal funding over external funding. Therefore, they may use debt to cover opportunities when ample development opportunities exist, but internal resources are insufficient. Hence, debt can positively affect growth (Myers and Majluf 1984). However, according to agency theory, debt holders' interests differ from shareholders', which could cause conflicts concerning the best way to allocate resources. Increased leverage could make these disputes more severe, limiting corporate expansion (Jensen and Meckling 1976). From this perspective, a negative association between growth and leverage is observed before and during the crisis (Jermias and Yigit 2019; Khan et al. 2023; Nguyen Kim 2023; Saif-Alyousfi et al. 2020). However, Deviyanti et al. (2023) state that firms could see opportunities to obtain debt as a tool to finance investments or expansion in an environment of recovery from recession. Additionally, Prakash et al. (2023) revealed no meaningful

relationship between growth and leverage ratios. Hence, the fourth hypothesis is proposed as follows:

Hypothesis 3. *Growth significantly affects capital structure.*

2.2.4. Profitability

According to the hypothesis of pecking order, profitable firms typically employ less borrowing because they can generate substantial savings of earnings that can be used to finance their operation in the future (Ahmed et al. 2023b). Conversely, firms that are not profitable must rely on outside financing because they are unable to generate sufficient retained income. According to Jermias and Yigit (2019), firms typically see an enormous fall in profitability throughout an economic downturn, which affects their retained profits. Several investigations show that capital structure positively affects a company's profitability (Abdullah and Tursoy 2021; Adair and Adaskou 2015; Al-Kayed et al. 2014; Heckenbergerová and Honková 2023). Nevertheless, some other studies have found an adverse relationship between capital financing and profitability (Ahmed et al. 2023a; Alhussain and Alsultan 2021; Muhammed et al. 2024; Barburski and Holda 2023; Jouida 2018; Khan et al. 2023; Le and Phan 2017; Sutomo et al. 2020; Vo and Ellis 2017). During the period of economic crisis, a negative and significant association between firm profitability and leverage ratios is found (Jermias and Yigit 2019; Nguyen Kim 2023; Mohd Azhari et al. 2022). Therefore, the third hypothesis is proposed as follows:

Hypothesis 4. *Profitability significantly affects capital structure.*

2.2.5. Tangibility

One of the key firm-specific factors influencing financing decisions is the type of resources the company owns, particularly the presence of tangible assets (Khan et al. 2023). The pecking order and trade-off theories offer contrasting perspectives on the significant impact of tangible asset accessibility on capital structure. According to the pecking order theory, firms with more fixed assets tend to rely less on debt financing (Aras and Mutlu Yildirim 2018). From this perspective, a negative association has been observed between asset tangibility and a firm's capital structure (Mohd Azhari et al. 2022; Serghiescu and Văidean 2014; Shoaib and Siddiqui 2022). However, the trade-off theory posits that firms with more collateral (physical assets) typically utilize greater leverage because these assets can be easily used as collateral to secure debt financing (Hang et al. 2018). Neves et al. (2020, 2024); Nguyen Kim (2023); and Saif-Alyousfi et al. (2020) support the trade-off hypothesis and provide evidence of a positive relationship between asset tangibility and financial structure. Thus, the fifth hypothesis is proposed as follows:

Hypothesis 5. *Tangibility significantly affects capital structure.*

2.2.6. Gross Domestic Product (GDP)

The capital structure of a company is often influenced by external factors, with gross domestic product (GDP) being among the most prevalent. As defined by Samuelson and Nordhaus (2010), GDP represents the total market value of all final goods and services produced within an economy over a specific period. While the link between GDP and capital structure decisions has been explored extensively in the academic literature, the findings remain inconclusive. For instance, Çam and Özer (2022) and Khémiri and Noubigh (2018) argued that since GDP correlates with the firm's growth, therefore, it has a significant influence on determining the financial structure. Nguyen Kim (2023) reported a positive association between GDP and financial leverage. However, other studies have presented contrasting viewpoints (Bokpin 2009), while Mursalin and Kusuma (2017) and Saif-Alyousfi et al. (2020) reported no significant correlation between those variables. Based on the above arguments, the sixth hypothesis is proposed as follows:

