American Journal of Economics and Business Innovation (AJEBI)

ISSN: 2831-5588 (ONLINE), 2832-4862 (PRINT)

VOLUME 5 ISSUE 2 (2026)

PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

American Journal of Economics and Business Innovation (AJEBI)

Volume 5 Issue 2, Year 2026
ISSN: 2831-5588 (Online), 2832-4862 (Print)
DOI: https://doi.org/10.54536/ajebi.v5i2.8121
https://journals.e-palli.com/home/index.php/ajebi

Female Director and Cost of Capital: Evidence from Australia

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Article Information

Received: Apil 25, 2026

Accepted: July 02, 2026

Published: August 14, 2026

Keywords

Australia, Cost of Capital, Female Directors, Gender Diversity

ABSTRACT

This paper examined the consequences of female directors' presence on the firm's cost of capital. This study included all the Australian listed companies in the primary list of samples from 2001 to 2015. This research revealed that female directors' presence could ensure better monitoring, reduce the agency risk for shareholders, and increase the financial reporting quality, which results in a lower cost of capital. Moreover, firms that have complied with the gender diversity regulation signal quality corporate governance (as gender diversity is one of the criteria of quality corporate governance), which leads to easy access to financial resources and reduces the cost of capital. Therefore, using the two measures of the cost of capital (PEG and MPEG measures), we have found that the existence of female directors has a negative and significant association with the cost of capital. Furthermore, the additional test regarding the self-selection concern of female directors revealed that the baseline model is free from self-selection bias. Our findings have implications for individual firms and for regulators. For example, firms can get access to financing at lower rates by modifying their boards' composition (i.e., through gender diversity). This paper makes a significant contribution to understanding that gender diversity can be a way of reducing the company's cost of capital collection. This research goes beyond the conventional attention on corporate governance and the cost of capital. We use the existence of female directors as a sign of good governance quality to determine the cost of capital. As per our knowledge, this study is the earliest to examine the consequences of board gender diversity on the cost of capital from the Australian 'best practice' gender diversity perspective.

INTRODUCTION

This research investigates the consequences of women directors' existence on the cost of capital in Australia. Female directors' roles and effectiveness in corporate boards have earned increased attention. This escalating concern arises from the acknowledgment that previously, females have had fewer opportunities in high-profile jobs (Lara *et al.,* 2017), such as corporate directorships (Bilimoria & Piderit, 2014; Westphal & Stern, 2007). Recent regulations mentioned the fear that unfairness might happen in gaining access to directorships, leading to inadequate access to the capital collection. Thus, they suggest growing the number of women directors on corporate boards. Previous studies unambiguously contend that gender diversity enriches board effectiveness. Because woman directors perform another way comparing to their male colleagues (Adams & Funk, 2012; Sila, Gonzalez, & Hagendorff, 2016), woman directors demonstrate higher monitoring skills, are more independent, risk-averse, highly sensitive to ethical issues, maintain shareholders' interest and provide higher levels of caution for confirming the quality financial statements (Arun, Almahrog, & Aribi, 2015; Abbott, Parker, & Presley, 2012). However, the literature studying gender diversity and the cost of capital systematically reports negative consequences.

The board of directors is considered a significant position for the safeguard of shareholders and to make sure the quality of financial statements (Bedarda & Johnstone, 2004). More explicitly, board attributes such as independence, expertise, and gender diversity are extremely promoted by shareholders' interest by decreasing the likelihood of earnings management (Arun *et al.,* 2015; Srinidhi, Gul, & Tsui, 2011) and by requiring high-quality audits (Yang, Lai, & Tan, 2008). Further, a gender diverse board offers better oversight over managers that supports fair financial reporting, which reduces agency costs and may affect the firm's cost of capital negatively. Therefore, we argue that female directors' existence enhances effective monitoring, which reduces the agency costs, provides high-quality financial reporting, followed by easy access to external financing, and may result in a lower cost of capital.

