

The effect of corporate boards on financial performance: Empirical evidence from Bangladeshi listed pharmaceutical companies

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Abstract

This fact-finding research aims to explore how corporate boards impacted the financial performance of publicly listed pharmaceutical companies in Bangladesh from 2007 to 2020 by focusing on the following characteristics: board size, board independence, women on the board, and board meetings. On the other hand, ROA, ROE, and TQ are used as the proxies of financial performance. Fixed and random effect regression models have been used to test the study hypothesis and meet its objective. The researchers finally implemented the Dynamic Ordinary Least Square (DOLS) method for estimating the long-term impacts on dependent variables. The study confirmed that BSIZE has a substantial negative effect on ROA, ROE, and TQ, whereas board independence has a notable beneficial impact on ROA and ROE. The study also shows that the ROA and TQ are significantly and favorably impacted by having women on board. Finally, ROA is negatively and significantly impacted by the frequency of BMEET. The study greatly contributes to the literature on corporate boards' affinity with firm performance. This study also offers academic support for governance reforms now being assessed by policymakers, investors, governments, international organizations, other stakeholders, and the general public. The research contributes to the growing body of knowledge on the connection between corporate boards and the firm performance of Bangladeshi pharmaceutical companies. This study focuses only on DSE-listed pharmaceutical companies in Bangladesh but excludes unlisted companies as financial and non-financial information about those companies needs to be accurately available.

Keywords: Corporate board, Board Size, Board Independence, Women on Board, Board meetings, Firm performance, Bangladesh.

1. Prelude

The concept of corporate governance (CG) in the subcontinent became popular after the Asian financial crisis due to the poor performance of companies in the subcontinent (Berglof & Von Thadden, 1999). Over the last few decades, CG has attracted the attention of academicians, practitioners, regulators, corporate stakeholders, and the public at large, particularly in the wake of corporate scandals, corporate catastrophes, and bailouts in both the advanced and emerging world (Akinkoye & Olanmi, 2014; Rana & Hossain, 2023). The eventual collapse of well-known corporations like Enron,

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World.com, Bank of Commerce and Credit International, and Parmalat raised serious questions about the financial condition of the companies and reinforced CG in industrialized and emerging countries (Sanda, Mikailu, and Garba, 2005), despite the fact that some manufacturing companies in Bangladesh, such as Hall Mark, Bismillah Group, Modern Food Ltd., an international food company, also experienced poor performance and financial collapse (Rashid, 2017). CG is a system, code, and approach by which enterprises direct and control internal and external business structures, monitor management and administrator actions, and mitigate agency risks (Opara & Alade, 2014). In order for a company to be successfully managed and to provide its shareholders and other stakeholders with value, good governance is necessary (Maher & Andersson, 2000). Sound CG is a corporate setup that leads to maximizing the value of the firm legitimately and on a sustainable basis while ensuring equity and justice to all the stakeholders (Ahmed, Alam, Jafar and Zaman, 2008). CG becomes a determinant of many subjects to identify a firm's strengths, weaknesses, and functions. Governance practices that keep the better interest of investors and other patrons can only strengthen our capital markets and expedite the capital formation and industrialization process (Saidat, 2018). Broadly, CG refers to the policies and procedures that the CEO, board of directors, and senior management use to lead and control corporations (Pucheta-Martínez & Gallego-Álvarez, 2020). According to Denis and McConnell (2003) and Mishra and Kapil (2018), several internal or external mechanisms can be used to address issues with corporate governance. The company's board of directors and equity ownership structure are the primary internal mechanisms, whilst the legal system and the takeover market are the primary external processes. The board of directors is regarded as the most significant CG mechanism since it oversees and counsels top management in carrying out their duty to safeguard the interests of shareholders (Johl, Kaur, and Cooper, 2015).

Pharmaceutical products are essential for all countries worldwide (Chowdhury, 2014). Bangladesh is an emerging market in the world in accelerating economic growth in the pharmaceutical sector. This sector in Bangladesh has made a remarkable contribution to economic growth close to the RMG sector. The pharmaceutical business contributed Tk 205.12 billion in 2018, with a growth rate of 9.36 percent; comparable statistics for 2017 and 2016 were Tk 187.56 billion and Tk 156.40 billion, with growth rates of 19.92 percent and 30.82 percent, respectively (Ahmed, 2019). Furthermore, the international wave of mergers and keen competition makes the pharmaceutical sector challenging and vulnerable to sustainability and long-term economic growth. All these issues together make it a debatable subject in CG research.