Hypothesis 6. *GDP significantly affects capital structure.*

3. Methodology

3.1. Data

Our research analyzes 208 listed non-financial firms over 13 years (2010–2022) across five Gulf Cooperation Council (GCC) nations, including Saudi Arabia, Kuwait, Qatar, Bahrain, and Oman. While the GCC traditionally consists of six members, limitations of data from the United Arab Emirates (UAE) necessitated its exclusion from this study. Financial firms are also excluded from this study due to having different financial systems and their characteristics being different (Jena et al. 2020; Zeitun and Gang Tian 2007). Firm-specific information is sourced from the Thomson Reuters Eikon database, whereas country-specific data are gathered from the official World Bank website. Originally, our initial sample encompassed a wider range of companies; however, our final analysis only considered data from 208 non-financial firms. This reduction was due to inconsistencies in variable definitions and data availability across the broader non-financial sector. Therefore, our final sample comprises 2704 firm-year observations. Table 1 provides details regarding the sample composition broken down by GCC members.

Table 1. Number of observations for each GCC member.

GCC Members	Number of Firms	Observations	Percentage
Saudi Arabia	82	1066	39.42
Kuwait	60	780	28.85
Qatar	23	299	11.06
Bahrain	11	143	5.29
Oman	32	416	15.38
Total	208	2704	100

3.2. Selection of Variables

3.2.1. Independent Variables

Crisis is theorized to significantly impact the reshaping capital structure (Bae et al. 2017). Therefore, this study uses COVID-19 as an independent variable. According to Nguyen Kim (2023), the COVID-19 pandemic caused substantial economic problems, which led to changes in the capital structures of companies. During the early stages of the pandemic, companies relied more on borrowing to obtain enough liquidity (Demirgüç-Kunt et al. 2020). However, the increase in borrowing demonstrates that firms have been searching for quick funding, which may have a beneficial short-term impact on financial structure.

Moreover, to isolate the effect of COVID-19 on capital structure, both firm-specific and macroeconomic factors were included as control variables in the regression models. Theoretically, these factors are considered as the main factors of determining capital financing. Previous studies utilized firm size, growth, profitability, liquidity, age, tangibility, corporate tax, investment opportunities, GDP, inflation and interest rate (Ahmed et al. 2023a; Barburski and Hořda 2023; Khan et al. 2023; Kuč and Kaličanin 2021; Mursalim and Kusuma 2017; Nguyen Kim 2023; Saif-Alyousfi et al. 2020). This study employs firm size, growth, profitability, tangibility, and GDP as factors of capital structure determinants.

3.2.2. Dependent Variables

Capital structure is a dependent variable in this study, and it is defined as a combination of debt and equity (Ahmed et al. 2023b). Prior studies measured capital structure through different metrics, such as the market value of debt, debt to assets, debt to equity, equity multiplier, and short- and long-term debt ratios (Abdullah and Tursoy 2021; Ahmed et al. 2023a; Al-Kayed et al. 2014; Jermias and Yigit 2019; Saif-Alyousfi et al. 2020; Sutomo et al. 2020). Our study measures capital structure through debt-to-equity ratio, equity multiplier ratio, and short-term debt ratio. Table 2 lists the variables that were employed in the empirical examination.

Table 2. Definition of variables.

Variables	Abbreviation	Measurements	Definition	Sources
Dependent Variable	Capital Structure	TDTE	Debt-to-Equity	Ratio of total debt to total shareholders' equity
		EM	Equity Multiplier	Ratio of total assets to total shareholders' equity
		STD	Short-Term Debt	Ratio of short-term debt to total assets
Explanatory Variables	COVID-19	COVID	Dummy	Assuming 0 for the period before COVID-19 and 1 for the period following 2020.
	Firm specific factors	FS	Firm Size	Natural log of total assets
		GROW	Growth	(Current value of sales—Previous value of sales)/Previous value of sales
		ROA	Profitability (Return on Assets)	Ratio of net income to total assets
		TANG	Tangibility	Ratio of fixed assets to total assets
	Macroeconomic factors	GDP	Gross Domestic Product	Rate of annual GDP growth

3.3. Method and Model Specification

This study employed secondary data to perform quantitative analysis and was collected from a broad sample of 208 non-financial companies in five GCC members. To guarantee accuracy and reliability, the dataset was diligently gathered from reliable sources, such as Thomson Reuters Eikon and the World Bank's official website. Data panel regression analysis was employed through the generalized least squares (GLS) cross-section weight method. To assess what factors influence the capital structure of non-financial firms among GCC countries, econometric models were expressed with statistical panel estimation methods.

