Capital Structure, Firm Performance and Risk Exposure: New Evidence from OECD Countries

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Optimal capital structure is a key tool to take advantage of the trade-off between firm performance and risk. Based on this, we examine how optimal capital structure influences corporate performance and risk exposure. We use a strong-balanced panel of 3,344 firm-year observations from 10 different OECD countries for 2006–2016. Results reveal that firms having short-term debt normally experience high accounting-based performance while lowering market-based performance, firms using long-term and total debt are largely exposed to decreased accounting and market-based performance. The higher the long-term and total debt, the greater the chances that firms become vulnerable to insolvency risk. Findings are robust across alternative indicators of capital structure, firm performance and risk, alternative model development and the two-step system GMM estimator to control endogeneity issues. This research will be of importance to firm managers and policymakers in designing an appropriate capital structure for maximizing firm performance while minimizing debt-taking risks.

Key Words: capital structure, performance, risk, Organization for Economic Cooperation and Development (OECD)
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Introduction

Capital structure is a vital corporate financing decision for making a trade-off between financial benefits, non-financial benefits and debt-

taking costs (Nazir, Azam, and Khalid 2021). Financial benefits refer to the increases in a firm's profitability, while the non-financial benefits indicate tax-shield advantage as well as investors' favourable perceptions and attitudes regarding the firm's investment competitiveness (Papangkorn et al. 2021). The financial and non-financial benefits are, together, termed as the indicators of firm performance (Alkurdi 2022; Li, Niskanen, and Niskanen 2018). The debt-taking cost, in contrast, is the severity of experiencing operational losses by the firm and the probability that it is exposed to bankruptcy risk (Nazir, Azam, and Khalid 2021). The operational losses and bankruptcy are combinedly coined as firm risk indicators (Jiang et al. 2020). An optimal capital structure is a point where firms can take advantage of this trade-off by maximizing firm performance and minimizing the associated firm risks (Abdullah and Tursoy 2021). Thus, a natural research question arises: How much debt and equity firms should maintain in order to reach an optimal capital structure to make this trade-off? Until now, this research question has not widely been investigated in the corporate finance literature.

Motivated by this important research gap, the significance of optimal capital structure in attracting risk-averse investors, and the differential effects that the optimal capital structure has on firm performance and firm risk exposure, we have performed this study. Our study investigates the influences of optimal capital structure on the corporate performance and risk exposure of the listed firms of ten different OECD countries for the time span of 2006 to 2016. Moreover, the foundations of this study rely on three established corporate finance theories, namely agency cost theory, pecking order theory, and trade-off theory. As per the agency cost theory, an optimal capital structure puts pressure on the firm managers to act in the best interests of the stakeholders, thereby minimizing the firm's agency costs (Danso et al. 2020). The pecking order theory states that firms should finance their projects using their internally retained earnings at first as it is free from information asymmetry (Abdullah and Tursoy 2021). In the case where additional funding is needed, firms should turn to debt financing. Lastly, firms should issue equity to address the remaining capital requirements. The trade-off theory argues that the optimal capital structure helps in balancing the tax-shield advantage of debt and the severe cost of debt (Khoa and Thai 2021). Under this theory, firms prefer to use more debt, owing to the advantage of the tax shield.

The contributions of the study are fourfold. First, earlier studies have concentrated on exploring the effects of optimal capital structure on a

firm's performance using only accounting-based performance metrics such as return on assets and return on equity. For instance, Abdullah and Tursoy (2021) confirm a positive association between capital structure and firm performance, as measured by the return on asset and return on equity. In contrast, Nazir, Azam, and Khalid (2021) report an inverse relationship between capital structure and the firm's profitability performance, as measured by return on asset and net profit margin. Li, Niskanen, and Niskanen (2018) portray similar evidence but moderate the capital structure-firm performance relationship using the financial crisis. Our study differs from its predecessors by examining the capital structure-firm performance relationship using both accounting and market-based firm performance metrics. Specifically, rather than focusing only on return on asset and return equity, this study employs Tobin's Q as a measure of market performance in studying capital structure-firm performance association. These two measures, together, provide a comprehensive proxy of firm performance that measures not only financial profitability but also investors' attitudes and perceptions regarding the firm's future growth and investment opportunities.

Our study further employs a comprehensive firm risk perspective in relation to capital structure. Specifically, both operational and bankruptcy risk proxies are used for examining the role of optimal capital structure in minimizing firms' financial risks, which have not hitherto been examined in prior corporate finance studies (Abdullah and Tursoy 2021). Second, while preceding studies use data up to 2013, this study extends the dataset to 2016 to include a more comprehensive extent of the aforementioned relationship. Third, unlike previous studies on capital structure, we investigate sixty-four diverse industries of ten developed countries that belong to the Organization for Economic Cooperation and Development (OECD). This broad examination allows us to form a comprehensive understanding of the financial structure, corporate performance and risk exposure of these developed countries. Fourth and finally, this study applies an econometric methodology of panel regression estimation using alternative measures of optimal capital structure. This methodology addresses the probable endogeneity issue of debt financing, firm performance and firm risk relationship using firm-fixed effects and the two-step system GMM approach. Overall, our study is unique and distinct from the previous studies in this corporate finance literature with regard to both theoretical and empirical contributions.

