Do financing institutions consider operating performance in estimating cost of debt?

Muhammad Shahin Miah[1*] , Mohammad Ariful Islam[2] and Md. Khaled Bin Amir[2]

Abstract

This paper examines the relationship between firm performance and cost of debt. More specifically this paper empirically shows that fund providers charge lower cost on debt for highly performing companies compared to lower performing companies. We argue that the profitable companies are more resilient, and they have more survivable capacity which impacts on the pricing of the cost of debt. In contrast, lower performing companies are more prone to financial distress or may have higher chances of non-repayment of loans thereby fund providers charge higher interest to compensate the risks. Consistently, analyzing 547 firm year observations for the period of 2015–2019 we find that the cost of debt is significantly lower for the highly performing companies compared to the lower performing companies. The negative relation between the cost of debt and firm performance is highly pronounced in smaller companies compared to bigger companies. It suggests that fund providers create opportunities for smaller companies thereby results in balanced growth in the economy. Our results are robust to a set of alternative measures of firm performance. This study has several policy implications and contributions to the literature of the cost of debt in developing economies.

Keywords Cost of debt, Firm performance, Developing country, Financial distress, Repayment of loan, Return on assets, TOBIN Q

Introduction

The present study is aimed to investigate whether the banks charge lower interest for high performing borrowers compared to lower performing borrowers in an emerging economy. More specifically, this paper examines whether the performance of publicly listed companies affect their interest cost of external debt in Bangladesh. The present study is motivated from the prevailing economic situation of Bangladesh where bad borrowers are rewarded with charging lower interest rate and good borrowers are charged with higher interest rate which is contradictory with neoclassical investment theory [23]. Recently, the Government of Bangladesh directed listed banks to reduce lending rates and deposit rates to a single digit to bring stability in the economy as banking sector has been struggling with higher non-performing loans (NPL), higher inflation rate, liquidity crisis, and financial scams [8]. Through such reform it is expected that banks will have easy access to raising capital from markets thereby results in greater monetary flow in the economy. Hence, different types of stakeholders will get its gratification. However, it is not yet clear whether banks consider performance, in corporate loans disbursement process, in estimating interest rate for non-financial public companies which is explored in this study.

A growing number of studies focuses on the cost of debt and its determinants in different jurisdictions [5, 15, 25, 27, 30, 33, 36, 39, 40]. For example, Anderson, Mansi, and Reeb [4] document an inverse relationship between corporate governance (board composition) and the cost

*Correspondence:
Muhammad Shahin Miah
mshahin@du.ac.bd
[1] Department of International Business, University of Dhaka, Dhaka 1000, Bangladesh
[2] Department of Banking and Insurance, University of Dhaka, Dhaka 1000, Bangladesh

of debt in S&P 500 firms in USA. Moreover, they empirically find that banks charge lower interest cost for firms with fully independent audit committee. They argue that fully independent audit committee provides a signal about the higher quality of corporate governance thereby results in lower interest cost. Dhaliwal et al. [13] investigated the connection between a company's change in debt cost and the disclosure of a significant flaw. They discovered that, on average, when a company reveals a material point, the cost of debt slightly rises. They also looked at how monitoring by credit rating agencies and/or banks affected this conclusion and discovered that it was more pronounced for unmonitored enterprises. Gao et al. [15] examines the role of family ownership on the cost of debt in China because they argued that family control aggravates the agency conflict between general shareholders and controlling shareholders in family-controlled firms. Moreover, the likelihood of expropriation and tunneling is higher in family-controlled firms compared to nonfamily firms in China. Consistent with their hypotheses they document that cost of debt is higher for family firms than nonfamily firms. Later they attribute their results to underperformance of family firms over nonfamily firms in China thereby results in higher interest costs charged by banks.

Despite substantial research has been conducted on the cost of debt in different jurisdictions, but none of the prior research deals with the cost of debt and firm operating performance from Bangladesh perspective. Moreover, all listed non-financial companies borrow funds from banks and non-bank financial institutions (NBFI) thereby most of funding cost consists of cost of external fund. Taking such a unique setting and considering prevailing economic condition this paper investigates whether banks and NBFI consider clients' performance before sanctioning loans or determining interest rate.