The Chow test can be used to compare pooled OLS and FE models; if the null hypothesis is disapproved, it suggests that the FE model is more appropriate. After that, the Hausman test helps the researchers to decide between RE and FE models by checking if the RE model estimates are reliable and efficient. The FE model estimation will be determined to be more reliable if this hypothesis is disproved, and then if the result supports random effect, we must add the Breusch–Pagan (LM) test to choose between pooled OLS and RE models by testing if individual effects are truly random and significant. If the null hypothesis is rejected, it suggests that the cross-section pooled OLS method is not suitable.

Moreover, according to Bai et al. (2021); Wooldridge (2010); and Wooldridge (2013), GLS is not affected by first-order autocorrelation, cross-sectional correlation, or heteroskedasticity across panels. The researchers contended that GLS is a more suitable method because it considers issues of homoscedasticity or/and normality. Additionally, the GLS approach is a modified version of the OLS method that performs better with non-normal data and estimates models that contain heteroscedasticity or/and serial correlation issues (Abubakar et al. 2018; Ahmed et al. 2023a; Saif-Alyousfi et al. 2020). Thus, the data panel model with GLS cross-section weight has more accuracy and efficiency of estimation. (Bai et al.

2021; PeiZhi and Ramzan 2020; Saif-Alyousfi 2020). The following equation represents the general econometric model used in this investigation:

$$Y_{it} = \beta_0 + \Sigma\beta X_{it} + E_{it}$$

where Y_{it} denotes the dependent variable, β_0 intercepts β denotes vectors of independent variables, X_{it} denotes the explanatory and control variables, and E_{it} is an error term. Drawing on the variable definitions in Table 2, the dynamic models have the following expressions:

Model 1:

$$TDTE_{it} = \beta_0 + \beta_1 COVID_{it} + \beta_2 FS_{it} + \beta_3 GROW_{it} + \beta_4 ROA_{it} + \beta_5 TANG_{it} + \beta_6 GDP_{it} + E_{it}$$

Model 2:

$$EM_{it} = \beta_0 + \beta_1 COVID_{it} + \beta_2 FS_{it} + \beta_3 GROW_{it} + \beta_4 ROA_{it} + \beta_5 TANG_{it} + \beta_6 GDP_{it} + E_{it}$$

Model 3:

$$STD_{it} = \beta_0 + \beta_1 COVID_{it} + \beta_2 FS_{it} + \beta_3 GROW_{it} + \beta_4 ROA_{it} + \beta_5 TANG_{it} + \beta_6 GDP_{it} + E_{it}$$

This study used GMM or dynamic regression as the robustness test model. GMM is used to ensure a consistent assumption of correlation between the residuals and the lag of the dependent variable.

4. Empirical Results

4.1. Summary Statistics

Table 3 shows descriptive statistics for the variables utilized in the analysis, based on a sample of 208 companies from 2010 to 2022. The mean values of TDTE, EM, and STD are 0.868, 2.432, and 0.113, respectively. This means that non-financial companies in GCC countries use both debt and equity, and their debt levels are below the optimum level. The standard deviation of TDTE is 1.346 with minimum and maximum values of 0.000 and 18.227, respectively. The minimum and highest values of EM are 1.008 and 49.850 with a deviation of 2.433. STD has a standard deviation of 0.115 with a minimum value of 0.000 and a maximum value of 0.711. The arithmetic means of COVID-19, FS, and GROW are (M = 0.231, SD = 0.421, Min = 0.000, and Max = 1.000), (M = 13.431, SD = 2.411, Min = 7.782, and Max = 20.291) and (M = 0.141, SD = 0.987, Min = −1.000, and Max = 35.118), respectively. Profitability that is proxied by ROA has a mean value of 0.046 with a deviation of 0.071. The minimum and highest values are −0.621 and 0.472, respectively. Tangibility and GDP has arithmetic means of (M = 0.659, SD = 0.210, Min = 0.041, and Max = 0.995) and (M = 2.875, SD = 4.349, Min = −8.855, and Max = 19.592), respectively.