This study reveals that short-term debt positively influences firms'

accounting-based performance measures (Return-on-asset and Return-on-equity) while long-term and total debt negatively impact both the firm's accounting and market-based performance measures (Return-on-asset, Return-on-equity and Tobin's Q). Moreover, the long-term and total debt significantly contribute to enhancing the firm's insolvency risks, while short-term debt increases operational risks. This study's findings reinforce that short-term debt contributes to the financial profitability performance of the listed OECD firms by reducing information asymmetry and agency conflicts between the firm's shareholders and managers. Since the listed firms of these countries have low growth, they should avoid long-term and total debt financing owing to the chances of being bankrupt. The current research, however, reveals that though short-term debt financing is enhancing financial profitability, it further brings associated operational risks for the firms. The outcomes of the research may be useful for the firm managers, owners and policymakers in developing an optimal capital structure conducive to enhancing the firm's financial performance and reducing risk exposure.

The remainder of the paper is organized as follows. Section 2 represents prior studies and related hypotheses. Section 3 shows the study methodology and preliminary analysis. The panel regression model for the capital structure and the related model results are presented in section 4. Sections 5 and 6 end with the additional tests and conclusions of the study.

Extant Literature and Hypotheses Formulation

CAPITAL STRUCTURE AND FIRM PERFORMANCE

Capital structure is defined as the mixture of a variety of funding sources to maintain optimal funds for financing a firm's projects (Farhan et al. 2020). It is the combination of debt and equity that the firm adopts for financial operations and business growth (Dao and Ngoc Ta 2020; Ojonta, Obodoechi, and Ugwu 2021). The capital structure aims to maximize the firm's financial value and minimize the overall cost of capital (Chadha and Sharma 2015). In this regard, financial value refers to the firm's performance on profitability metrics as well as investment competitiveness within the industry (Abdullah and Tursoy 2021). Profitability metrics are the yielding of financial gains as measured by financial statement-based data such as return on asset, return on equity, basic earning power and so on (Sheikh and Wang 2013). On the other hand, investment competitiveness is the firm's ability to shape investors' attitudes and perceptions in

a positive way and generate their interest to invest in the firm's business (Jamadar et al. 2022). Earlier literature resorts to several theories in explaining the capital structure-firm performance relationship. MM theory, agency cost theory, pecking order theory, trade-off theory and signalling theory are some of the prominent ones (Dao and Ngoc Ta 2020). Following previous literature, this study picks up the agency cost theory, pecking order theory and trade-off theory to develop the grounds of the study.

As per the agency cost theory, an optimal capital structure plays a significant role in decreasing agency costs between shareholders (agents) and managers (principals) of a firm (Li, Niskanen, and Niskanen 2018). More precisely, financing through debt puts pressure on managers to focus more on stakeholders' benefits that contribute to the reduction of the firm's agency cost (Yazdanfar and Öhman 2015). Thus, firms choose to employ debt financing in order to mitigate agency conflict between managers and shareholders, which brings enhanced firm value (Sheikh and Wang 2013). The theory further suggests that debt financing through issuing short-term debt instead of long-term debt plays a more dominant role in resolving agency conflicts and enhancing firm value (Myers 1977). Prior empirical studies support this theoretical assertion and confirm that short-term debt financing is positively associated with the firm's value as measured by the profitability metrics (Ayaz, Zabri, and Ahmad 2021; Singh and Bagga 2019). Therefore, this study hypothesizes that:

H1a *Short-term debt financing is positively associated with the profitability of the firms of OECD countries as measured by financial statement-based data.*

The agency cost theory further draws on the stock-based firm performance metric 'Tobin's Q' in analysing the impacts of capital structure on firm value. The previous empirical stance highlights this theoretical assertion and shows that short-term debt financing is negatively related to the market-based firm performance indicator 'Tobin's Q' (Mehmood, Hunjra, and Chani 2019; Olajide, Funmi, and Olayemi 2017). Thus, this study hypothesizes that:

H1b *Short-term debt financing is negatively associated with the with the profitability of the firms of OECD countries as measured by market-based data.*

Regarding long-term debt financing, it is found that long-term debt involves high fixed costs and relatively larger out-of-pocket costs (Dalbor and Upneja 2002). Moreover, long-term debt involves more risks as

it facilitates transferring wealth to stockholders (Moradi and Paulet 2019). Owing to these shortcomings, owners and managers of low-growth firms do not prefer to finance their profitable projects by employing external risky capital sources (Yazdanfar and Öhman 2015). This notion is consistent with the theory of pecking order which states that firms should first go for internal financing in raising capital rather than external capital financing (Myers and Majluf 1984). If internal financing falls short of investment, firms should look for low-risk debt financing (Li, Niskanen, and Niskanen 2018). Thus, the theory suggests that having more long-term debt obstructs firm performance, whether measured by accounting-based or stock-based metrics. The theory further sheds light on total debt financing sources by depicting an inverse relationship with firm performance. Based on this theoretical stance, we can state that:

H2 *Long-term debt financing is negatively related to the firm performance of* OECD *countries as measured by accounting or marker-based data.*

H3 *Total debt financing is negatively related to the firm performance of* OECD *countries as measured by accounting or marker-based data.*