We use non-financial listed companies, at Dhaka Stock Exchange in Bangladesh, during period of 2015–2019 to test the impact of firm performance on cost of debt. We utilize Bangladesh context as banking sector, in Bangladesh, has been experiencing with several corruption and irregularities.[1] Surprisingly Islami banks are also facing severe corruption and operational difficulty due to ownership changes. In sum, the banking sector, these days, is losing stability and public trust, which is alarming for long-term survival. Taking the above issues into consideration we undertake our present study to investigate whether banks consider clients' operating performance

before issuing debt. Consistently we find that firm performance is negatively associated with the cost of debt. Our results suggest that firms having higher operating performance are able to borrow funds at lower rates, which is consistent with our hypothesis. In addition to our baseline regression analysis between firm performance and cost of debt, a set of sensitivity analyses is conducted to validate our main results. Our results remain the same for the alternative measures of firm performance. To control self-selection biasness and reverse causality we run Heckman two stage regression analysis. Our results are consistent with main baseline regression and our analysis does not suffer from reverse causality and self-selection problems.

Our paper makes several contributions. First, this is the first study, in Bangladesh, that directly investigates possible connection between the cost of raising capital for non-financial companies and firm performance. This study uncovers the hidden consideration used by banks in determining interest rates for corporate loan disbursement in Bangladesh. Second, our paper highlights the importance of wealth maximization philosophy by borrowers before approaching to banks for loans as banks significantly consider clients' performance before sanctioning loans. Third, our paper is also closely related to the line of previous related research on firm performance and cost of debt [10, 12, 26]. Finally, this paper provides unique features of debt market taking an emerging market context where banks consider operating performance of borrowers.

The remainder of the paper proceeds as follows. The next section discusses related research and the development of hypothesis. Section 3 shows the research methodology. Section 4 presents the results. Section 5 presents the results of additional analyses. Section 6 concludes the paper.

Literature review and hypothesis development

A large number of research focuses on the cost of debt with: corporate governance [4, 16, 37]; family firm and family ownership structure [2, 15, 18], financial reporting quality [3, 9, 11], corporate social responsibility [7, 24], audit quality [22, 35], and board gender diversity [6, 14, 32, 41] in different jurisdictions and provides mixed results. However, the research on the relation between firm performance and cost of debt is limited particularly from developing country perspective.

For instance, Piot and Missonier-Piera [37] attempt to determine the relation between cost of debt and corporate governance in France. Taking a sample of 102 French listed businesses from the year of 1998 to 2002, they document a positive relation between corporate governance quality and cost of debt which suggests that banks charge

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[1] See the detail irregularities which are taking place in banking sector: https://thefinancialexpress.com.bd/views/columns/rising-risks-in-bangladeshs-banking-sector-1670081584.

lower interest for firms with greater corporate governance compliance quality. However, they do not find any moderating role of audit quality on the relation between corporate governance and cost of debt.

Bhuiyan and Nguyen [7] examined 230 Australian listed companies to study the association between corporate social responsibility (CSR) and cost of debt using a multivariate regression analysis. They find a negative association between CSR and cost of debt because they attribute CSR reduces firm specific risks thereby banks charge lower interest. Similar research is conducted by Xu et al. [43] where they record a negative relation between CSR reporting quality index and cost of debt in China. Another study on listed non-financial companies at Casablanca Stock Exchange (CSE) in Morocco, Jabbouri and Naili [21] investigate the relation between ownership concentration and external funding cost, and they find that controlling shareholders reinforce management to ensure quality governance to enjoy lower interest cost.

Prior research also finds that government ownership reduces the agency conflicts between shareholders and debtholders assuming government ownership enhances the monitoring agency conflicts thereby results in lower interest cost. Taking the similar context, Lorca et al. [28] focus on the Spanish stock market and investigate the possible moderating role of government's influence on interest cost for both financial and non-financial companies. Consistently, they document that such government's presence increases clients' credibility, and it works as assurance to the fund providers thereby results in lower interest cost.

Recently it is found that female representation, in board, also results in lower borrowing cost as fund providers assume female-led firms are more conservative, safer than male led companies. Taking this sentiment, Miah [31] explores the scenario in Australia and he finds that companies with female CEO have lower interest cost compared to companies with male CEO. He, further, investigated whether the relation between gender and cost of debt is direct or moderated because of female conservatism or risk aversion. The analysis shows that the inverse relation between gender diversity and cost of debt is direct and is not motivated by the individual attributes, which suggest the impact of mere gender diversity, in corporate board, on cost of debt in Australian capital market.

Another stream of research explores the impact of audit quality on cost of debt [22, 35]. They argue that banks charge lower interest cost if the borrowers are audited by the high-quality auditor. Moreover, banks charge significantly lower for firms if they are big4 audited clients. Nevertheless, pricing of debt capital also depends on the types of audit opinion. Overall, it is evident that audit quality is also an important and relevant factor for pricing of debt capital. However, none of the prior studies focuses on Bangladeshi money market where government's intervention is frequent, and it is unclear the connection between firm performance and pricing for cost of debt. Our research fills this void.