Table 3. Descriptive statistics.

Variables	Obs.	Men	Std. Dev.	Min.	Max.
TDTE	2704	0.868	1.346	0.000	18.227
EM	2704	2.432	2.433	1.008	49.850
STD	2704	0.113	0.115	0.000	0.711
COVID	2704	0.231	0.421	0.000	1.000
FS	2704	13.431	2.411	7.782	20.291
GROW	2704	0.141	0.987	−1.000	35.118
ROA	2704	0.046	0.071	−0.621	0.472
TANG	2704	0.659	0.210	0.041	0.995
GDP	2704	2.875	4.349	−8.855	19.592

4.2. Correlations Matrix

This section uses correlation analysis and variance inflation factor (VIF) to investigate the prospect of multicollinearity among the explanatory variables (regressors) in Tables 4

and 5. TDTE, EM, and STD as indicators of capital structure have a positive link with COVID-19, but the relationship is not significant in the case of STD only. FS has a significant and positive influence on TDTE and EM, but a negative on STD. Growth shows a negative connection with all measures of financial leverage, but this connection is significant in the case of EM only. All ratios of debt illustrate a significant and negative correlation with profitability that is indicated by ROA. Asset tangibility positively affects TDTE and EM, and negatively on STD. GDP portrays a negative and insignificant association with TDTE, EM, and STD.

In addition, Wooldridge (2013); Shao (2019); and Yoshikawa and Phan (2003) documented that multicollinearity problems could be present if the degree of relationship among independent (explanatory) variables is greater than 0.7. Based on Table 4, the correlation coefficients between independent variables are less than 0.7, indicating that this study is free from the issues of multicollinearity.

Table 4. Correlation analysis.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) TDTE	1.000								
(2) EM	0.903 ***	1.000							
(3) STD	0.326 ***	0.246 ***	1.000						
(4) COVID	0.119 ***	0.116 ***	0.016	1.000					
(5) FS	0.117 ***	0.075 ***	−0.141 ***	0.024	1.000				
(6) GROW	−0.005	−0.013	−0.040 **	0.007	0.034 *	1.000			
(7) ROA	−0.197 ***	−0.178 ***	−0.161 ***	−0.187 ***	0.145 ***	0.096 ***	1.000		
(8) TANG	0.098 ***	0.002	−0.321 ***	0.026	0.244 ***	0.059 **	−0.097 **	1.000	
(9) GDP	−0.026	−0.029	−0.024	−0.171 ***	0.139 ***	0.095 ***	0.188 ***	−0.025	1.000

Note(s): *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

In addition to the control matrix, we have also explored possible multicollinearity problems using well-known metrics such as the variance inflation Factor (VIF). Studies by Gujarati and Porter (2009); Hair et al. (2013); and Newbold et al. (2013) claimed that finding a VIF greater than 10 and a tolerance lower than 0.2, shows that serious multicollinearity exists among independent variables. As illustrated in Table 5, the maximum value of VIF is 1.12 and the minimum value of tolerance is 0.979. Overall, our study does not appear to have any issues of multicollinearity.

Table 5. Variance inflation factors (VIF).

Variables	VIF	Tolerance
COVID	1.064	0.940
FS	1.120	0.894
GROW	1.022	0.979
ROA	1.110	0.901
TANG	1.091	0.917
GDP	1.084	0.923
Mean	1.081	

Lastly, the Jarque–Bera test has been conducted to check the normality of distributing data for each model. As exhibited in Table 6, the p -value of all models is statistically significant at $\alpha = 1\%$, which indicates that the data is not normally distributed. However, when the research has a large sample size, as this study does, non-normal data distribution is unlikely to be an issue (Ahmad et al. 2022; Elliott and Woodward 2007; Ghasemi and Zahediasl 2012; Kim 2013; Lee et al. 2011).

Table 6. Normality and heteroscedasticity test.