CAPITAL STRUCTURE AND FIRM RISK

Firm risk plays a crucial role in the decision of capital structure (Dao and Ngoc Ta 2020). Those firms who are likely to have higher business risk exposure have less ability to undertake financial risks, thereby preferring less debt financing (Kim and Sorensen 1986). A number of corporate finance theories assert the presence of an inverse relationship between capital structure and firm risk. For instance, the trade-off theory suggests that high-risk firms should not be highly levered due to the probability of being in default (Khoa and Thai 2021). The pecking order theory (POT) provides a more precise stance on the capital structure-firm risk relationship. As per the theory, higher volatility in earnings increases the chance that a firm will become bankrupt (Li, Niskanen, and Niskanen 2018). This bankruptcy presents the firm with low creditworthiness likely to obtain debt (Alipour, Mohammadi, and Derakhshan 2015). Thus, bankruptcy or insolvency risk increases with the undertaking of more debt financing. However, more profitable firms have lower exposure to insolvency risk which has led them to employ higher debt financing (Li, Niskanen, and Niskanen 2018). Moreover, high debt financing brings more opportunities for firms to exploit interest tax breaks (Viviani 2008). Based on this argument, we posit that:

H4 *Firms' capital structure and insolvency risk in* OECD *countries are positively associated with each other.*

The pecking order theory suggests a positive relationship between capital structure and operating risk (Viviani 2008). According to the theory, the lower variability in net profit enables firms to rely more on retained earnings and less on external financing (Alipour, Mohammadi, and Derakhshan 2015). As a result, firms need not boost their projects through debt financing. The reduction of debt financing brings a decreased level of operating risks for firms. Earlier studies also reflect this theoretical stance through empirical estimations and confirm the negative association between debt financing and a firm's operational risk (Abor and Biekpe 2009; Sheikh and Wang 2011). Based on these theoretical foundations and empirical evidence, this study posits that:

H5 *Firms' capital structure and operational risk in* OECD *countries are positively associated with each other.*

Methodology

STUDY SAMPLE AND DATA

The purpose of the study is to explore how capital structure impacts firm performance and risk-taking behaviour. The study sample consists of listed firms from 10 different European countries, namely Denmark, Spain, Finland, France, Germany, Italy, Norway, Portugal, Sweden and the United Kingdom. Precisely, a total of 295 firms and 3344 firm-year observations have been considered. These countries are included in the sample in consideration of their homogeneous and comparable economic development. All of the countries are members of the OECD who have experienced similar inflation rates, interest rates, per capita GDP and discretionary income. However, these countries differ in terms of the development of financial and banking systems, the legal regulatory environment and corporate operations. This sample selection pattern coincides with the study of Vallelado and Saona (2011). Our study sample is dominated by firms from the United Kingdom, with the highest number of firms at 85 (table 1). France and Germany subsequently occupy the second and third positions.

Earlier 'capital structure' research covered periods up to 2013 (Chadha and Sharma 2015; Li, Niskanen, and Niskanen 2018). This study aims to fill the prior research gap and contribute to the existing capital structure literature by considering subsequent periods. Therefore, the study

TABLE 1 Sample Countries, Number of Firms and Firm-Year Observations

Country	(1)	(2)	(3)	Country	(1)	(2)	(3)
Denmark	17	187	11.00	Italy	21	242	11.52
Spain	27	308	11.40	Norway	22	253	11.50
Finland	23	264	11.47	Portugal	14	165	11.78
France	33	374	11.33	Sweden	25	286	11.44
Germany	28	319	11.39	United Kingdom	85	946	11.13

NOTES Column headings are as follows: (1) number of firms, (2) observations, (3) observations per firm. Total 295 firms (3344 observations). Based on data sourced from Thomson Reuters Eikon (https://eikon.thomsonreuters.com).

starts with 2006 and ends with the year 2016. However, the study does not consider recent time frames (2017–2021), owing to the unavailability of relevant firm-level data. The total data set comprises 295 firms from 64 diverse industries. However, industry-wise detailed information has not been considered in this research. The capital structure perspective is extensively examined using only firm-level data from 10 OECD countries. Overall, the study sample consists of debt, financial and risk-related information sourced from Thomson Reuters Eikon.

CAPITAL STRUCTURE MEASURES

Our study considers short-term debt, long-term debt, total debt and leverage as the measures of a firm's capital structure. The short-term debt ratio (STD_{it}) is calculated as the short-term debt over total assets (Hussain et al. 2020). Firms with higher STD_{it} are likely to undergo continuous renegotiations that may result in credit supply shock and financial difficulties (Vallelado and Saona 2011). The long-term debt ratio (LTD_{it}) is measured as the long-term debt to total assets (Hussain et al. 2020). Bigger firms in developed countries prefer to have more LTD_{it} since they have an effective legal system in place (Yazdanfar and Öhman 2015). The total debt ratio (TTD_{it}) is calculated as the total debt over the total asset (Moradi and Paulet 2019). TTD_{it} is the sum of long-term debt and interest-bearing short-term debt. In calculating total debt, non-interest-bearing liabilities (deferred tax, accounts payable and accrued liabilities) are not given any consideration.

This study further controls for firm size, growth, intangibility and ownership structure. Firm size ($SIZE_{it}$) is calculated by taking a logarithmic transformation of total firm assets, Growth ($GROWTH_{it}$) denotes the %

change in a firm's sales in a particular year (Abdullah and Tursoy 2021); intangibility ($INTANG_{it}$) is the ratio of total intangible assets to total equity (Margaritis and Psillaki 2010) and ownership concentration (OWN_{it}) is the average of shares owned by the major stakeholders of the firms (Hussain et al. 2020).