Hence, a diversified gender board enhances better monitoring, decreases information asymmetry because of better quality earnings, higher transparency, and enhanced provision of public information, so there is a possible association between a gender-diverse board and cost of capital. Previous researchers have examined the consequences of female directors' existence from a performance (Njuguna, D., Rono, L., & Limo, P. 2025), financial reporting quality, earnings management, and compensation perspective. However, taking into account this, this research was motivated to conduct the study on the cost of capital as an outcome of the firm's gender diversity.

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Using data from Australian listed firms throughout the 2001-2015 sample period where the corporate governance approach (the "if not, why not" approach) is dissimilar from that of the European and some Asian countries, this study finds that firms with woman directors on the board (measured as the percent of female directors (%FD), percent of the independent female director (%INDFD) and a dummy variable of the female director (D_FD)) incur a lower cost of capital from the Australian context. This study answers the call for further study at the gender diversity level to comprehend well how female directors' existence affects financial statements (Lara *et al.,* 2017), which is incremental to analyze the firm's cost of capital. Second, this study contributes to the consequences of gender diversity literature. Past evidence details a negative association between financial reporting quality and cost of capital; similarly, the quality of earnings management is higher for companies with more women directors (Arun *et al.,* 2015), but how female directors' existence at the firm-level influences the cost of capital remains unanswered. This research fills this void in the literature.

The remainder of this study begins with a review of the relevant literature and the development of the research hypotheses. It then describes the sample, data sources, and variable measurements, followed by the presentation and discussion of the empirical findings. The paper concludes with a summary of the key findings and their implications.

LITERATURE REVIEW

The likely determinants, as well as the estimation of cost of equity, are significant because these are normally used in situations such as the estimation of equity risk premiums, capital budgeting, firm valuation, portfolio allocation, and performance evaluation (Camara, Chung, & Wang, 2009; Hou, Dijk, & Zhang, 2012). Easley & O'hara (2004) stated that the quantity and quality of information affect the cost of equity. The separation between ownership and control in a firm (agency theory) is positioned at the heart of the theoretical framework of the relationship between financial information quality and cost of capital. Given the existence of agency costs, which may be unfavorable to capital providers and their interests, it is essential to determine effective governance mechanisms by delivering a high quality of financial information. Diamond and Verrecchia (1991) argue that information asymmetry is possible to reduce through the clarity of financial reporting which improves investor demand for shares, which, by the way, enhances the firm's liquidity and decreases its financing cost (Diamond & Verrecchia, 1991).

However, the previous study in corporate governance literature mentioned that better-governed companies give higher quality accounting numbers (Armstrong & Balakrishnan, 2012) as the female director's presence in the corporate board may be a proxy for the quality of the company governance structure (Lara *et al.,* 2017). Generally, in decision-making contexts, women are very cautious and show less aggression than men (Byrnes *et al.,* 1999) and have a low prospect of risk-taking, particularly in financial decision-making circumstances (Powell & Ansic, 1997). More precisely, females have a tendency to work more assertively than men to improve earnings quality since they are highly responsive to the reputational losses and risk of lawsuits (Srinidhi *et al.,* 2011). Therefore, in terms of earnings management, a gender diverse board is highly expected to exhibit a restrained approach (Gull, 2018). In this context, Krishnan and Parsons (2008) discovered that companies with more females in their senior management report high-quality earnings management (Krishnan & Parsons, 2008). In this way, the placement of women in crucial monitoring positions boosts the board's efficiency at supervising the activities of management, which in turn decreases the probability of earnings management and agency cost, and improves accounting quality. So, Female directors' existence in the corporate board specially in audit committee positively influences financial reporting quality which may negatively impact a firm's cost of capital.

Therefore, female directors' presence is negatively correlated with earnings management as female representation on the board leads to intense monitoring, which follows less agency costs through higher financial reporting quality. Proper disclosure of the financial report gives the stakeholders a clear picture of the firm's economic performance. So, it is anticipated that female directors' existence is negatively related to the firm's cost of capital.