Test (Chi-Square)	Model 1 (TDTE)	Model 2 (EM)	Model 3 (STD)
Jarque–Bera	314.07 ***	959.12 ***	119.02 ***
Breush–Pagan–Godfrey	29.29 ***	17.58 ***	170.25 ***

Note(s): *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

4.3. Diagnostic Test Results

Before we analyze the results of our models, the underlying presumptions that guarantee the accuracy of linear regression must be verified. A set of diagnostic tests, used to evaluate the suitability of fixed effects over random effects models and heteroscedasticity, are presented in the following tables. Table 7 displays the result of the Lagrange multiplier (LM), Chow, and Hausman tests for selecting the suitable model. The Chow test was additionally used to compare the results between OLS and FE models. The p -value is statistically significant (less than 5%), suggesting that the FE model is demonstrably more suitable. Then, the Hausman test is used to compare between the RE and FE models, and the result shows that the p -value is less than 5%, which rejects the null hypothesis of the RE model and states that the FE model is more robust. However, the picked FE method does not pass the heteroscedasticity test, as demonstrated in Table 6. Therefore, FE is not a perfect model in this study. More precisely, there is a serial correlation in the residuals and heteroscedasticity (different error variance) produced by the picked FE method. This study used a fixed effect model with the GLS cross-section weight method instead of the standard FE estimator to address these limitations. According to [Abubakar et al. \(2018\)](#); [Bai et al. \(2021\)](#); [Ahmed et al. \(2023a\)](#); [Saif-Alyousfi et al. \(2020\)](#); and [Saif-Alyousfi \(2020\)](#), the GLS approach is a modified version of the OLS method that performs better with non-normal data and estimates models that contain heteroscedasticity or/and serial correlation issues.

Table 7. Data panel model selection.

Panel Data Selection Test	Model 1 (TDTE)	Model 2 (EM)	Model 3 (STD)	Result
Chow test (pooled vs. FE)	1645.3 ***	1475.8 ***	1365.4 ***	Fixed effect
Hausman test (FE vs. RE)	46.22 ***	19.01 ***	121.65 ***	Fixed effect
Lagrange multiplier test (pooled vs. RE)	34.81 ***	31.95 ***	45.02 ***	Random effect

Confidence level * ($\alpha = 10\%$), ** ($\alpha = 5\%$), *** ($\alpha = 1\%$).

4.4. Results

The findings from data panel regression with GLS cross-section weight and dynamic panel regression analysis as robustness test are presented in Table 8. First, the COVID-19 pandemic significantly and positively affects TDTE and EM with coefficients of ($\beta = 0.088$; sig. < 0.01) and ($\beta = 0.177$; sig. $< 0.01\%$), respectively, while weakly negative on STD with coefficients of ($\beta = -0.005$; sig. < 0.01) among listed non-financial companies in GCC countries. Providing that no other variables change, this implies that a one-unit rise in COVID-19 results in a 0.088 and 0.177 unit increase in TDTE and EM, respectively, and in STD of 0.005, in ascending order. This may be because non-financial firms in the GCC probably raised their debt funding and transferred debt from short-term to long-term financing during COVID-19 because they needed liquidity to guarantee long-term financial stability during an uncertain economy.

Second, firm size has a strong and positive effect on TDTE, EM, and STD, with coefficients of ($\beta = 0.574$; sig. < 0.01), ($\beta = 0.615$; sig. $< 0.01\%$), and ($\beta = 0.037$; sig. < 0.01), respectively among listed non-financial companies in GCC countries. Providing that no other variables change, this indicates that a one-unit rise in FS results in a 0.574, 0.615, and 0.037 unit increase in TDTE, EM, and STD, respectively. According to these findings, bigger companies in the GCC tend to rely more on borrowing to expand their business. This might be the result of easier access to debt markets, a greater demand for funding to support future investments, or an intention to possibly take advantage of tax shields.

Table 8. Results of data panel regression.