FIRM PERFORMANCE MEASURES

Our study classifies firm performance measures into two broad categories, namely accounting-based performance measures and market/stock-based performance measures. Accounting-based performance measures refer to the firm's financial profitability in a particular year, while market-based performance measures indicate shareholders' expectations regarding the firm's current and future financial operations (Papangkorn et al. 2021). Our study concentrates on two accounting-based performance measures following Khan, Al-Jabri, and Saif (2021), namely Return on asset (ROA_{it}), Return on equity (ROE_{it}) and one market-based measure including Tobin's Q (TQ_{it}). The ROA_{it} is calculated by taking the ratio of the firm's net profit after tax to the total reported assets. The ROA_{it} exhibits the firm's efficiency in generating a net profit by utilizing the firm's total assets. The ROE_{it} is the ratio of the firm's net profit after tax to the total shareholder's equity. It measures how much returns or earnings a firm is offering to its shareholders. Tobin's Q (TQ_{it}), the market-based measure, is obtained by summarizing the market value of stocks and the book value of debt divided by the book value of total assets. It represents the firm's position in terms of its replacement cost. TQ_{it} measures the firm's stance on competitive advantage and dynamism. A TQ_{it} value >1 suggests that firms have higher investment opportunities, growth potential and systematic resource management capabilities.

FIRM RISK MEASURES

Our study considers the operational and insolvency risk exposure of the listed European firms. Asset return volatility (ARV_{it}) is used as the proxy measure of operational risk, following Psillaki and Daskalakis (2009) and Alipour, Mohammadi, and Derakhshan (2015). This is calculated as the standard deviation of return on assets over a 5-year overlapping window. This study further uses an additional measure of operational risk, namely stock return volatility (SRV_{it}), following Sun and Chang (2011). This is measured as the standard deviation of the daily stock return multiplied by the square root of the trading day number in a financial year. The higher

the asset return or stock return volatility, the greater the severity of the firm's operational risk exposure. The insolvency risk is proxied by *Z*-score ($Zscore_{it}$), following Kumar, Colombage, and Rao (2017). It is the ratio of the summarization of ROA and capital-to-asset divided by the asset return volatility. $Zscore_{it}$ is an inverse measure of the firm's risk. This study takes the natural logarithmic transformation of the *Z*-score in order to remove the influences of skewness and outliers. This transformation coincides with the study of Laeven and Levine (2009).

ANALYSIS

Descriptive Statistics

The descriptive information of the variables relating to firm performance, risk, capital structure and firm-level control variables is shown in table 2. Accounting performance is measured by the ROA_{it} and ROE_{it}. These variables deviate considerably across 3344 firm-year observations from –0.395 to 1.343. The market-based performance variable, TQ_{it}, ranges from 0.68 to 7.45. Both accounting and market-based measures of firm performance have significant variations within the data range, as indicated by their descriptive statistics in table 2. The operational and insolvency risk measures have considerable differences in their mean values, with $Zscore_{it}$ having a mean value >3. The implication is that firms within the industries are less likely to have insolvency risk exposures. Regarding the capital structure variables, the LTD_{it} ratio is found to be higher than STD_{it} and TTD_{it} across the sampled firms. Furthermore, the firms in the study have an average $SIZE_{it}$ of 23. The year-to-year percentage change in firm sales ($GROWTH_{it}$) is around 3.7%. With an $INTANG_{it}$ ratio of 32.1%, the sampled firms are offering a good source of collateral to the lenders. Lastly, the percentage of shares held by individual shareholders is ±30%, indicating high ownership concentrations (OWN_{it}) for the sample firms.

Correlation Matrix

This section covers the Pearson Correlation analysis of the study variables (table 3). The matrix finds that both accounting and market-based 'Firm Performance' measures (ROA_{it}, ROE_{it}, TQ_{it}) at a 10% level are inversely associated with the firm's capital structure as measured by STD_{it} and LTD_{it}. This inverse relationship is also observed when the capital structure of the sampled firms is measured by TTD_{it}. This offers a source of robustness regarding the capital structure-firm performance relationship. In contrast, capital structure is found to have a positive relationship with all the risk

TABLE 2 Descriptive Statistics

Acronyms	Study variables	(1)	(2)	(3)	(4)	(5)
ROA	Return on Asset	3201	0.049	0.078	−0.395	0.334
ROE	Return on Equity	3155	0.156	0.228	−0.659	1.343
TQ	Tobin's Q	3085	1.669	1.064	0.676	7.450
ARV	Asset Return Volatility	3344	0.078	0.005	0.070	0.086
SRV	Stock Return Volatility	3344	0.227	0.009	0.213	0.243
Zscore	*Z*-Score	2639	3.051	2.141	0.552	14.662
STD	Short-term debt	1373	2.906	0.133	2.373	3.200
LTD	Long-term debt	3057	3.046	0.109	1.883	3.268
TTD	Total debt	3199	0.260	0.167	0.000	1.571
SIZE	Firm size	3201	23.008	1.835	10.314	28.421
GROWTH	Sales growth	2822	0.037	0.182	−0.996	1.000
INTANG	Intangibility	3077	0.321	0.530	−0.576	3.366
OWN	Ownership concentration	3195	0.317	0.231	0.000	1.000

NOTES Column headings are as follows: (1) observations, (2) mean, (3) standard deviation, (4) minimum, (5) maximum. This table represents the descriptive statistics for the balanced panel of 3344 firm-year observations for the period 2006–2016.

measures but is statistically significant only to $Zscore_{it}$ at the 10% level. The matrix, however, finds no high correlations among the study variables. This is further verified by the Variance Inflation Factor (VIF) test (table 4). The mean value of the test is 2.455, which is far below the threshold level of the test, indicating no multicollinearity issue in the study.