Hypothesis Development

From the economics and accounting perspective, the cost of capital means the costs that are associated with collecting a corporation's funds. While the cost of capital is the compensation for shareholders to lend their money while taking on risks, the cost of getting access to external finance decreases with lower associated information asymmetries and dangers. Hence, the ethical issue or lack of morals results in higher earnings management, which increases the possible risks of expropriation and misalignment of interests between shareholders and managers. Earnings management is connected with managers' and accountants' moral sense (William & Merchant, 1990).

The extant literature implies that gender diversity improves the efficacy of internal governance, as higher females board participation is linked with more endeavor on monitoring (Adams & Ferreira, 2009), task-oriented conflict on decision making expanded public disclosure and stock price informativeness (Gull, 2018), greater board independence and activism (Perrault, 2015) and enhanced board negotiations of complex issues (Huse & Solberg, 2006). Thus, it is conceivable that women directors assist in easing the agency problems through effective monitoring. Chen (2009) argued that a diversified board can enhance the external monitoring of managers' behavior that declines the deadweight loss of the agency

cost and offering them with incentives, which results the lower cost of equity (Chen, Chen, & Wei, 2009). Thus, a gender diverse board can enhance monitoring, reduce information asymmetry due to better quality earnings, higher transparency, and improved provision of public information, it should influence the cost of capital negatively. Thus, we hypothesize as follows:

H1: Female directors' existence negatively affects the firm's cost of capital.

MATERIALS AND METHODS

Sample Construction

This study examine the research questions in the Australian regulatory environment. We have included ASX-listed companies in the primary list of samples from 2001 to 2015. We have chosen 2001 as the initial firm-year observation, as CGBPC was first enacted in 2001 in Australia. By nature, the Corporate Governance Best Practice Code is a voluntary regulation (also known as 'comply or explain' or 'soft regulation') which suggests all compliance as a sign of best governance practice. Also, company-listed regulations are often aligned with such soft regulations, and therefore, the duration of samples is deemed to be sufficient to generalize. The sample comes from three key data sources: i) the governance data from the Securities Industry Research Centre of Asia-Pacific (SIRCA) database, ii) financial accounting information from COMPUSTAT (Global Vantage), and iii) the Institutional Brokers' Estimate System (I/B/E/S) for the future earnings data. There are some requirements of using the I/B/E/S database, such as following the price/earnings to growth (PEG) approach for calculating the cost of capital (Easton, 2004). If the analyst's forecast for year 2 is less than that for year 1, then they have to omit such data.

Table 1: Sample distribution and industry breakdown

Panel A – Sample distribution			
Details		**Observations**	**Observations**
	Initial sample after matching SIRCA and Global Vantage for the period (2001 – 2015)		15,467
Less	Observations pertaining to financial institutions (GICS code-40) and regulated industries (GICS code-60)	(1,381)	
Less:	Missing observation in the relevant control variables	(4,562)	
Less:	Merged I/B/E/S database	(6,341)	
	Total Deduction		(12,284)
Total Sample			**3,183**
Panel B – Industry distribution			
Industry	**GICS Industry sector**	**Observations**	**Percentage**
Code	Energy	(%)	
10	Materials	306	9.61
15	Industrials	772	24.25
20	Consumer discretionary	611	19.20
25	Consumer staples	545	17.12
30	Health care	252	7.92
35	Information technology	239	7.51
45	Telecommunication services	290	9.11
50	Utilities	106	3.33
55		62	1.95
Total		**3,183**	**100.00**