The country has achieved considerable progress in CG indicators in the last two decades. However, in reality, the state of CG in Bangladesh is not good, even though CG is a prerequisite for sustainable growth and smooth functioning of corporate entities, capital markets, and the economy. In Bangladesh, since the CG guidelines were initiated by the BSEC for the listed companies on February 09, 2006, very few studies have investigated the relationship between corporate boards and financial performance. Therefore, this

study seeks to provide new perspectives for scholars and regulators on the significance of corporate boards and company performance in terms of ROA, ROE, and TQ by examining corporate board issues such as board size, board independence, women on boards, and board meetings of DSE listed pharmaceutical companies. The results of this study will benefit several groups in Bangladesh, such as corporate entities, capital market players and regulators, corporate policy planners, corporate management, existing and potential investors, accounting professionals, academics, and future researchers in this field.

2. Literature Review and Hypotheses Development

The conflicting evidence between corporate boards and company financial performance was reported in earlier studies. The variables like board size, board independence, women on the board, and board meetings are considered to determine the effectiveness of corporate boards on company financial performance.

2.1 Board Size

Board size is considered an effective tool to control the internal corporate governance of a company (Rahman & Saima, 2018). The board of directors (BODs) is an element of implementing CG successfully. The BODs must be responsive to the main functions assigned to them (Martin & Herrero, 2018). The number of directors on the board is referred to as the board's size (Haque, Arun, and Colin, 2008). The number of corporate board members specifies efficiency in managing and controlling the company ((Maniruzzaman & Hossain, 2019a, 2019b; Maztoul, 2014). There is a great deal of discussion over the board's size and whether it will be large or small. Lipton and Lorsch (1992) and Mak and Kusnadi (2005) argued that due to extensive monitoring costs, the BSIZE should not exceed 7 to 8 members, but (Ogbechie et al., 2009) asserted that the board should have between 7 and 15 directors despite carrying higher costs, even though the overall number of directors varies by nation. Regarding board size, Mustafa et al. (2017) and Amedi and Mustafa (2020) stated that due to coordination issues, smaller corporate boards may be more active than larger corporate boards. They suggested that up to 8 directors would be an acceptable number. There are no global industry-wide norms regarding the composition of boards of directors. Greater board sizes can hamper the effectiveness of boards due to major repercussions such as a lack of coordination and commitment (Eisenberg, 1998). Large boards could be more cohesive and have better communication, according to Yermack (1996). However, bigger boards can operate comfortably in problematic economic conditions or financial instability and reduce conflicts in such situations (Mintzberg, 1983). Goodstein, Gautam, and Boeker (1994) opined that extended boards have better access to the firm's outside environment, allowing much scope to utilize various resources and alleviating uncertainties. In order to address the agency problem, company boards act as inside safeguards for principals' interests (Hasan et al., 2010; Hasan, Normah, et al., 2015). It happens because boards are primarily responsible for selecting and overseeing senior management to

preserve shareholders' interests (Haque, Arun, and Kirkpatrick, 2008). Ning, Davidson, and Wang (2010) mentioned that when BSIZE increases, agency problems in the boardroom also increase, leading to internal and internal conflicts among managers. From the standpoint of the stewardship theory, the directors on a firm board are important because they have superior knowledge of the firm's operations (Nicholson & Kiel, 2003). According to condition No.6 of the 2018 recommendations from the Bangladesh Securities Exchange Commission (BSEC), a company's board members cannot be fewer than 5 (five) or more than 20 (twenty). Numerous studies on the relationship between BSIZE and financial performance have discovered mixed results for developed and developing economies. Bonn and Fisher (2005) examined a sample of 55 US-listed corporations and reported a positive association between BSIZE and financial performance. Mak and Kusnadi (2005) and Haniffa and Hudaib (2006) discovered identical outcomes. Ibrahim and Samad (2011) discovered that the performance of family businesses, as measured by Tobin's Q, ROA, and ROE, was positively impacted by smaller boards. Yermack (1996) found a negative relationship between the financial ratio (Tobin's Q) and the size of the board in the USA large companies. Bozec (2005) and Lasfer (2004) discovered identical outcomes in large companies. In a study done in an Asian setting, BSIZE has a bad correlation with business performance (Weir, Laing & McKnight, 2002). Hansson et al. (2011) noted that larger boards are an effective governance system and have a negative effect on performance. Ng (2012) found that the BSIZE did not impact the performance of family firms in Hong Kong. Bhatt and Bhattacharya (2017) found no evidence that a large board could improve the effectiveness of a firm in India. Therefore, to confirm reality in our context regarding the pharmaceutical business in Bangladesh, the effect of BSIZE on a firm's financial performance must be assessed. Based on the findings of the above discussions, we propose the subsequent hypothesis:

H₀₁: There is no association between board size and a firm's financial performance.