However, taking all above studies together, it is expected that the cost of debt is lower if the firms perform higher and we estimate the hypothesis as follows:

Hypothesis 1 (H1): The cost of debt is negatively related to the firm's operating performance.

Research methodology

Data sample

The present study's data sample consists of listed companies at Dhaka Stock Exchange in Bangladesh for the period of 2015–2019. Following prior research, we exclude financial and utility firms as they are subject to different regulations (150). Moreover, financial companies, in Bangladesh, follow calendar year as their fiscal periods where non-financial companies follow budget period (i.e., July–June) as their accounting periods. Later, we exclude 228 firm year observations due to data unavailability (228 observations) which leaves us for 547 firm-year observations for the present study. Panel-B, Table 1 shows industry-wise distribution of sample and the representation of different industries in our final sample. Around 18.28% firm year observations come from textile industry, and 17.92% firm year observations come from engineering sector. 14.81% of observations come from pharmaceuticals and 3.47% firm year observations come from tannery sector. All of our analyses are based on 547 firm-year observations.

Research design

In the present paper the baseline regression model of the cost of debt and firm performance is estimated to test our hypothesis following previous research of Pittman et al. (2004).

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\begin{aligned}
Cost\ of\ Debt\left(COD_{i,t}\right) = {} & \beta_0 + \beta_1 FIRM\_PERFORMANCE_{i,t} \\
& + \beta_2 SIZE_{i,t} + \beta_3 LEVERAGE_{i,t} + \beta_4 OCF_{i,t} \\
& + \beta_5 NWC_i + \beta_6 CAPEX_{i,t} + \beta_7 AGE_{i,t} \\
& + \beta_8 RND_{i,t} + \beta_9 BOD\_SIZE_{i,t} + \beta_{10} BIG4_{i,} \\
& + \beta_{11} RECINV_{i,t} + \beta_{12} SIZE\_AC_{i,t} + \beta_{13} INST\_OWN_{i,t} \\
& + \beta_{14} GOVT_{i,t} + \beta_{15} DUALITY_{i,t} + \beta_{16} OPINION_{i,t} \\
& + \sum YEAR_{i,tv} + \sum INDUSTRY_{i,t} + \varepsilon_{i,t}
\end{aligned}
$$
(1)

where *COD* is measured as the interest expense divided by the average of total short-and long-term debt during the year. In the present paper the measures of firm

Table 1 Sample Selection and Industry-wise sample breakdown

Panel A: Sample selection		
Total number of firm-year observations from 2015 to 2019		925
Less: Observations in the financial and utilities industries		(150)
Less: Observations dropping due to insufficient control variables		(228)
Final sample (firm-year observations) used for analysis		**547**
	N	**%**
Panel B: Industry-wise sample breakdown		
Ceramics and cement	53	9.69
Engineering	98	17.92
Food & allied sector	47	8.59
Power and fuel	58	10.6
Information technology and services	53	9.69
Miscellaneous	38	6.95
Pharmaceuticals	81	14.81
Tannery	19	3.47
Textile	100	18.28
Total	547	100

Table 2 Descriptive statistics

variable	N	Mean	Median	S.D	P25	P75	P90	Min	Max
COD	547	0.087	0.076	0.075	0.039	0.112	0.163	0.000	0.421
ROA	547	0.048	0.028	0.069	0.011	0.071	0.148	−0.123	0.280
TOBINQ	547	2.074	1.335	1.932	0.988	2.550	4.230	0.000	12.420
ROE	547	0.115	0.065	0.224	0.026	0.148	0.271	−0.505	1.287
SIZE	547	8.201	8.174	1.699	7.148	9.289	10.632	4.524	11.835
LEVERAGE	547	0.089	0.032	0.139	0.000	0.122	0.255	0.000	0.702
OCF	547	0.058	0.042	0.098	0.002	0.102	0.182	−0.168	0.373
NWC	547	0.041	0.039	0.214	−0.079	0.156	0.314	−0.565	0.533
CAPEX	547	0.045	0.021	0.061	0.001	0.067	0.132	0.000	0.312
AGE	547	2.814	2.996	0.659	2.303	3.367	3.526	0.000	3.714
RND	547	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.013
BOD_SIZE	547	2.014	2.079	0.306	1.609	2.197	2.398	1.609	2.773
BIG4	547	0.155	0.000	0.363	0.000	0.000	1.000	0.000	1.000
RECINV	547	0.332	0.316	0.180	0.196	0.445	0.588	0.018	0.767
SIZE_AC	547	3.927	4.000	1.021	3.000	4.000	5.000	3.000	9.000
INST_OWN	547	16.045	15.010	9.842	9.020	22.360	29.700	0.000	46.060
GOVT	547	5.313	0.000	17.476	0.000	0.000	3.770	0.000	76.250
DUALITY	547	0.009	0.000	0.095	0.000	0.000	0.000	0.000	1.000
OPINION	547	0.159	0.000	0.366	0	0	1	0	1
INST_OWN	547	16.045	15.010	9.842	9.020	22.360	29.700	0.000	46.060
DUALITY	547	0.009	0.000	0.095	0.000	0.000	0.000	0.000	1.000
GROWTH	547	0.267	0.000	0.443	0.000	1.000	1.000	0.000	1.000