Table 1 represents the sampling distribution (Panel A) and industry-wise segregation of the final sample (Panel B). Panel A of Table 1 presents an initial sample of 15,467 firm-year observations for empirical analysis. Then (i) removed 1,381 observations about financial institutions and regulated industries (GICS code 40 and 60) due to different financial nature of business as they need to follow different types of regulatory environment where the female directors' consequence model is not useful (Pandey, Biswas, Ali, & Mansi, 2019; Habib, Bhuiyan, & Sun, 2019; Habib, Bhuiyan, & Hasan, 2017) (ii) deleted 4,562 missing observation in the relevant control variables, and finally; (iii) we then merged this sample of 9,524 firm-year observations with the population of companies listed on the Australian Securities Exchange and covered by the I/B/E/S International database.We have lost a significant number of observations in the course of this matching process, as of the requirements for companies to have non-missing current and 1-year-ahead forecasted earnings per share, and non-missing closing stock price data. Therefore, the final sample consists of 3,183 firm-year observations for the whole

sample period. All the continuous variables are winsorized at the 1st percentile to mitigate the undesirable influence of outliers. Panel B of Table 1 illustrates the industry-wise breakdown of 3,183 firm-year observations between 2001 and 2015. The database included nine different types of industries involving: Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health care, Information technology, Telecommunication services, and Utilities according to the Global Industry Classification Standard (GICS) (Habib *et al.,* 2017). It shows that most of the sample firms belong to the Materials industry (24.25%). Followed by Industrials (19.20%), Consumer Discretionary (17.12%), Energy (9.61%), Information Technology (9.11%), Consumer Staples (7.92%), Health Care (7.51%), Telecommunication Services (3.33%), and Utilities (1.95%).

Empirical Constructs on Female Directors and Cost of Capital

The purpose of this study is to examine the consequences of board gender diversity on the firm's cost of capital, and to do so, this research focuses on how the presence of women directors reduces the firm's cost of capital.

To test the above-mentioned research question, the following regression model is anticipated–

$$CoC_{i,t} = \partial_0 + \partial_1 \sum FD_{it} + \partial_2 INDUSTRY\_SPEC_{it} + \partial_3 ROA_{it} + \partial_4 LNSIZE_{it} + \partial_5 BTM_{it} + \partial_6 BETA_{it} + \partial_7 LEVERAGE_{it} + \partial 8 \ |DAC|it + \partial_9 BODSIZE_{it} + \partial_{10} BODIND_{it} + \partial_{11} ACSIZE_{it} + \partial_{12} ACIND_{it} + INDUSTRY\ DUMMY + YEAR\ DUMMY + \varepsilon_{i,t} \quad (1)$$

Here, CoC indicates the cost of capital, where the dependent variable is measured by the price-earnings-growth (PEG) or modified PEG (MPEG). Our variable of primary interest is the female directors' existence (FD). FD indicates female directors. We plan to consider three different proxies of female directorship (FD). First, %FD considers the % of female representation on the board comparing total board size. Second, a dummy variable assigns a value equal to 1 if the firms have a female director, otherwise 0. Third, %INDFD indicates % of an independent female director on the board, comparing total board size.

In this model, control variables are INDUSTRY_SPEC, which indicates industry specialization. The auditor's industry specialization demonstrates vast knowledge regarding the client's business environment, its industry's regular accounting practices, and prospective "abusive" accounting practices. Such knowledge and expertise would be perceived as the information risk-reducing factor by investors. Therefore, according to Leuz and Verrecchia (2005), for the clients of specialist BigX auditors, it should ultimately result in a lower cost of capital compared to non-specialist BigX auditors (Leuz & Verrecchia, 2005). So, a negative relationship is expected between an auditor's industry specialization and the cost of capital. ROA indicates the return on assets assessed as the ratio of earnings before interest and tax divided by total assets; it is expected that a firm's profitability will influence the cost of equity because it affects the shareholders' expectations. According to previous literature, reported earnings (ROA) are anticipated to directly influence the cost of capital through both investors' expectations of returns (Gebhardt, Lee, & Swaminathan, 2001; Gode & Mohanram, 2003), and it has consequences for the financial health of the firm's shareholders. Firm size lessens the cost of equity capital since larger firms have a lower probability of default (Berger & Udell, 1995), are pursued more by analysts, and are more liquid. We will use the natural log of the market value of equity to determine the firm size (LNSIZE). Growth opportunity is described by uncertainty and risk and is estimated to be linked positively with the cost of equity capital (Boone, Khurana, & Raman, 2008; Chan, Hamao, & Lakonishok, 1991; Khurana & Raman, 2004). As a growth proxy, We will use the book-to-market ratio (BTM). We keep under control for the effect of systematic risk (BETA), as this is related positively to the cost of equity capital (Harris & Marston, 1992; Lintner, 1965; Sharpe, 1964). We have included leverage (LEVERAGE) as a proxy for the riskiness of the company. The higher the level of leverage, the greater the perceived risk linked with the firm and, consequently, the higher the cost of equity capital (Fama & French, 1992; Gebhardt *et al.,* 2001; Modigliani & Miller, 1958; Petersen & Rajan, 1994). |DAC| signifies the absolute value of discretionary accruals. This analysis uses the absolute value of the modified Jones model after controlling the prior performance (Dechow & Dichev, 2002; Kothari, Leone, & Wasley, 2005). Chung *et al.* (2009) find that there is a negative relationship between earnings management and equity liquidity, which results in a higher cost of capital because of poor financial reporting quality (Yang *et al.,* 2009).