2.2 Board Independence

Since the turn of the century, the importance of board independence (BIND) has been highlighted more by shareholders, leaders, and regulators due to the presence of independent directors or non-executives on boards (Ha, 2018). One of the reasons behind the appointment of independent directors is to confirm fairness, where they might assess and evaluate the performance and well-being of a company without any conflict of interest or undue influence (Sattar, 2018). According to the agency theory perspective, independent directors can defend shareholders' value by governing them and performing more effectively than other directors for the benefit of shareholders, protecting shareholders' interests against any self-serving behavior (Arosa et al., 2010). By discussing agency theory, Ramdani and Witteloostuijn (2010) proposed that when a firm employs outside directors, its capability to increase profitability starts. At least one-fifth of the members of a corporate board must be independent directors, according to the revised CG Guidelines published by the BSEC on June 03, 2018. Numerous studies have

examined board independence's impact on a firm's financial performance and uncovered diverse results. The number of independent directors and the firm financial performance is positively correlated, according to research by Kaplan and Reishus (1990), and Muravyev et al. (2014). Khan and Awan (2012) and Desoky and Mousa (2012) examined the relationship between the percentage of outside directors on the board and financial performance as determined by ROA, ROE, and TQ and found that having more outside directors on the board is positively correlated with firms' financial performance. Ghosh (2006), and Bhatt and Bhattacharya (2017) found no correlation between board independence and firm financial performance. Rashid (2017) studied the effect of independent directors on a company's financial performance in Bangladesh using a sample of 135 enterprises. The conclusions showed that BIND has a negative relationship with business financial performance. The following hypotheses are developed from the above literature review discussion:

H₀2: There is no association between a board's independence and the firm's financial performance

2.3 Women on Board

Many scholars from both developed and developing nations are interested in moving forward with the issue of having more women on board (Qian, 2016). Gender diversity is a matter that has drawn attention from nearly all sectors and enterprises, be it private or public organizations. The urge to ensure female representation in boardrooms compels companies to include more female members on their boards (Kilic & Kuzey, 2016). According to Bonn, Yoshikawa, and Phan (2004), the board plays a crucial role in CG procedures, notably in monitoring and advising; therefore, a variety of factors, including gender diversity, may have an impact on the effectiveness of the board (Ferreira, 2015). Women's board members can make diversity and provide new ideas to the board that can result in the better financial performance of companies (Julizaerma & Sori, 2012). By 2020, the European Union wants to see 40% female non-executive directors in big enterprises. A regulation requiring non-executive directors in Germany to have a gender diversity ratio of 30% was implemented in 2016. A 40% gender quota was also implemented in Norway in 2009 (Rhode & Packel, 2014).

Agency theory and resource dependency theory are seen as the theoretical pillars that encourage higher representation of women on BODs (Low, Roberts, and Whitling (2015). Carter et al. (2003) claimed that agency theory equates female directors to outside directors. Having more women on BODs improves performance by reducing principal-agent conflict (Francoeur et al. (2008). Bennouri et al. (2018) investigated the relationship between female director posts and company accounting performance (ROA and ROE) and market-based performance (Tobin's Q). They discovered that having female board members considerably lowers Tobin's Q and increases ROA and ROE. Some research, such as those by Rose (2007), and Yasser (2012), do not find a connection between gender disparities and financial performance.

The following hypothesis is developed based on the above literature review:

H₀₃: There is no association between the woman on board and a firm's financial performance

2.4 Board Meetings

Board meetings (BMEET) are another vital CG mechanism that can increase the effectiveness of the board (Saidat, 2018). A board can be influenced through the decisions and planning of BMEET, so a firm's managers must make strategic decisions at BMEET to oversee the conditions and oversight of the firm. Failure to attend regular BMEET indicates that the director is reluctant or incapable of discharging his responsibilities (Chou, Chung, and Yin, 2013). Boards point out problems in corporate firms and prepare a proposal for their correction (Agarwal & Singh, 2020). According to Lipton and Lorsch (1992), boards with regular meetings have a higher propensity for keeping to their commitments. Vafeas (1999) also described that BMEET is used as a measure of activity regarding decision-making and ensuring value to the board characteristics. The regularity of BMEET indicates improving boards' efficiency and monitoring efficacy (Vafeas 1999). Al-Daoud, Saidin, and Abidin (2016) conducted research that discovered a significant correlation between company BMEET frequency and firm financial performance. Aryani, Setiawan, and Rahmawati (2017) found that the firm performance is unaffected by the number of BMEET. Horvath and Spirollari (2012) and Qadorah and Fadzil (2018) revealed a negligible correlation between ROA and BMEET frequency. As for the Bangladeshi Pharmaceutical industry, it is necessary to examine the frequency of meeting relationships with firm financial performance.