Table 3 Correlation statistics

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
COD	1	1.00																
ROA	2	−0.04	1.00															
SIZE	3	−0.11	0.19	1.00														
LEVERAGE	4	−0.13	−0.29	0.07	1.00													
OCF	5	0.09	0.65	0.10	−0.14	1.00												
NWC	6	0.13	−0.07	−0.09	0.00	−0.19	1.00											
CAPEX	7	−0.07	0.17	0.17	0.16	0.17	−0.13	1.00										
AGE	8	0.01	0.02	−0.24	−0.14	−0.03	−0.10	−0.20	1.00									
RND	9	0.04	0.06	0.04	−0.01	0.04	0.07	0.13	0.00	1.00								
BOD_SIZE	10	−0.22	0.09	0.40	0.21	0.11	−0.32	0.09	0.06	−0.04	1.00							
BIG4	11	−0.10	0.40	0.30	−0.13	0.27	−0.09	0.05	−0.04	−0.06	0.30	1.00						
RECINV	12	0.08	−0.08	−0.08	−0.17	−0.18	0.36	−0.21	0.10	−0.07	−0.26	0.09	1.00					
SIZE_AC	13	−0.07	0.22	0.16	−0.09	0.25	−0.18	0.09	−0.06	−0.03	0.31	0.24	−0.05	1.00				
INST_OWN	14	0.00	−0.05	0.34	−0.10	−0.11	0.09	0.05	−0.11	0.14	0.03	−0.03	0.11	−0.11	1.00			
GOVT	15	−0.20	−0.10	0.38	0.32	−0.06	−0.07	−0.05	−0.12	−0.03	0.31	−0.12	−0.11	−0.01	0.08	1.00		
DUALITY	16	0.03	−0.05	0.00	−0.03	−0.04	−0.03	−0.05	0.04	−0.02	0.06	−0.04	−0.02	−0.09	0.03	−0.03	1.00	
OPINION	17	−0.07	−0.13	0.05	0.16	−0.06	0.03	−0.05	−0.07	0.10	0.12	−0.13	−0.07	−0.07	−0.07	0.41	0.01	1

performance are return on assets (*ROA*) and market-based performance measure is *TOBINQ* Q. *TOBINQ* Q is computed as the ratio of book value of total assets plus market value of equity minus book value of equity to total assets [1]. Appendix-A shows the definition of all the variables.

Data analysis and discussion of the results
Descriptive statistics
Table 2 presents the summary statistics for variables used to measure the impact of firm performance on cost of debt. The mean (median) value of cost of debt (*COD*) is 8.7% (7.6%). This rate displays the prevailing average interest rate charged on external debt for the company. The average value of the return on asset (*ROA*) is 4.8% and *TOBINQ* are 4.8% and 2.07, respectively. The average value (median) of *ROE* is 11.5% (6.5) which is significantly consistent with *TOBINQ*. As measured by the debt to asset ratio, the average value of leverage is 0.089, indicating that on average about 8.9% capital of total fund comes from external sources. The average value of the current ratio (CR) 1.927 which is at satisfactory level based on the accounting benchmark (e.g., Tóth et al. 2013). On average, there is no large variation in the size of the board (BOD). The mean value of institutional ownership (*INST_OWN)* is 16.045 which measures the shareholding by institutional investors in public companies in Bangladesh. The mean value of the proportion of government ownership (*GOVT*) is 5.313. The mean value of *DUALITY is* 0.009 which indicates that only 9% of our sample firms have same person as CEO and the board chairman.

Correlation coefficients
Table 3 displays the correlation statistics of variables used in the present paper. Our results show that cost of debt (*COD*) is negatively correlated with both measures of firm performance (*ROA* and *TOBIN*Q) at 1 percent level which implies that firm performance has positive impact on reducing fund costs. In addition, we find that *COD* is negatively associated with firm size (*SIZE*), leverage (*LEVERAGE*), capital expenditure (*CAPEX*), board size (*BODSIZE*), type of audit firm (*BIG4*), size of audit committee (*SIZE_AC*), government share ownership proportion (*GOVT*), and firms audit opinion (*OPINION*), and *COD* is positively associated with the operating cash flow (*OCF*), net working capital (*NWC*), firm age of listing with stock exchange (*AGE*), research and development expenditure (*RND*), firm level complexity (*RECINV*), proportion of institutional ownership (*INST_OWN*), CEO duality in firm(*DUALITY*).