Another set of control variables includes corporate governance variables, including board size (BODSIZE, number of board members), board independence (BODIND, the proportion of independent board members), audit committee size (ACSIZE, number of audit committee members), and audit committee independence (AC_IND), which is the ratio of outside directors on the audit committee (Habib *et al.,* 2019). BODSIZE means the size of the board, which indicates the total number of board members. The previous study showed that a negative relationship between board size and cost of capital (Upadhyay & Sriram, 2011) because extremely transparent companies keep a larger board to deal with the improved monitoring responsibilities arising from investors' demand for higher governance standards, which reduces a firm's information asymmetry and cost of capital. BODIND means board independence, assessed by the proportion of independent directors on the board. Board independence affects the firm's cost of capital as companies with more independent boards enjoy a lower cost of capital (Upadhyay & Sriram, 2011) because independent directors may focus more on transparency, which leads to a lower cost of capital. ACSIZE means audit committee size, which was

measured by the number of audit committee members. The audit committee can ensure intense monitoring and advising on essential matters that dominate the agency's cost and enhance financial reporting quality, decreasing the firm's cost of capital (Appuhami, 2018). On the other hand, audit committee independence (ACIND) is the proportion of independent directors on the audit committee (Klein, 2002), which may negatively influence the firm's cost of capital, as auditor independence may increase the credibility of financial reporting (Azizkhani, Monroe, & Shailer, 2013).

Measurement of Cost of Capital (CoC)

The implied approach and the realized approach can be used both to measure the cost of capital. Assessment of the implied cost of equity entails estimating the internal rate of return that equates the stock prices to the present value of forecasted cash flows (Hou *et al.,* 2012). Alternatively, the realized approach applies ex-post stock returns to assess the cost of equity. Though assessments based on ex-post realized stock returns may suffer from measurement errors, such as imprecise estimates of the factor risk premium and risk loading (Elton, 1999; Fama & French, 1997). Hence, academics are progressively trusting of the implied cost of equity capital. According to the prior studies, this research used fundamental approaches for estimating the cost of equity. In particular, We have used the Easton (2004) PEG model and the MPEG model. Botosan & Plumlee, (2005) claim that Easton's (2004) PEG ratio overshadows the other options, which means that they are consistently and predictably associated to numerous risk measures. The formulas for estimating PEG and MPEG are as follows:

$$PEG_{i,t} = \sqrt{\frac{eps_2 - eps_1}{p_0}} \quad (2)$$

$$MPEG_{i,t} = \sqrt{\frac{eps_2 + (MPEG \times dps_1) - eps_1}{p_0}} \quad (3)$$