The following hypotheses are developed from the above literature review discussion:

H₀₄: There is no association between board meetings and a firm's financial performance

3. Objectives of the Study

This study aims to examine whether there is any association between corporate boards and financial performance using panel data of DSE-listed pharmaceutical companies in Bangladesh. Objectives of this study include:

1. To examine the relationship between board size and firm financial performance;
2. To examine the relationship between the board's independence and the firm financial performance;
3. To explore the impact of women on board on the firm financial performance; and
4. To find out the impact of board meetings on the firm financial performance.

4. Research design and methodology

A purposeful sample of 9 companies from the listed pharmaceutical companies in the DSE has been selected from 2007 to 2020 to investigate the effect of corporate boards on firm financial performance. The data collection process includes one hundred twenty-six (126) firm-year observations. Nine (9) companies are chosen from a group of 15 based on the DSE listing age and availability data. These nine companies became listed with the DSE before promulgating CG guidelines in 2006. The study was carried out by the researchers using secondary data from various sources such as DSE and BSEC websites and publications, the websites of the sample companies, audited annual reports, research papers, journal articles, etc. The financial statements of the sample companies have been examined to obtain the Return on Assets (ROA), Return on Equity (ROE), and Tobin's Q in order to analyze the firm financial performance. Financial statements and other sources have been used to get information on corporate boards. The data were analyzed using the IBM Statistical Package for Social Sciences (SPSS) version 20 software, Stata MP 13 (64-bit), and MS Excel 2013. Data analysis for the study has used both descriptive and inferential statistical approaches. Frequency distribution, mean, median, maximum, minimum, standard deviation, skewness, kurtosis, correlation, etc., are examples of descriptive statistics. The study has used inferential statistics, including tests of normality, multicollinearity, correlation matrix, cross-sectional dependence test, slope heterogeneity, and unit root test. The study has also used multiple linear regressions (OLS regression, fixed effect model, and random-effect model) to examine the relationships between corporate boards (board size, board independence, women on board and board meetings) and financial performance measured as ROA, ROE, and Tobin's Q (TQ) of DSE listed pharmaceutical companies in Bangladesh. The study employed a Hausman test to determine whether a fixed or random effect model was the best estimating technique. Finally, the study employed the Dynamic Ordinary Least Square (DOLS) methodology to ascertain the long-term effects between the dependent and independent variables.

5. Variables construction and explanation

Variables	Indicators	Measure
Independent Variables	Board Size (BSIZE)	The number of the board members of the company, including a chairperson and independent directors.
	Board Independence (BIND)	Percentage of independent directors of the board of directors.
	Woman on Board (WBOARD)	Percentage of women on total boards.
	Board Meetings (BMEET)	The number of meetings held by the board.
Control Variables	Firm Size (FSIZE)	The natural logarithm of total asset
	Firm Age (FAGE)	The natural logarithm of the number of years since the firm was listed
	Financial Leverage (FLEV)	Total liabilities to shareholder equity.

Variables	Indicators	Measure
Dependent variables	Return on Assets (ROA)	ROA=Operating Income/ Average Total Assets
	Return on Equity (ROE)	ROA=Operating Income/Average Shareholders' Equity
	Tobin's Q (TQ)	Tobin's Q=Equity Book Value / Equity Market Value

6. Empirical model and estimation techniques

Model: $ROA_{it} = \alpha + \beta_1 BSIZE_{it} + \beta_2 BIND_{it} + \beta_3 WBOARD_{it} + \beta_4 BMEET_{it} + \beta_5 FSIZE_{it} + \beta_6 FAGE_{it} + \beta_7 FLEV_{it} + \varepsilon_{it}$

Model 2: $ROE_{it} = \alpha + \beta_1 BSIZE_{it} + \beta_2 BIND_{it} + \beta_3 WBOARD_{it} + \beta_4 BMEET_{it} + \beta_5 FSIZE_{it} + \beta_6 FAGE_{it} + \beta_7 FLEV_{it} + \varepsilon_{it}$

Model 3: $TOBIN'S Q_{it} = \alpha + \beta_1 BSIZE_{it} + \beta_2 BIND_{it} + \beta_3 WBOARD_{it} + \beta_4 BMEET_{it} + \beta_5 FSIZE_{it} + \beta_6 FAGE_{it} + \beta_7 FLEV_{it} + \varepsilon_{it}$

Where ROA is equal to Return on Asset, ROE equal to Return on Equity, BSIZE is equal to Board size, BIND is equal to Board independence, WBOARD is equal to Women on board, BMEET is equal to Board meetings, FSIZE is equal to Firm size, FAGE equal to Firm age, FLEV equal to Financial Leverage, β_1 , β_2 , β_3 , β_4 , β_5 , β_6 , and β_7 , are the coefficients, i represents the number of companies, t shows time, and ε is the error term.