Results and Discussion

To empirically examine the assertion that capital structure has an impact on firm performance and risk-taking behaviour, we employ the following baseline panel-regression models:

$$Performance_{it} = \alpha + \beta\ Capital\ structure_{it} + \gamma X_{it} + \varepsilon_{it} \quad (1)$$

$$Risk_{it} = \alpha + \beta\ Capital\ structure_{it} + \gamma X_{it} + \varepsilon_{it}, \quad (2)$$

where i and t denote the firm and year, respectively. $Performance_{it}$ refers to the firm's financial performance as measured by accounting and market-based indicators (ROA_{it}, ROE_{it}, TQ_{it}), $Capital\ structure_{it}$ indicates four proxies used to measure firm capital structure (STD_{it}, LTD_{it}, TTD_{it}), $Risk_{it}$ denotes the firm risk exposure as measured by operational (ARV_{it} and

TABLE 3 Study Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1)ROA	1.000													
(2)ROE	0.737*	1.000												
	(0.000)													
(3)TQ	0.527*	0.429*	1.000											
	(0.000)	(0.000)												
(4)ARV	−0.064*	−0.058*	−0.147*	1.000										
	(0.000)	(0.001)	(0.000)											
(5)SRV	−0.092*	−0.078*	−0.134*	0.900*	1.000									
	(0.000)	(0.000)	(0.000)	(0.000)										
(6)Zscore	0.598*	0.300*	0.806*	−0.098*	−0.100*	1.000								
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)									
(7)STD	−0.077*	−0.046	−0.132*	0.019	0.032	−0.228*	1.000							
	(0.004)	(0.093)	(0.000)	(0.479)	(0.236)	(0.000)								
(8)LTD	−0.181*	−0.073*	−0.384*	0.007	0.015	−0.545*	0.413*	1.000						
	(0.000)	(0.000)	(0.000)	(0.717)	(0.416)	(0.000)	(0.000)							
(9)TTD	−0.108*	0.054*	−0.147*	0.035	0.041	−0.489*	0.091*	0.368*	1.000					
	(0.000)	(0.002)	(0.000)	(0.045)	(0.019)	(0.000)	(0.001)	(0.000)						
(10)SIZE	−0.054*	−0.036	−0.352*	−0.034	−0.010	−0.368*	0.546*	0.722*	−0.001	0.159*	1.000			
	(0.002)	(0.043)	(0.000)	(0.056)	(0.554)	(0.000)	(0.000)	(0.000)	(0.960)	(0.000)				
(11)INTANG	−0.013	0.113*	−0.005	−0.023	−0.020	−0.024	0.052	0.024	0.022	0.314*	0.024	1.000		
	(0.467)	(0.000)	(0.799)	(0.207)	(0.272)	(0.220)	(0.056)	(0.200)	(0.231)	(0.000)	(0.188)			
(12)GROWTH	0.151*	0.117*	0.164*	−0.041	−0.063*	0.122*	−0.044	−0.083*	−0.048	−0.015	−0.129*	0.006	1.000	
	(0.000)	(0.000)	(0.000)	(0.031)	(0.001)	(0.000)	(0.126)	(0.000)	(0.011)	(0.444)	(0.000)	(0.760)		
(13)OWN	−0.007	−0.015	0.017	0.037	0.021	−0.032	−0.085*	−0.170*	0.143*	−0.002	−0.184*	0.001	0.027	1.000
	(0.683)	(0.394)	(0.353)	(0.035)	(0.230)	(0.104)	(0.002)	(0.000)	(0.000)	(0.908)	(0.000)	(0.967)	(0.151)	

NOTES This table shows the Pearson correlation matrix for the firm performance, risk, capital structure and firm-level control variables. *P*-values are shown in parentheses;
* indicates significance at the 10% level.

TABLE 4 Collinearity Statistics

Acronyms	Study Variables	VIF	Tolerance
STD	Short-term debt	1.594	0.627
LTD	Long-term debt	4.532	0.221
TTD	Total debt	3.032	0.330
SIZE	Size	4.665	0.214
GROWTH	Intangibility	1.203	0.832
INTANG	Sales Growth	1.023	0.978
OWN	Ownership concentration	1.140	0.877

SRV_{it}) and insolvency risks ($Zscore_{it}$), X is the firm-level control variable and ε_{it} is the stochastic error term. These panel regression models differ from the earlier studies on capital structure in that the models incorporate market-based firm performance measures and firm-level risk measures to offer a comprehensive stance on the optimal capital structure-firm performance-firm risk relationship. Table 5 provides a summary of the novel features of our study models in comparison to the previous studies of optimal capital structure. We start by estimating these baseline regression models using the FE-Generalized Least Square (GLS) model. Then, we examine the robustness of the estimations using the Two-step system GMM.

CAPITAL STRUCTURE AND FIRM PERFORMANCE: FIXED EFFECT ESTIMATION

To estimate Equation (1), this study first runs fixed and random effect regression models separately for the strongly balanced panel of 3344 firm-year observations for the time 2006–2016. The study then conducts the Hausman Specification test to determine the validity of the fixed and random effect estimations. With the χ^2 value of 30.04 ($P = 0.000$), the Hausman test rejects the null hypothesis, thus preferring the fixed-effect model for investigating the capital structure-firm performance relationship.