Variables	Model 1 (TDTE)		Model 2 (EM)		Model 3 (STD)	
	Coef. GLS (Fixed Effect Model)	Coef. GMM	Coef. GLS (Fixed Effect Model)	Coef. GMM	Coef. GLS (Fixed Effect Model)	Coef. GMM
C	−7.222 *** (0.555)	−3.040 ** (1.420)	−6.129 *** (0.845)	−1.269 (2.546)	−0.361 *** (0.055)	−0.177 (0.123)
COVID	0.088 *** (0.018)	0.082 (0.063)	0.177 *** (0.032)	0.261 * (0.150)	−0.005 *** (0.002)	−0.004 (0.003)
FS	0.574 *** (0.042)	0.245 ** (0.101)	0.615 *** (0.063)	0.197 (0.196)	0.037 *** (0.004)	0.019 ** (0.009)
GROWTH	−0.008 (0.006)	0.002 (0.021)	0.001 (0.008)	−0.001 (0.043)	−0.0001 (0.0005)	0.000 (0.001)
ROA	−1.390 *** (0.149)	−2.772 *** (0.669)	−2.100 *** (0.252)	−4.561 *** (1.480)	−0.111 *** (0.019)	−0.167 *** (0.035)
TANG	0.626 *** (0.122)	0.307 (0.393)	0.501 *** (0.147)	−0.069 (0.630)	−0.028 *** (0.061)	−0.051 ** (0.023)
GDP	0.006 *** (0.001)	0.009 (0.006)	0.008 *** (0.002)	0.011 (0.012)	0.001 *** (0.0002)	0.0007 * (0.0003)
TDTE_lag1		0.592 *** (0.086)				
EM_lag1				0.510 *** (0.146)		
STD_lag1						0.591 *** (0.045)
R-Square	0.816	0.686	0.822	0.626	0.804	0.774
Adjusted R-Square	0.801	0.657	0.807	0.591	0.787	0.752
F-statistic	51.88		54.308		48.12	
Prob.	0.000		0.000		0.000	
Obs	2704	2496	2704	2496	2704	2496

Note(s): confidence level * ($\alpha = 10\%$), ** ($\alpha = 5\%$), *** ($\alpha = 1\%$); parentheses is standard error.

Third, as illustrated in Table 8, growth affects TDTE and STD negatively, and positively impacts EM. However, these relationships are statistically insignificant. This means that changes in growth do not necessarily lead to changes in capital structure among listed non-financial companies in GCC countries.

Fourth, profitability, proxied by ROA, significantly and negatively impacts capital structure in all models with coefficients of ($\beta = -1.390$; sig. < 0.01) for TDTE, ($\beta = -2.100$; sig. < 0.01%) for EM and ($\beta = -0.111$; sig. < 0.01) for STD. Providing that no other variables change, this indicates that a one-unit rise in ROA leads to a 1.390, 2.100, and 0.111 unit decrease in TDTE, EM, and STD, respectively. This negative connection indicates that firms with higher profitability generate their internal financing. These earnings could be invested in the company, which eliminates the demand for higher levels of debt.

Fifth, the results also show that tangibility has a significant and positive correlation on TDTE and EM with coefficients of ($\beta = 0.626$; sig. < 0.01) and ($\beta = 0.501$; sig. < 0.01%), respectively, while negatively affecting STD with coefficients of ($\beta = -0.028$; sig. < 0.01) among listed non-financial companies in GCC countries. Providing that no other variables change, this implies that a one-unit rise in tangibility leads to a 0.626, and 0.501 unit increase in TDTE and EM, respectively, and on STD of 0.028 in ascending order. This implies that firms are more inclined to utilize long-term loans if they have more tangible assets.

Sixth, GDP has a weakly positive but significant influence on TDTE, EM, and STD with coefficients of ($\beta = 0.006$; sig. < 0.01), ($\beta = 0.008$; sig. $< 0.01\%$), and ($\beta = 0.001$; sig. < 0.01), respectively. Providing that no other variables change, this indicates that a one-unit rise in GDP leads to a 0.006, 0.008, and 0.001 unit increase in TDTE, EM, and STD. According to this finding, a stronger economy, such as the “GCC economy”, could provide greater business opportunities, enabling companies to rely on more debt to grow. Table 9 gives a synopsis of testing the hypotheses.