Regression results
In the present study we use time series panel data therefore we employ Hausman test (1978) to determine whether pooled ordinary least squares (OLS), random effects model or fixed effect model is appropriate. Based on the results we find that random effect model is appropriate for the current study.[2] Table 4 displays the main regression analysis. Model 1 and Model 2 show the results of cost of debt on operating performance

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[2] Husman's test (1978) displays that $\chi 2$ (18) = 18.86, and Prob > $\chi 2$ = 0.4006 which recommends that random effects model, in the present study, is appropriate than fixed effects model for the analysis.

Table 4 Regression results of firm performance on cost of debt

	(1) Pooled	(2) Random effects	(3) Pooled	(4) Random effects
VARIABLES	COD	COD	COD	COD
ROA	−0.235***	−0.198***		
	[−2.66]	[−2.79]		
TOBINSQ			−0.005**	−0.002**
			[−2.09]	[−1.87]
SIZE	0.004	0.003	0.001	−0.002
	[1.19]	[0.02]	[0.15]	[−0.55]
LEVERAGE	−0.044*	−0.079**	−0.024	−0.063**
	[−1.87]	[−2.54]	[−1.10]	[−2.03]
OCF	0.208***	0.192***	0.163***	0.161***
	[4.65]	[5.27]	[4.42]	[4.58]
NWC	0.028	0.022	0.016	0.013
	[1.51]	[0.95]	[0.84]	[0.58]
CAPEX	−0.051	−0.085	−0.07	−0.090*
	[−1.05]	[−1.61]	[−1.45]	[−1.69]
AGE	0.001	−0.003	0.001	−0.003
	[0.12]	[−0.32]	[0.13]	[−0.40]
RND	0.46	0.555	0.344	0.968
	[0.25]	[0.27]	[0.18]	[0.48]
BOD_SIZE	−0.028**	−0.018	−0.026**	−0.019
	[−2.27]	[−0.99]	[−2.11]	[−1.03]
BIG4	−0.018*	−0.022**	−0.023**	−0.027**
	[−1.66]	[−2.09]	[−2.13]	[−2.46]
RECINV	0.016	0.028	0.023	0.033
	[0.77]	[0.99]	[1.14]	[1.16]
SIZE_AC	−0.002	−0.003	−0.002	−0.002
	[−0.76]	[−0.61]	[−0.70]	[−0.56]
INST_OWN	0	0	0	0
	[−0.25]	[0.61]	[−0.28]	[0.75]
GOVT	−0.001***	0	−0.001**	0
	[−2.71]	[−0.36]	[−2.37]	[−0.14]
DUALITY	0.020*	0.015	0.019	0.016
	[1.68]	[0.24]	[1.53]	[0.27]
OPINION	−0.001	−0.012	−0.002	−0.011
	[−0.11]	[−1.33]	[−0.15]	[−1.25]
Year effects controlled	Yes	Yes	Yes	Yes
Fixed effects-Industry	Controlled	Controlled	Controlled	Controlled
Constant	0.140***	0.161***	0.157***	0.175***
	[3.51]	[3.05]	[3.72]	[3.28]
Observations	547	547	547	547
Number of Unique companies		114		114
Wald Chi2 (28)		68.09***		60.13***
Prob > Chi2		0.0000		0.000
R-squared	0.14		0.13	
Adj. R-squared	0.09		0.08	

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measure (*ROA*) under pooled and random effects model, respectively, and model 3 and model 4 show the results of cost of debt and market-based performance measure *TOBINQ* under pooled and random effects regression models, respectively. The coefficient of *ROA* is negative, in both analyses, and statistically significant at 1 percent, which suggests that cost of debt is lower if the firm performance is higher. Our results support our hypothesis in the sense that fund providers charge lower fees on long term debt for firms who are performing better compared to lower performing companies. Our results infer that banks charge an interest rate, for firm with greater operating performance, by more than 23 percent less compared to firms with lower operating performance. Model 2 and Model 3 show that the coefficient of firm performance (*TOBINQ*) is negative and statistically significant at 5 percent which suggests that cost of debt is lower when market value of the firm is higher. More specifically, fund providers charge lower cost when a firm's market valuation is positive. In all specifications our results provide the consensus that firm performance and market valuation are inversely connected with cost of debt. In sum, our results support our hypothesis regarding cost of debt and firm operating performance. Regarding control variables we find that firm size (*SIZE*) has a positive impact on cost of debt which indicates that bigger firms pay lower cost which is consistent with the notion of economies of scale. This is because fund providers get more security or collateral from bigger companies compared to smaller companies which provides more room for them, hence banks charge lower interest cost. Next, we find the leverage ratio (*LEVERAGE*) is also negatively associated with the cost of debt which suggests that fund providers charge lower interest cost for highly levered firm which is line with the literature that fund providers get more confidence when clients have evidence of getting more capital from competitions in the same market. More importantly client's reputation regarding loan repayment helps them to get new fresh loans from fund providers. In addition, excessive and idle cash and liquid assets indicate the inability of the firms to mobilize their resources thereby affect client's capacity in repaying external debt in future thereby results in greater cost of debt. Hence, external fund providers charge premium cost on firms with greater cash flow (*OCF*). Cost of debt is lower for firms which are big 4 audited and which is consistent with the prior research (such as, [22, 35]. This is because lenders get added confidence on the clients who are being audited by high quality auditors. We also find that fund suppliers charge lower interest for the firms with greater members in audit committee which indicates that independent directors can provide