where p_0 is the price per share at the current date, dps_1 is 1-year ahead expected dividend per share, eps_1 is the 1-year-ahead expected EPS, and eps_2 is the 2-year-ahead expected EPS.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 2, provides descriptive statistics for the variables used in the model. The means (medians) of the cost of equity capital are 0.14 (0.10) and 0.16 (0.13) for the PEG and MPEG measures, respectively. In this analysis, the definition of the female director (FD) includes three proxies of female directorship, such as the percent of female directors (%FD), the percent of independent female directors (%INDFD), and a dummy variable of the female director (D_FD). The respective proportions are 7 percent, 6 percent, and 40 percent of female directors. Table 2, also indicates that 6 percent of the auditors are industry specialists, and the firm's ROA is 1 percent. The mean value of LNSIZE is (5.49). Moreover, the mean (0.76) and median (0.57) BTM suggest that the sample firms have valuable growth opportunities. The mean BETA is 0.02 percent. The average LEVERAGE ratio is 15 percent. The mean (median) |DAC| is 0.17 (0.14). The firm's average board size is 7.33, where an average of 74 percent of directors is independent. The average size of the audit committee is 3.39, and the audit committee's independence is 3.11 percent.

Table 2: Descriptive analysis and mean difference test

Panel A: Descriptive analysis								
Variable	**N**	**Mean**	**SD**	**Min**	**Max**	**Q1(25%)**	**Q2(Median)**	**Q3(75%)**
PEG	3,183	0.14	0.14	0.00	0.87	0.08	0.10	0.16
MPEG	3,183	0.16	0.15	0.00	0.98	0.10	0.13	0.19
%FD	3,183	0.07	0.10	0.00	0.60	0.00	0.00	0.13
D_FD	3,183	0.40	0.49	0.00	1.00	0.00	0.00	1.00
%INDFD	3,183	0.06	0.08	0.00	0.57	0.00	0.00	0.11
IND_SPEC	3,183	0.06	0.24	0.00	1.00	0.00	0.00	0.00
ROA	3,183	0.01	0.23	-1.92	0.36	-0.00	0.04	0.09
LNSIZE	3,183	5.49	1.12	2.74	8.22	4.76	5.49	6.24
BTM	3,183	0.76	0.68	-0.03	3.88	0.32	0.57	0.94
BETA	3,183	0.02	0.02	-0.01	0.11	0.00	0.02	0.03
LEVERAGE	3,183	0.15	0.15	0.00	0.71	0.00	0.12	0.24
|DAC|	3,183	0.17	0.15	0.00	1.02	0.08	0.14	0.21
BODSIZE	3,183	7.33	2.34	3.00	18.00	6.00	7.00	8.00
BODIND	3,183	0.74	0.14	0.00	0.94	0.67	0.78	0.86
ACSIZE	3,183	3.73	1.07	3.00	8.00	3.00	3.00	4.00
ACIND	3,183	0.69	0.05	0.60	0.86	0.67	0.67	0.75

Notes: All variables are defined in Appendix A. All the continuous variables are winsorized at the top and bottom 1 percent of their distribution to mitigate the effect of outliers

Mean Difference Test

Table 3 compares the variables between companies that have at least one woman director and companies with no woman directors across company years. The majority of variables of a company that hires at least one female director are different from those of companies with no female directors. The mean differences test shows that companies with at least 1 female director tend to incur a lower cost of capital than companies without a female director. Companies with female directors tend to be bigger (in terms of firm size, board size, and audit committee size), more independent, profitable, more efficient, and well-established than the firms with no female directors.

Table 3: Mean difference test

Variables	FEMALE DIRECTOR= 0		FEMALE DIRECTOR= 1		Mean Difference
	N	Mean	N	Mean	
PEG	1,912	0.153	1,271	0.121	0.032***
MPEG	1,912	0.174	1,271	0.142	0.032***
%FD	1,912	0.000	1,271	0.170	-0.170***
%INDFD	1,912	0.000	1,271	0.137	-0.137***
IND_SPEC	1,912	0.024	1,271	0.115	-0.091***
ROA	1,912	-0.005	1,271	0.026	-0.031***
LNSIZE	1,912	5.303	1,271	5.764	-0.461***
BTM	1,912	0.790	1,271	0.712	0.078**
BETA	1,912	0.017	1,271	0.018	-0.001*
LEVERAGE	1,912	0.138	1,271	0.166	-0.028***
|DAC|	1,912	0.166	1,271	0.168	-0.002
BODSIZE	1,912	6.659	1,271	8.343	-1.684***
BODIND	1,912	0.720	1,271	0.781	-0.061***
ACSIZE	1,912	3.563	1,271	3.972	-0.409***
ACIND	1,912	0.686	1,271	0.687	-0.001