7. Results and Discussion

7.1 Descriptive Statistics

The corporate board must include at least five members and a maximum of twenty, according to guidelines issued by the Bangladesh Securities Exchange Commission (BSEC). The highest and lowest board sizes shown in the descriptive statistics Table 1 are 11 and 4 respectively. However, the median and mean board sizes, which are 7.89 and 8, respectively, indicate that the majority of the listed sample companies have a board of directors with at least five members. The findings of this study are in line with those of Brown and Caylor (2004), who contend that a BSIZE between 6 and 15 is excellent for enhancing firm performance. While Lipton and Lorsch (1992) recommended a BSIZE of 8-9, Jensen (1993) and Jensen and Ruback (1983) asserted that a BSIZE of 7-8 members is likely to ensure efficacy since big boards are less likely to operate well and agree on specific results. Board sizes should be 7-9, claim Tornyeva and Wereko (2012), in order to provide smooth operation and enhanced performance. According to Table 1, the mean and median of independent directors are 17.98% and 20%, respectively, with a range of 0% to 35% for the years under consideration and a standard deviation of 0.07169. A minimum of one-fifth (1/5) or 20% (twenty percent) of the total number of directors on the board of the company must be independent, according to guidelines issued by the BSEC. The findings of the study revealed that it

does not entirely adhere to the BSEC requirements. The mean and median number of women on board is 1.9921 and 2, respectively, according to the descriptive statistics in Table 1. The minimum and the maximum number of women on board are 0 and 5 throughout the years examined, and its standard deviation is 1.44497. The results indicated that most of the listed companies have women on their boards, but the guidelines provided by the BSEC do not provide any guidance on having women on boards. The study demonstrates that the number of BMEET is between 4 and 20, with a mean and median of 7.62 and 7, respectively, and a standard deviation of 3.42895. It is in the best interest of the company to hold regular meetings at a time that works for the board because the minimum number of meetings that must be held is not stipulated in the law, depending on the company's situation.

Table 1: Summary of descriptive statistics

	BFSIZE	BIND	WBOARD	BMEET	FBSIZE	FAGE	FLEV	ROA	ROE	TQ
Mean	7.89	.18	1.99	7.62	7.94	3.21	1.55	.095	.161	4.94
Median	8.00	.20	2.00	7.00	7.97	3.22	.932	.098	.158	4.08
S.D	1.83	.07	1.44	3.43	1.94	.31	1.64	.058	.095	4.75
Skewness	-.41	-.40	.16	1.30	-.055	-.43	1.66	.142	.825	2.19
Kurtosis	-.73	.24	-.84	1.61	-1.38	-.33	1.83	-.640	2.07	6.00
Minimum	4.00	.00	0	4.00	4.24	2.40	.060	.001	.002	.130
Maximum	11	.35	5	20	11.21	3.78	6.45	.241	.531	27.03

Source: Researcher's calculations

7.2 Tests of Normality

Skewness and kurtosis statistics must be less than the absolute value of 2.0 in order to satisfy the statistical inference of normality. It is presumed that the continuous distribution is non-normal if either the skewness or kurtosis statistic is more than 2.0 in absolute value (George & Mallery, 2010). Based on the aforementioned descriptive statistics, it can be said that the data presented are normally distributed in terms of standard skewness and kurtosis.

7.3 Correlation Matrix

This section uses the Pearson correlation test to show the relationship between the CG mechanisms and financial performance measures (See Table 2). The correlation analysis reveals that the firm size negatively correlates with TQ at 1% significance levels, but there is no real connection between ROA and ROE. At a 5% level of significance, firm age significantly positively correlates with ROE, although ROA and TQ do not. Financial leverage, on the other hand, has no significant effects on ROA and ROE but has a substantial positive link with TQ at a 1% significance level. At the 5% level of significance, board size and board independence have a negative link with TQ but no meaningful correlation with ROA or ROE. At a 1% level of significance, women on corporate boards have a negative link with ROA and ROE, but no meaningful correlation with Tobin's Q. The frequency of BMEET exhibits an insignificant relationship with respectively.

Table-2: Correlation Matrix (Pearson Correlation) and VIF

	ROA	ROE	TQ	BSIZE	BIND	WBOARD	BMEET	FSIZE	FAGE	FLEV	VIF
ROA	1										
ROE	.942**	1									
TQ	.589**	.740**	1								
BSIZE	.088	.037	-.187*	1							2.090
BIND	-.100	-.128	-.188*	.452**	1						1.865
WBOARD	-.466**	-.362**	-.047	-.144	.112	1					1.800
BMEET	-.121	-.182*	-.243**	.386**	.320**	-.332**	1				1.511
FSIZE	.030	-.101	-.433**	.553**	.529**	-.310**	.433**	1			2.488
FAGE	.159	.187*	.018	.539**	.452**	.094	.028	.305**	1		1.684
FLEV	-.156	.086	.438**	-.126	-.100	.571**	-.220*	-.506**	-.030	1	1.924

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

7.4 Multicollinearity Test

This multicollinearity test can be done through a correlation matrix and variance inflation factor test (VIF) (see Table 2). Table 2 shows that the VIF value for each independent value is less than 10 and more than 1; it indicates the result of the econometric model for ROA, ROE, and TQ concerning independent variables is free from multicollinearity and data is also reliable. All of the coefficients in Table 2 are less than 0.6, demonstrating that the independent variables are not strongly associated. Therefore, there are no problems with multicollinearity among the independent variables.