Table 5 Regression results of ROE on Cost of Debt (Alternate measure of firm performance)

VARIABLES	COD
ROE	− 0.053**
	[− 2.34]
Control variables	Controlled
Industry fixed effects	Controlled
Year effects	Controlled
Constant	0.140***
	[3.48]
Observations	547
R-squared	0.13
Adj. R-squared	0.09

better assessment which benefits fund providers. In other words, the greater number of independent directors in audit committee reflects the notion of high-quality corporate governance. Later, we document that cost of debt is higher for high complex firms (*RECINV*). This finding is consistent with the notion that banks/NBFIs are not inclined to finance highly complex organizations as they are relatively more expensive than the firms with lower complexity. Next the coefficient of *DUALITY* indicates that fund suppliers charge higher interest for the clients who have same person as both the chairman of the board and the chief executive officer (CEO). More importantly CEO duality represents the impairment of governance quality which is compensated by higher interest cost. Finally, we find that fund suppliers charge lower interest for growing companies compared to matured companies. This works as added motivation for new and growing organizations.

Additional analysis
Alternative measure of firm performance

To ensure the robustness of firm performance measures (i.e., *ROA* and *TOBINQ*) we use another measure of firm operating performance i.e., return on equity (*ROE*) and we investigate the relation between *ROE* and cost of debt. *ROE* is measured as the ratio of profit for the year over the book value of the equity (e.g., [44]). Results of the analysis are reported in Table 5. The coefficient of *ROE* ($\beta_{ROE} = -0.053$, $t = -2.34$) is negative and statistically significant at 5 percent level which is consistent with our baseline regression results in Table 4. Our results suggest that our two measures of firm performance are not suffering from variables measurement errors. The signs of all other control variables are also consistent with that of in main regression analysis in Table 4.

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Firm size and firm performance (sub-sample analysis)

We conduct subsample analysis to investigate whether the relation between cost of debt and firm performance is affected because of the firm size. To do so we divide our entire sample into bigger firms (273 firm-years) and smaller firms (274 firm years) (based on median total assets). We employ the same regression (Eq. 1) for both samples separately. Our results show that the inverse relation between cost of debt and firm performance hold for smaller companies but not for bigger companies. The coefficient of firm performance (for smaller companies) is negative and statistically significant ((β_{ROA}−=−0.0044, t=−2.53; (β_{TOBINQ}−=−0.005, t=−2.46)). However, we do not find any statistical significance for bigger size companies. In sum, our results are consistent with the notion that fund providers are more likely to finance smaller companies compared to larger companies as the chance of fund manipulation is lower in smaller companies. Moreover, fund suppliers have more confidence on small firms' managements rather than on large company management. Notably, fund providers can control small firms' management for loan repayment which is relatively more difficult in larger companies.

Endogeneity test

There can be possible endogeneity or reverse causality between firm performance and cost of debt. More specifically those firm have higher debt can have higher profitability if they properly manage external fund. Moreover, it is also plausible that firms with external debt are highly vigilant in utilizing their resources thereby results in greater operating performance. In addition, our analysis can suffer from self-selection bias due to unobservable firm specific variables and due to variable omission problems [20]. To control such self-selection biasness, we run Heckman two stage regression model where, in first stage, firm performance variable (*ROA*) is considered as dependent variable and we add some instrumental variables such as market to book value ratio (*MBRATIO*), number of local subsidiaries of the sample firms (*BSEG*), and firm's growth (*GROWTH*) as independent variables. Next, we estimate Inverse mills Ratio (IMR) from the first stage regression and then we run second stage regression models to test the impact of firm performance on cost of debt. Regression models are stated below:

$$
\begin{aligned}
COD_{i,t} = {}& \beta_0 + \beta_1 FIRM\_PERFORMANCE_{i,t} \\
& + \beta_2 SIZE_{i,t} + \beta_3 LEVERAGE_{i,t} + \beta_4 OCF_{i,t} \\
& + \beta_5 NWC_{i,t} + \beta_6 CAPEX_{i,t} + \beta_7 AGE_{i,t} \\
& + \beta_8 RND_{i,t} + \beta_9 BOD\_SIZE_{i,t} + \beta_{10} BIG4_{i,} \\
& + \beta_{11} RECINV_{i,t} + \beta_{12} SIZE\_AC_{i,t} \\
& + \beta_{13} INST\_OWN_{i,t} + \beta_{14} GOVT_{i,t} \\
& + \beta_{15} DUALITY_{i,t} + \beta_{16} OPINION_{i,t} \\
& + \beta_{17} IMR + \sum YEAR_{i,tv} \\
& + \sum INDUSTRY_{i,t} + \varepsilon_{i,t} \quad \text{(Second stage)}
\end{aligned}
$$

Results are presented in Table 6. In our first stage regression we find that the instrumental variable market to book ratio (*MBRATIO*) is statistically significant with firm operating performance (ROA). Next, we find that that control variables show sign and statistical significance which is consistent with prior research. In our second stage we control Inverse Mills Ratio (IMR) estimated from 1st stage and we do not find any statistical significance for IMR which suggests that our results are not suffering from self-selection problems. The coefficient of ROA is negative, and the coefficient is significant at 1 percent which is consistent with our main baseline regression results. Hence, we can infer that cost of debt is significantly lower for highly performing companies or fund providers charge lower interest costs for firms with higher operating performance.

Conclusion

The main purpose of this study is to investigate whether firm performance has impact on cost of debt or not in Bangladesh. Prior research documents that banks charge lower interest for firms with high quality corporate governance and more importantly firms with fully independent audit committee enjoy super savings on raising funds from external sources in different countries. However, none of the previous studies attempt to test whether lending organizations assess borrowers'/clients' operating performance before issuing loans which is investigated in this study. This study is a timely initiative where financial sector, particularly

$$
\begin{aligned}
ROA_{i,t} = {}& \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEVERAGE_{i,t} + \beta_3 OCF_{i,t} + \beta_4 NWC_{i,t} \\
& + \beta_5 CAPEX_{i,t} + \beta_6 AGE_{i,t} + \beta_7 RND_{i,t} + \beta_8 BOD\_SIZE_{i,t} + \beta_9 BIG4_{i,} + \beta_{10} RECINV_{i,t} \\
& + \beta_{11} SIZE\_AC_{i,t} + \beta_{12} INST\_OWN_{i,t} + \beta_{13} GOVT_{i,t} + \beta_{14} DUALITY_{i,t} + \beta_{15} OPINION_{i,t} \\
& + \beta_{16} MBRATIO_{i,t} + \beta_{17} BSEG_{i,t} + \beta_{18} GROWTH_{i,t} + YEAR_{i,tv} \\
& + \sum INDUSTRY_{i,t} + \varepsilon_{i,t} \quad \text{(First Stage)}
\end{aligned}
$$

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Table 6 Heckman two stage regression analysis (Endogeneity test)

Variables	Firm performance (ROA)	COD
	1st stage	Second stage
INTERCEPT	− 0.0357***	0.2595
	− 1.57	[0.74]
ROA		− 0.2387***
		[− 2.64]
SIZE	0.007***	0.0034**
	[4.08]	[1.11]
LEVERAGE	− 0.086***	− 0.041**
	[− 5.99]	[− 1.43]
OCF	0.29***	0.195***
	[9.15]	[2.55]
NWC	0.06***	0.027**
	[4.58]	[1.43]
CAPEX	0.08**	− 0.054**
	[1.67]	[− 1.06]
AGE	0.00	0.001
	[1.54]	[0.06]
RND	0.13	0.474
	[0.16]	[0.26]
BOD_SIZE	− 0.01	− 0.027***
	[− 0.85]	[2.24]
BIG4	0.03***	− 0.019***
	[5.26]	[− 1.56]
RECINV	− 0.04***	0.016
	[2.34]	[0.79]
SIZE_AC	0.00	− 0.0024
	[0.61]	[− .77]
INST_OWN	0.00	− 0.000
	[− .41]	[− 0.22]
GOVT	0.00	− 0.001
	[− 1.03]	[.22]
DUALITY	0.00	0.020**
	[− .08]	[1.69]
OPINION	− 0.01	− 0.001
	[− 0.75]	[− 0.08]
MBRATIO	0.0032***	
	[4.40]	
BSEG	− 0.0005	
	[− 0.14]	
GROWTH	0.0025	
	[0.56]	
IMR		− 0.07
		[− 0.21]
Industry control	Yes	Yes
Year control	Yes	Yes
Observations	547	547
R-squared	0.6221	0.1382
F statistics	28.06	6.48