Moreover, this study uses GMM for a robustness test. GMM is used to ensure a consistent assumption of correlation between the residuals and the lag of the dependent variable, and the result of GMM in Table 8 shows variables FS, ROA, and TDTE_lag1 affecting TDTE. Apart from that, COVID, ROA, and EM_lag1 influence EM. Additionally, FS, ROA, Tang, GDP, and STD_lag1 influence STD. Although the direction of influence in the fixed-effects GLS matches the significant GMM results, the fixed-effects GLS has a greater adjusted R-squared and finds more significant independent variables. As a result, the fixed-effects GLS results appear to provide a stronger justification and are more suitable to answer the research questions in this study. To sum up, these findings show that COVID-19 pushed GCC non-financial firms to take on more total debt but borrow less for short-term needs. Larger and more profitable firms were more likely to use debt financing, while growth plans did not seem to affect their decision. Firms with tangible assets (physical assets) leaned towards long-term debt, and a healthy economy meant firms borrowed more overall. These results fit well with established financial theories, such as trade-off and pecking order theory.

Table 9. Test of hypotheses.

Hypothesis	Results
H1. <i>COVID-19 significantly affects capital structure.</i>	Accepted
H2. <i>Firm size significantly affects capital structure.</i>	Accepted
H3. <i>Growth significantly affects capital structure.</i>	Rejected
H4. <i>Profitability significantly affects capital structure</i>	Accepted
H5. <i>Tangibility significantly affects capital structure.</i>	Accepted
H6. <i>GDP significantly affects capital structure.</i>	Accepted

4.5. Discussion

This study examined how the COVID-19 epidemic affected the capital structure of non-financial listed companies in the Gulf Cooperation Council (GCC). The results offer novel and insightful perspectives on the debt and equity financing strategies employed by these companies.

The COVID-19 pandemic has caused a significant change in financing methods. It was found that non-financial companies in GCC countries were more dependent on debt during the crisis period, especially long-term obligations. This implies that in times of economic uncertainty, liquidity should come first to guarantee long-term finances. Hence, the first hypothesis, that COVID-19 significantly affects capital structure, is accepted and in line with some aspects of trade-off theory, which claims that companies measure the advantages of debt concerning the costs associated with bankruptcy (Abdullah and Tursoy 2021; Ahmed et al. 2023a). These results are consistent with the work of Huang and Ye (2021); Melgarejo Duran and Stephen (2020); Mouton and Pelcher (2023); Mohd Azhari et al. (2022); and Turkki (2021).

The importance of the size of the company is also highlighted in this investigation. Increasing debt levels were discovered in bigger companies. Companies that are bigger have more access to the financial markets and have a greater demand for capital in order to make more investments. They may also have greater success in utilizing the tax advantages connected to financing through debt. Therefore, the second hypothesis, that firm size

significantly affects the capital structure, is accepted and supported by the trade-off theory, which argues that bigger companies may be seen as safer and more trustworthy, which could tip the scales toward the direction of a moderate level of using debt as they develop (Abdullah and Tursoy 2021; Jermias and Yigit 2019). These results are also similar to the findings of Barburski and Hołda (2023); Demirgüç-Kunt et al. (2020); Jermias and Yigit (2019); Mohd Azhari et al. (2022); Prakash et al. (2023); and Saif-Alyousfi et al. (2020).

Moreover, leverage is not significantly determined by prospects for future growth and rejects the third hypothesis that growth significantly affects capital structure. The findings are similar to the results of Prakash et al. (2023) and contradict the work of Jermias and Yigit (2019) and Saif-Alyousfi et al. (2020).

Another important aspect impacting the financial structure is profitability. The analysis shows that profitability and indicators of capital structure are inversely correlated. This suggests that more profitable firms choose internal funding sources such as retained earnings and depend less on outside funding to finance their operations. Therefore, the fourth hypothesis, that profitability significantly affects capital structure, is accepted and in line with pecking order theory, which argues that firms need to follow a hierarchy system of funding, providing internal sources such as retained income priority across loans. If internal sources are not sufficient, borrowing might be the next option, followed by the issuance of equity (Ahmed et al. 2023a; Neves et al. 2024; Sutomo et al. 2020). The study results are also supported by the previous findings of Alhussain and Alsultan (2021); Barburski and Hołda (2023); Jermias and Yigit (2019); Jouida (2018); Khan et al. (2023); and Nguyen Kim (2023).