7.5 Slope heterogeneity

Statistically, heterogeneity suggests that there will be differences in populations, data, surveys, samples, sample size, or findings. Heterogeneity and homogeneity are different, i.e., the opposite of homogeneity. Before using unit root testing, an econometric analysis for panel series data, a cross-sectional dependence test, and a heterogeneity test should be conducted. The following Pesaran and Yamagata slope heterogeneity test results indicate the delta and delta adjusted value and reveal $p > 0.05$ in models 1, 2, and 3. As a result, the alternative hypothesis (H_1) is rejected, and the null hypothesis (H_0) is accepted. Therefore, panel data is homogeneous for these models.

Table 3: Results of Homogeneity Tests

	Model-1		Model-2		Model-3	
Test	Test Stat.	p-value	Test Stat.	p-value	Test Stat.	p-value
Delta	0.615	0.539	-0.283	0.777	-0.023	0.982
Delta adj.	1.109	0.267	-0.510	0.610	-0.041	0.967

7.6 Cross-sectional dependence (CD) test and CIPS Unit root test

The study should first test cross-sectional independence for each variable before determining stationarity. The study employed the STATA software's Pesaran CD (cross-sectional dependence) test (Pesaran, 2004). While conducting the analysis, it is necessary to check for horizontal cross-sectional dependence in series. Using Pesaran CD (2004), the following table shows the findings of the horizontal cross-sectional dependence test results of DSE-listed pharmaceutical companies. $CD \sim N(0, 1)$ p-values are almost equal to zero under the null hypothesis of sectional independence. The statistics for cross-sectional dependence and the corresponding p-values strongly refute the null hypothesis of cross-section independence. The study suggests a cross-sectional correlation between the variables since they show that cross-correlations are significant. So, the test result indicates the presence of cross-sectional dependence in most model variables except for ROA, ROE, and BSIZE.

Determining whether a series is stationary (does not contain a unit root) or not stationary (contains a unit root) is crucial when analyzing data. After estimating Pesaran's 2004 CD test, Pesaran's 2007-unit root test is employed. We conduct a CADF panel unit root test for level and initial differences variables to assess the stationarity of all inherent time series data on a cross-sectional dependent panel (Pesaran, 2007). The study conducted a second-generation unit root test to check misleading assumptions. The below table-4 shows the CIPS unit root test results. The CIPS unit root test findings clarify that the series is not stationary at levels except WBOARD and FSIZE. All variables became stationary after the first differentiation.

Table 4: Results of CD and CIPS unit root test.

Variable	CD Test		CIPS Unit Root Test	
	Statistics	p-value	Level	1 st Difference
BSize	-0.440	0.660	-2.059***	
BIND	12.650	0.000	-2.022**	
WBOARD	19.96	0.000	-1.071	1.463***
BMEET	5.780	0.000	-2.286***	
FSIZE	19.090	0.000	-1.270	-3.713***
FAGE	22.440	0.000	-3.396***	
FLEV	2.140	0.032	-3.220***	
ROA	-1.590	0.111	-2.279***	
ROE	-0.930	0.353	-2.434***	
Tobin's Q	3.410	0.001	-2.161***	

7.7 Regression model results

The impact of corporate boards (board size, board independence, women on the board, and board meetings) on financial performance (ROA, ROE, and Tobin's Q) is shown in the following table. In table-6, looking at the Hausman test's Chi-square values for model-1 and model-2, the probability values of which are less than 5% ($P\text{-value} < 0.05$), indicate that the study rejects the null hypothesis and accepts the alternative. The fixed-effect model is therefore thought to be more appropriate than the random-effect model, according to the Hausman test results that are related to ROA and ROE. In table-6, looking at the Hausman test's Chi-square values for model-3, the probability values of which are greater than 5% ($P\text{-value} > 0.05$), indicate that the study accepts the null hypothesis and rejects the alternative. The Hausman test results, which are connected to Tobin's Q, thus opine that the random-effect model is preferable to the fixed-effect model.