Panel A of table 6 reports the fixed effect regression results for examining the role of capital structure in financial performance. Contrary to the expectation and studies of Salim and Yadav (2012) and Sheikh and Wang (2013), STD_{it} is significantly associated with a firm's accounting-based performance measures (ROA_{it} and ROE_{it}). One possible explanation for such positive impacts is that profitable firms could find it easier to finance their required working capital through short-term debt. However, LTD_{it} is in-

TABLE 5 Summary of Comparison between the Current Study and the Related Earlier Studies on Optimal Capital Structure

Previous literature			Study Gaps				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sheikh and Wang (2013)	Firm performance and capital structure (1,440 firm-year obs.)	Agency issue causes high-debt policy that results in lower performance.	Yes	No	No	No	Pakistan
Yazdanfar and Öhman (2015)	Firm performance and debt financing (63,588 firm-year obs.)	Firm performance and debt financing are inversely related.	Yes	No	No	No	Sweden
Abdullah and Tursoy (2021)	Firm performance and capital structure (2,448 firm-year obs.)	Highly levered firms enjoy high firm performance.	Yes	No	No	No	Germany
Nazir, Azam, and Khalid (2021)	Firm performance and capital structure (340 firm-year obs.)	Agency issue causes high-debt policy that results in lower performance.	Yes	No	No	No	Pakistan
Ngatno, Apriatni, and Youlianto (2021)	Firm performance, capital structure and corporate governance (1,253 firm-year obs.)	Capital structure and firm performance are positively related to each other.	Yes	No	No	No	Indonesia
Our Study	Firm performance, firm risk and capital structure (3,344 firm-year obs.)		Yes	Yes	Yes	Yes	OECD countries

NOTES Column headings are as follows: (1) authors, (2) study focus, (3) main findings, (4) accounting-based performance measure, (5) market-based performance measure, (6) operational risk, (7) insolvency risk, (8) region/country.

versely associated with accounting-based performance measures, which are in line with Yazdanfar and Öhman (2015). Overall, TTD_{it} is significantly negative to both accounting and market-based performance measures. Regarding the firm-level control variables, only GROWTH_{it} is statistically positive to all the performance indicators, suggesting that the year-to-year percent increases in firm sales leads to the sharp increase of firms' ROA_{it}, ROE_{it} and TQ_{it}, significantly. The *F*-statistics of all the models

TABLE 6 Capital Structure-Firm Performance-Firm Risk Association (Fixed Effect Estimation)

Acronyms	Variables	Panel A: Firm Performance			Panel B: Firm Risk		
		(1)	(2)	(3)	(4)	(5)	(6)
STD	Short-term debt	0.033**	0.095*	−0.242	0.004	0.005	−0.237
		(0.033)	(0.09)	(0.178)	(0.112)	(0.231)	(0.399)
LTD	Long-term debt	−0.082**	−0.254**	−0.634	0.002	0.005	−2.068***
		(0.017)	(0.039)	(0.114)	(0.625)	(0.589)	(0.000)
TTD	Total debt	−0.157***	−0.262***	−1.123***	0.002	0.001	−5.644***
		(0.000)	(0.007)	(0.001)	(0.658)	(0.94)	(0.000)
SIZE	Firm size	−0.003	−0.027	−0.018	−0.006***	−0.008***	−0.128
		(0.57)	(0.107)	(0.744)	(0.000)	(0.000)	(0.115)
GROWTH	Growth	0.064***	0.182***	0.169**	−0.001	−0.004**	0.59***
		(0.000)	(0.000)	(0.025)	(0.219)	(0.015)	(0.000)
INTANG	Intangibility	−0.02***	0.002	−0.156**	0.001	0.001	−0.535***
		(0.001)	(0.926)	(0.029)	(0.36)	(0.495)	(0.000)
OWN	Ownership conc.	−0.026**	−0.112**	−0.724***	0.005***	0.008**	−1.03***
		(0.039)	(0.015)	(0.000)	(0.009)	(0.027)	(0.000)
	Constant	0.318***	1.347***	5.136***	0.198***	0.378***	14.745***
		(0.008)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
	R-squared	0.200	0.256	0.168	0.220	0.187	0.341
	F-Statistics	28.78***	11.72***	8.32***	14.27	8.87	54.94
		(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
	Observations	1105	1105	1095	1105	1105	1,021
	Groups	174	174	173	174	174	163

NOTES Column headings are as follows: (1) return on asset, (2) return on equity, (3) Tobin's Q, (4) asset return volatility, (5) stock return volatility, (6) Zscore. This table represents the fixed effect estimations for Panel A (Firm performance) and Panel B (Firm risk). Return on asset and Return on Equity represents the accounting-based performance measures, whereas Tobin's Q represents the market-based performance measure. Asset return volatility and Stock return volatility denote the operational risk measures, whereas the Zscore indicates the insolvency risk measure for the firms. *P*-values are shown in parentheses; *, **, and *** indicate significance at the 10%, 5% and 1% levels, respectively.

in Panel A are statistically significant at the 1% level, implying the validity of the regression estimation of the capital structure-firm performance relationship.

CAPITAL STRUCTURE AND FIRM RISK: FIXED EFFECT ESTIMATION

This section examines the impact of capital structure on the firm's risk-taking behaviour using Equation (2). Similar to the capital structure-firm

performance relationship, this section, at first, runs the fixed and random effect model individually. With the χ^2 value of 102.312 (P = 0.000), the Hausman Specification test rejects the null hypothesis (H0) that the 'Random effect model is preferred for the study' and selects the fixed-effect model for examining the aforementioned relationship.