in Bangladesh, has been experiencing with the rising non-performing loans (NPL), classified loans, corruption, and liquidity crisis. The present study is also motivated by the prevailing banking sector's crisis and fund shortage from clients' end. Taken all of the above issues in consideration, we use a large sample of DSE listed non-financial companies from 2015 to 2019, we document that high performing clients are able to borrow fund from lending organizations at lower cost with easier terms which indicates that banks assess client's performance before setting interest cost for the loan they sanctioned. Our results are robust to alternative measures of firm performance we used in our present paper. However, readers should be cautious in generalizing our paper's findings as this study is subject to some limitations. Firstly, this study only tests the association between firm performance and cost of debt, but we do not examine cause and effect relation between firm operating performance and cost of debt. Future researchers can extend our study by examining the possible cause and effect relation between cost of debt and firm performance in a similar context.

Second, we use only one measure for the cost of debt which is measured by the total interest cost divided by total long-term loan borrowed by a client. As we do not have alternative measure for cost of debt due to data unavailability regarding credit rating information of borrowing clients. Future researcher can revisit cost of debt scenario covering alternative measures of cost of debt in Bangladesh.

Despite limitations this study has several contributions. For example, our findings complement the existing debate about the relation firm performance and cost of external debt in emerging economies. In addition, this study provides insights about the importance of firm performance on cost of raising external funds in an economy where most of the publicly listed companies are family dominated and family controlled [32, 34]. Future researchers can extend our research by examining the role of business group affiliation on cost of debt because more than fifty percent companies are currently affiliated with one of the business groups in Bangladesh. Business group affiliated firms can enjoy lower cost over standalone firms as they have higher reputation which can be an interesting avenue for further research.

Appendix

Appendix: variable definition

Notation	Description
COD	Interest expense for the year divided by the average of short-term and long-term debt during the year [29, 38].
FIRM_PERFORMANCE	We use TOBIN Q, *ROA* and *ROE* as firm performance proxy measures in our paper.
ROA	ROA is measured as the ratio of income before extraordinary items divided by total assets of firm [17, 29].
ROE	Ratio of income before extraordinary items divided by total shareholders' equity of the firm.
SIZE	Firm size is measured at the natural logarithm of total assets of the sample firm.
LEVERAGE	Leverage is measured as the ratio of total debt scaled by total assets of the firm.
OCF	*OCF* is measured as the ratio of cash flow from operating activities is divided by the total assets [29, 38].
NWC	Net property plant and equipment is divided by total assets [29, 38].
CAPEX	*CAPEX* is measured as the ratio of total capital expenditure to total assets of the current year of sample firm.
AGE	The number of year firm is listed with stock exchange.
RND	The ratio of total research and development expenditure to total assets of the firm.
BOD_SIZE	The Natural logarithm of the total number of directors on the board [29].
BIG4	A dummy variable equals to 1 if the sample company employs a *BIG4* affiliated firm as their external auditor, 0 otherwise [17].
RECINV	The proportion of receivables and inventories to total assets of the firm.
SIZE_AC	Number of members in Audit Committee.
INST_OWN	It represents institutional shareholders' ownership with the firm.
GOVT	Measured as the percentage of shareholding by government in the sample firm.
DUALITY	1, if the firm's Chairman and MD are the same, 0 otherwise.
OPINION	1, if the firm is issued with a qualified audit opinion, and 0 otherwise.

Appendix: variable definition

Notation	Description
BSEG	Number of local business segment of the sample company in the current year.
MBRATIO	*MBRATIO* is measured as the ratio of total market value of share to book value of shares of the company in the sample period.
GROWTH	Total sales revenues in the current year minus total sales revenues in last year divided by total sales revenues in the last year [29].

Abbreviations

COD   Cost of debt
ROA   Return on assets
OCF   Operating cash flow
NWC   Net working capital
CAPEX   Capital expenditure
GOVT   Government
BSEG   Business segment
MBRATIO   Market to book value ratio
NPL   Non-performing loans
NBFI   Non-bank financial institutions (NBFI)
SIZE   Firm size
RECINV   Sum of receivables and inventories
INST_OWN   Institutional share ownership
AC_SIZE   Audit committee size
LEVERAGE   Leverage

Availability of data and materials
Governance data are hand collected and other firm fundamental data are collected from COMPUSTAT and from firms' annual reports. Firm fundamental data are available on request.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
We authors declare that we do not have any competing interests.

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