The results demonstrate that the BSIZE significantly and negatively affects ROA, ROE at a 1% significance level, and TQ at a 5% significance level. It indicates that BSIZE flourishes to negatively impact the financial performance of DSE-listed pharmaceutical companies in Bangladesh. This inverse link suggests that as BSIZE rises, company performance will decline. The negative relationship was documented by several researchers such as Alves (2014), Fuzi, Adriana, and Julizaerma (2016), Pranati (2017), and Danoshana and Ravivathani (2019). According to resource dependence theory and agency theory, BSIZE has a beneficial impact on a firm's financial performance, while stewardship theory favors lower BSIZE and contends that greater BSIZE has a negative impact on a firm's financial performance. This negative link is most likely caused by a larger BSIZE resulting in more conflicts of interest and prolonging the decision-making process.

Board independence, on the other hand, has no significant link with TQ but a significant beneficial impact on the firm's financial performance as evaluated by ROA and ROE at 5% and 10% significance levels, respectively. Some earlier empirical research, including Fich and Shivdasani (2006), Rouf (2011), and Bhat, Chen, Jebran, and Bhutto (2018), established a relationship between board independence and firm financial performance. Based on these results, it is clear that the increased proportion of independent board members supports the perspectives of the agency and resource dependence theories since outside directors offer valuable oversight and contributions to the management team.

The table also demonstrates that having women on board has a significant and favorable impact on ROA and TQ at levels of significance of 10% and 5%, respectively, but has no meaningful impact on ROE. These findings can be explained by the fact that big boards with a high attendance of female directors are consistent with firm performance (ROA), support agencies, and resource dependency theory and are in line with the monitoring or supervision hypothesis. In numerous earlier studies, including Julizaerma and Sori (2012), Amore et al. (2014), Hutchinson et al. (2015), and Bennouri et al. (2018), significant relationships between the impact of women on board and firm financial performance. Women can develop fresh viewpoints and ideas to assist BOD in improving their problem-solving and business strategy setting, according to Agency Theory (Francoeur et al., 2008) and Resource Dependency Theory (Rose, 2007).

Last but not least, at a 10% significance level, the frequency of BMEET has a negative and significant influence on ROA but no significant impact on ROE or TQ. As a result, the quantity of BMEET would significantly enhance company performance as determined by accounting measures (ROA), rather than by market measures (TQ). Some prior studies have not found any impact of the number of BMEET on firm performance, such as Bhatt and Bhattacharya (2015), Aryani, Setiawan, and Rahmawati (2017), and Bhat, Chen, Jebran, and Bhutto (2018). However, some studies have found that a number of BMEET affect financial performance, such as Al-Daoud, Saidin, and Abidin (2016), Qadorah and Fadzil (2018), and Danoshana and Ravivathani (2019).

Table 5: Regression model results

	Model-1(ROA)		Model-2 (ROE)		Model-3(Tobin's Q)	
	OLS	FE	OLS	FE	OLS	RE
BSIZE	.175 (0.732)	-1.430*** (0.002)	-.161 (0.723)	-1.11*** (0.003)	-.550 (0.190)	-.408** (0.041)
BIND	.0152 (0.965)	.506** (0.029)	.034 (0.910)	.326* (0.082)	.329 (0.241)	.085 (0.633)
WBOARD	-1.597*** (0.000)	.485* (0.075)	-1.66*** (0.000)	.307 (0.163)	-1.17*** (0.000)	.382** (0.048)
BMEET	-.939*** (0.001)	-.463* (0.069)	-.882*** (0.000)	-.259 (0.209)	-.456*** (0.042)	.029 (0.878)
FSIZE	-.045 (0.541)	-.687*** (0.000)	-.044 (0.503)	-.722*** (0.000)	-.163*** (0.008)	-.292*** (0.011)
FAGE	.940** (0.013)	.687 0.183	1.18*** (0.001)	1.46*** (0.001)	.711** (0.022)	.622* (0.100)
FLEV	.111 (0.149)	-.149 0.136	.301*** (0.000)	.216*** (0.008)	.387*** (0.000)	.280*** (0.000)
R ²	0.3747	0.2963	0.4350	0.4390	0.308	0.2525
F-test	9.939	6.62	9.200	12.30	7.515	38.01
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hausman Specification Test						
Chi 2	30.42		12.34		1.83	
Prob>chi2	0.0001		0.0089		0.9685	
Hypothesis Results						
H ₀ 1	Rejected		Rejected		Rejected	
H ₀ 2	Rejected		Rejected		Accepted	
H ₀ 3	Rejected		Accepted		Rejected	
H ₀ 4	Rejected		Accepted		Accepted	

Source: Researcher's Calculations

***, **, and * represents significance at the 1%, 5%, and 10% level respectively.

7.8 DOLS Estimators Results Discussion

The results of the DOLS are in Table 6 for Model 1 (ROA), Model 2 (ROE), and Model 3 (TQ). BSIZE has a negative and significant long-term impact on financial performance as measured by ROA, ROE, and Tobin's Q. Furthermore, board independence has no substantial effect on Tobin's Q. However, it has a negative and considerable long-term impact on ROA and ROE. These results do not match those from our panel regression model estimation. However, only Tobin's Q is negatively and significantly long-term impacted by the BMEET. This outcome contrasts with the estimations from our panel regression model.