The estimation results of Equation (2) are reported in Panel B of table 6. The panel shows that the coefficients of STD_{it} are statistically positive but insignificant in all the risk models (Models 1–3). The results indicate that short-term debt financing has an impact on a firm's risk-taking behaviour but the magnitude of effects is not that considerable. When LTD_{it} and TTD_{it} are used as the proxy measures of capital structure, it leads to significant coefficients only for $Zscore_{it}$. More precisely, LTD_{it} and TTD_{it} are negatively associated with $Zscore_{it}$. Since $Zscore_{it}$ is an inverse measure of insolvency risk, its negative relationship with LTD_{it} and TTD_{it} implies the role of capital structure in increasing firms' insolvency risk exposure. Among all the firm-level control variables, only OWN_{it} is significantly negative to all the risk proxies, indicating that concentrated ownership increases the firm's operational and insolvency risk-taking tendencies. The F-test coefficients are statistically significant at a 1% level across all the risk models (Models 1–3), which confirms the validity of the panel regression estimation of the capital structure-firm risk relationship.

Additional Tests

The previous section shows the regression estimations for capital structure-firm performance-firm risk relationship using fixed-effect models for 1105 firm-year observations. This section presents the robustness of the earlier results related to capital structure, firm performance and firm risk. In addition to that, the moderating effect of firm risk is shown in the capital structure-firm performance.

CAPITAL STRUCTURE-FIRM PERFORMANCE: TWO-STEP SYSTEM GMM ESTIMATION

Capital structure and firm performance may be influenced by each other simultaneously. For instance, a high-performing firm may prefer to finance its assets through debt. In contrast, a mixture of debt and equity may determine the firm's financial profitability. To address this potential endogeneity issue regarding capital structure and performance relationship, this study employs the two-step system GMM approach, originally proposed by Blundell and Bond (1998), where appropriate instrumen-

tal variables are employed. The estimation outputs regarding the capital structure-firm performance relationship are presented in Panel A of table 7. As expected, all the performance measures are positively correlated with the prior values at the 1% level, indicating similarities between earlier and current firm performance. The table further reports the results of AR (1) and AR (2) of the first-order and second-order serial correlation test and Hansen J test of over-identification restriction. AR (1) and AR (2) are the autoregressive tools used to correct serial autocorrelation problems (Arellano and Bond 1991). The P-value of AR (2) and Hansen J test are statistically insignificant, thus failing to reject null hypotheses that the relationship does not have any second-order serial correlation and that the study instruments are valid. The study findings are consistent with the prior results reported in Panel A of table 6. Once again, the study confirms that long-term debt and total debt reduce firms' accounting and market-based financial performances. In contrast, short-term debt decreases a firm's market-based financial performance while enhancing the accounting-based performance measures.

CAPITAL STRUCTURE-FIRM RISK: TWO-STEP SYSTEM GMM ESTIMATION

Similar to the capital structure-firm performance relationship, this section offers robust evidence regarding capital structure and firm risk association using the two-step system GMM approach. The findings of the aforementioned relationship are presented in Panel B of table 7. Here, all the lag values of the risk proxies are statistically related to their current period values at the 1% level. The findings of AR (1), AR (2) and the Hansen J test are used to examine the robustness of the study relationship. The P-values of AR (2) and Hansen J test are statistically insignificant only to the $Zscore_{it}$ risk measure, thus failing to reject the null hypothesis that no second-order serial correlation and the study instruments are valid. Once again, the capital structure of a firm increases its insolvency risk-taking behaviour. However, despite the study finding that capital structure significantly impacts firms' operational risk-taking, no evidence is found regarding its robustness.

Conclusion and Policy Implications

This study is a new addition to the corporate finance literature which comprehensively investigates capital structure-firm performance-risk association using the listed firms of 10 different OECD countries. The

TABLE 7 Capital Structure-Firm Performance-Firm Risk Association (Two-Step System GMM)

Item	Panel A: Firm Performance			Panel B: Firm Risk		
	(1)	(2)	(3)	(4)	(5)	(6)
Return on asset$_{n-1}$	0.301*** (0.000)					
Return on equity$_{n-1}$		0.063*** (.000)				
Tobin's Q$_{n-1}$			0.244*** (0.000)			
Asset return volatility$_{n-1}$				0.611*** (0.000)		
Stock return volatility$_{n-1}$					0.456*** (0.000)	
Zscore$_{n-1}$						0.57*** (0.000)
STD	0.021 (0.15)	0.132** (0.012)	−0.061 (0.854)	0.004*** (0.001)	0.005** (0.019)	0.179 (0.797)
LTD	−0.036 (0.259)	−0.306*** (0.003)	−1.65* (0.079)	0.000 (0.981)	0.001 (0.847)	−5.759** (0.042)
TTD	−0.057** (0.037)	−0.222** (0.03)	−0.226 (0.655)	0.001 (0.45)	0.003 (0.393)	−6.111*** (0.000)
SIZE	0.005** (0.04)	0.004 (0.572)	0.046 (0.436)	0.000 (0.113)	0.000 (0.412)	0.199 (0.261)
GROWTH	0.054*** (0.00)	0.145*** (0.000)	0.276*** (0.000)	−0.001*** (0.002)	−0.003*** (0.000)	0.923*** (0.000)
INTANG	0.004 (0.497)	0.042* (0.085)	0.174 (0.168)	−0.001*** (0.001)	−0.001*** (0.004)	−0.171 (0.335)
OWN	−0.004 (0.663)	−0.022 (0.495)	−0.441 (0.104)	0.000 (0.919)	0.000 (0.921)	−1.906*** (0.002)
Constant	0.203** (0.011)	0.784*** (0.007)	8.271*** (0.000)	0.025*** (0.000)	0.118*** (0.000)	28.256*** (0.000)