Tangibility had a crucial role in determining capital structure. Long-term borrowing is preferred by companies with more tangible assets (more physical assets). This shows that physical assets may be employed as collateral because companies with more of them tend to utilize borrowing on a long-term basis. In other words, tangible resources have a higher value than intangible resources during bankruptcy. Firms with greater physical assets may decrease the cost of debt by using them as a form of security when implementing debt financing. The above discussion accepts the fifth hypothesis that tangibility significantly affects the capital structure and, supported by trade-off theory, argues that firms with more tangible assets typically utilize greater levels of debt, as these assets can be easily used as collateral to secure debt financing. These results are also similar to the findings of Barburski and Hołda (2023); Demirgüç-Kunt et al. (2020); Jermias and Yigit (2019); Hang et al. (2018); and Saif-Alyousfi et al. (2020).

Finally, the analysis discovers that GDP has a weak but favorable impact on each of the three capital formation metrics. This implies firms may take on greater debt to support expansion in an economic recovery. Hence, the sixth hypothesis, that GDP significantly affects capital structure, is accepted and consistent with the findings of Çam and Özer (2022); Khémiri and Noubbigh (2018); and Nguyen Kim (2023), which claim a thriving economy makes it easier for firms to finance debt.

Overall, the present investigation clarifies the effect of COVID-19 and other factors on capital structure among listed non-financial firms in the GCC nations. These corporations predominantly handle their funding through equity and debt because of the COVID-19 epidemic, firm size, profitability, asset tangibility, and economic growth. This study provides insightful information that financial managers, investors, and policymakers in the GCC area may use to make well-informed decisions.

5. Conclusions

GCC nations play a significant role in international trade and have distinctive economic features. Developing knowledge of their companies' financial choices is essential to encouraging economic expansion and possibly providing substitute models for optimizing capital structure. To the best of our knowledge, few studies have explored how COVID-19 affects firms' decision-making processes regarding capital financing. This paper aims to empirically investigate the effect of COVID-19 on capital structure among listed non-financial

firms in GCC countries during the period from 2010 to 2022. To accomplish the objective of the study, three econometric models with an estimation based on generalized least squares (GLS) were applied.

The findings demonstrated that COVID-19 had a positive and significant impact on TDTE and EM but had a negative on SDT. Firm-specific factors, such as FS, GROW, and TANG, had a significant and favorable relationship with capital structure, while ROA as a measure of profitability inversely affects the structure of firm capital. GROW was found to not affect capital financing significantly. Macroeconomic factors, such as GDP, had a weakly positive but significant influence on capital structure proxies. Overall, non-financial companies in the GCC probably increased their debt financing and transferred debt from short-term to long-term financing during COVID-19 because they needed liquidity to guarantee long-term financial stability during an uncertain economy. The above findings are consistent with both trade-off and pecking order theory and offer new empirical results on how COVID-19 has affected capital structure among listed non-financial firms in GCC countries.

Although the COVID-19 pandemic clearly had an influence on GCC firms, there is a surprising twist in how it affected their financial structure. However, this sort of behavior poses a difficulty for policymakers seeking to promote recovery from the pandemic. Firms may be reluctant to make investments for future expansion owing to persistent economic volatility, even though they promote long-term survival via borrowing. By investigating other funding possibilities outside of typical loans from banks, policymakers in the Gulf Cooperation Council (GCC) may play a significant role in promoting investment. A more extensive and easily available corporate bond market may offer a financially advantageous option for companies wishing to raise finance for long-term development, eventually facilitating a more fluid economic recovery in the area.

Like other studies, this research has some limitations. First, this study used data from listed companies, therefore, future studies can examine data from non-listed companies to see whether similar results exist. Second, this study measured capital structure based on the book value of debt. Future work must use debt ratios at the market level. Third, future research could also explore the effect of COVID-19 on capital structure through the lens of agency costs. Finally, research indicates that the pandemic's impact on firms' funding decisions differs between economies. This is probably due to the fact that certain nations depend more on funding from debt than others. Thus, it would be beneficial for future studies to investigate how distinct national attributes impact corporate funding choices in times of global crisis.

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