Table 6: Results of long-run estimation through DOLS

Regressors	Model-1(ROA)		Model -2 (ROE)		Model-3 (TQ)	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
BSIZE	-1.633	0.036	-1.741	0.002	-2.205	0.000
BIND	-0.697	0.043	-0.619	0.012	0.239	0.277
WBOARD	0.616	0.286	0.326	0.434	0.191	0.605
BMEET	0.434	0.302	0.199	0.511	-0.641	0.017
FSIZE	7.705	0.000	5.325	0.000	1.689	0.000
FAGE	1122.717	0.000	1359.792	0.000	1610.141	0.000
FLEV	-3.192	0.000	-2.838	0.000	-1.929	0.000

Source: Researcher's Calculations

8. Summary of Research Findings

The study has reached the following findings.

- The study showed that the BSIZE had significant negative correlations with financial performance as determined by the ROA, ROE, and TQ. Thus, BSIZE growth has a detrimental effect on the performance of DSE-listed pharmaceutical companies.
- The number of independent directors in the sample companies showed an increasing trend since 2012, indicating that the revised CG Guidelines issued by the BSEC on August 30, 2012, impact the growing number of independent directors of pharmaceutical companies in Bangladesh.
- Board independence is associated with accounting measures (ROA and ROE) but not market measurements (Tobin's Q). The study also showed that the BSEC guidelines regarding BIND were not fully complied with.

- The current study revealed that women on the company board have significant positive impacts on both the accounting measure (ROA) and market measure (TQ) but little effect only ROE. The study also showed that the number of women on boards in pharmaceutical companies has an upswing trend in examined years. But, there are still not enough women on the corporate boards of Bangladeshi pharmaceutical firms.
- The findings of the regression analysis revealed that the BMEET has no discernible effect on ROE or TQ but has a significant impact on ROA, i.e., the frequency of the BMEET considerably enhances firm performance as measured by accounting measures (ROA), not by market measurements (Tobin's Q).

9. Conclusions and Recommendations

This study strives to examine the impact of board traits on both the accounting and market-based financial performance using panel data of DSE-listed 9 pharmaceutical companies from 2007 to 2020. The data was assembled from various sources, such as DSE, BSEC, and the websites of the sample companies. The fixed and random effect regression models were used to examine the associations. The study finally executed the Dynamic Ordinary Least Square (DOLS) technique to estimate the long-term impacts on dependent variables. The study found that BSIZE has a long-term adverse influence on the financial performance of DSE-listed pharmaceutical companies based on ROA, ROE, and TQ.

The study recommends that a corporate board be smaller, highly experienced, and composed of expert members in all relevant fields who can make decisions more quickly and effectively than a large board with inefficient members. The study outcomes also revealed that, in terms of board independence, corporate entities need to follow the BSEC requirements thoroughly. It has no impact on the market measure (TQ) but has considerable positive influences on the accounting performance measures (ROA and ROE). The inclusion of autonomous directors depends on political reasons, which drive no value addition. Thus, due diligence is needed while nominating an independent director. The study also uncovered that women on boards favourably impact market and accounting indicators (TQ and ROA). In Bangladesh, women's participation on the corporate board in major decision-making areas is significant. However, in the case of pharma companies, corporate boards have a low ratio of female directors compared to males. Based on ROA, the number of board meetings enhances company performance. The study recommends that pharmaceutical companies follow the norm of the frequency of BMEET in a year and that the required number of members attend the meetings. From the viewpoint of the control variable in all models, firm size has negative and significant impacts on financial performance. However, the two other variables, namely firm age and financial leverage, positively and significantly influence performance measured by ROE and TQ. To boost corporate financial performance, BSEC, the government, and politicians should work together to eliminate strict regulations that obstruct the efficient collection and use of long-term funding sources.

The study focuses only on DSE-listed pharmaceutical companies in Bangladesh but excludes unlisted companies as financial and non-financial information about such companies is not accurately available. Hence, the results of this study cannot be universal to unlisted pharmaceutical companies in Bangladesh. In terms of practical implications, the study offers essential contributions to policymakers, investors, international organizations, governments, other stakeholders, and the general public. This study suggests that future researchers can undertake comparable investigations utilizing data from Bangladeshi pharmaceutical companies that are not DSE-listed. Further studies can include other industries, emerging economies, or a comparative study between Bangladesh and other South Asian countries.

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