Continued on the next page

panel regression estimation findings offer some novel findings. Among the capital structure measures, only short-term debt financing is positively significant to the firm's accounting-based performance measures, and negatively, insignificant to the market-based performance measure. These findings are in line with the implications of the agency cost theory and lend support to H1a and H1b. Regarding the long-term and total debt financing, the estimation results exhibit statistically inverse relationships with the firm's accounting and market-based performance measures, thereby supporting H2 and H3. These negative findings fur-

TABLE 7 *Continued from the previous page*

Item	Panel A: Firm Performance			Panel B: Firm Risk		
	(1)	(2)	(3)	(4)	(5)	(6)
Number of observations	1104	1103	1085	1105	1105	1004
Number of instruments	17	18	19	18	18	18
Number of groups	174	174	172	174	174	162
Wald Test	2949.08 (0.000)	588.34 (0.000)	1742.57 (0.000)	8.718 (0.000)	8.612 (0.000)	564.18 (0.000)
Arellano-Bond AR (1) (z, *p*-value)	−4.04 ($p = 0.000$)	−2.53 ($p = 0.011$)	−2.60 ($p = 0.009$)	−9.17 ($p = 0.000$)	−9.09 ($p = 0.000$)	1.67 ($p = 0.095$)
Arellano-Bond AR (2) (z, *p*-value)	−1.82 ($p = 0.069$)	−2.14 ($p = 0.072$)	−0.32 ($p = 0.747$)	−9.39 ($p = 0.000$)	−9.25 ($p = 0.000$)	−0.80 ($p = 0.421$)
Sargan test (Chi-square, *p*-value)	4.04 ($p = 0.775$)	27.22 ($p = 0.001$)	266.39 ($p = 0.000$)	897.04 ($p = 0.000$)	999.56 ($p = 0.000$)	68.12 ($p = 0.000$)
Hansen test (Chi-square, *p*-value)	3.69 ($p = 0.815$)	11.45 ($p = 0.177$)	44.22 ($p = 0.320$)	125.81 ($p = 0.000$)	127.95 ($p = 0.000$)	17.45 ($p = 0.261$)

NOTES Column headings are as follows: (1) return on asset, (2) return on equity, (3) Tobin's Q, (4) asset return volatility, (5) stock return volatility, (6) Zscore. This table shows the Two-step System GMM estimation results for capital structure, firm performance and firm risk relationship. Here, a one-year lag value is taken for the performance and risk measures. The Return on asset and Return on equity are the accounting-based performance measures and Tobin's Q is the market-based performance measure. The asset return volatility and stock return volatility are the operational risk measures and Zscore is the insolvency risk measure. The estimated coefficients and *p*-values are the two-way system GMM; AR(1) and AR(2) are the two test statistics that represent the first-order and second-order serial correlations, respectively. The Sargan test statistics test whether the model is overidentified, and the Hansen test statistics test the null hypothesis that all the instruments taken are valid for the study. *P*-values are in parentheses; *, **, and *** indicate significance at the 10%, 5% and 1% levels, respectively.

ther confirm the notion of the theory of pecking order that firms should avoid external long-term financing owing to its associated financial distress. The capital structure-firm risk relationship is exhibited as positively associated with the firm's operational risks while, negatively, significant to the insolvency risk, thereby proving H4 and H5.

The study findings offer a variety of implications for firm managers and owners, as well as policymakers of the OECD countries. The positive relationship between short-term debt and accounting-based firm performance implies that firms should prefer to use short-term debt to overcome the problems associated with information asymmetry (Öhman and Yazdanfar 2017). This will enable firms to reduce agency problems and the cost of financing (Abor and Biekpe 2009). The listed firms of the OECD countries, on average, have growth potential of less than 5%, as evidenced by the findings. Such low growth potential is one explanation of the in-

verse relationship that long-term and total debt has with the firm's performance (Abor and Biekpe 2009). Thus, firms should not go for seeking long-term debt in financing their projects. This implication is more pronounced for the capital structure-firm risk relationship as the higher the long-term and total debt, the greater the likelihood that firms become insolvent and bankrupt. Further, firms should try to reduce variability in their net profit-making in order to accumulate retained earnings for project financing. Such accumulated retained earnings will enable firms to lower their asset return volatility and stock return volatility, thereby decreasing the frequency and extremeness of the firm's operational risk losses.

This study is subject to some limitations. Firstly, the database used in the study covers the time period from 2006 to 2016. The incorporation of the recent database would help in better estimation of the study topic. Second, the capital structure-firm performance-firm risk relationship is estimated using the listed firms of the sixty-four diverse industries of OECD countries. The industry-wide separate estimation would give more in-depth results regarding the aforementioned relationship. Third, the study considers a total of 10 countries of OECD economies. Estimation using an individual country's firms would provide more country-specific insights regarding capital structure formation, financial performance and risk-taking behaviour. Moreover, each country has distinct laws, regulations and policy frameworks that may affect capital structure decisions. Thus, extant research should be conducted considering this limitation, to conduct more cross-country analysis. The data set includes a time frame from 2006 to 2016 which offers more room to conduct future studies on the pre-crisis, crisis and post-crisis periods (Danso et al. 2020). Another possible research area is to include some moderating variables such as firm size, firm age, financial flexibility, growth opportunities and gender diversity in the capital structure-firm performance relationship (Abdullah and Tursoy 2021; Moradi and Paulet 2019). The consideration of two more risk measures, namely liquidity and credit risk, would offer more robustness to the capital structure-firm risk relationship for the listed OECD firms (Li, Niskanen, and Niskanen 2018).

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