*Notes: All variables are defined in Appendix A. *, **, *** indicates significance at the p<0.1, p<0.05, p<0.01, respectively*

Correlation Analysis

Table 4: Correlation matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PEG (1)	1															
MPEG (2)	0.865***	1														
%FD (3)	-0.096***	-0.092***	1													
D_FD (4)	-0.085***	-0.085***	0.899***	1												
%INDFD (5)	-0.113***	-0.105***	0.860***	0.891***	1											
IND_SPEC (6)	-0.104***	-0.096***	0.119***	0.087***	0.186***	1										

ROA (7)	LNSIZE (8)	BTM (9)	BETA (10)	LEVERAGE (11)	|DAC| (12)	BODSIZE (13)	BODIND (14)	ACSIZE (15)	ACIND (16)
-0.250***	0.0686***	0.174***	-0.166***	-0.082***	0.134***	-0.099***	-0.065***	-0.025	0.006
-0.151***	0.0386*	0.191***	0.110***	-0.072***	0.113***	-0.064***	-0.041*	-0.012	0.002
0.033	0.123***	-0.037*	0.023	0.054**	0.047**	0.183***	0.185***	0.153***	0.028
0.033	0.087***	-0.052**	0.022	0.040*	0.040*	0.129***	0.161***	0.081***	0.025
0.051**	0.201***	-0.056**	0.037*	0.092***	0.005	0.353***	0.217***	0.188***	0.012
0.042*	0.238***	-0.077***	0.010	0.117***	0.003	0.314***	0.098***	0.177***	0.024
1	-0.045*	-0.068***	0.084***	-0.031	-0.179***	0.046**	0.032	0.025	-0.009
	1	0.058***	-0.178***	0.156***	-0.033	0.336***	0.223***	0.113***	0.018
		1	0.058***	-0.094***	-0.110***	-0.041*	0.035*	0.004	0.005
			1	0.112***	-0.090***	0.100***	0.034	0.064***	0.021
				1	-0.060***	0.231***	0.155***	0.077***	0.036*
					1	-0.053**	-0.003	0.016	0.015
						1	0.257***	0.408***	0.022
							1	0.207***	0.060***
								1	0.230***
									1

*The sample with all the controls included comprises 3,183 firm-year observations for the period 2001-2015. All variables are defined in Appendix A. Table 4 panel C presents the correlation matrix. It shows the Pearson correlation coefficients. All the continuous variables are winsorized at the top and bottom 1 percent of their distribution to mitigate the effect of outliers. *, **, *** indicates significance at the p<0.1, p<0.05, p<0.01, respectively*

Table 4, shows the correlation analysis among the variables. In this study, we have used two measures of the cost of capital. These are PEG and MPEG. The definition of the female director (FD) includes three proxies of female directorship, such as the percent of female directors (%FD), the percent of the independent female directors (%INDFD), and a dummy variable of the female director (D_FD). Consistent with the expectation, all three female directors' variables (%FD, D_FD, and %INDFD) are significantly and negatively correlated with the PEG and MPEG (coefficient: -0.096, -0.085 and -0.113, respectively, $p<0.001$) for PEG and MPEG (coefficient: -0.092, -0.085, and -0.105, respectively, $p<0.001$). However, consistent with my proposition, Firm size (LNSIZE) and discretionary accruals (|DAC|) show a positive and significant correlation with PEG and MPEG. To measure multicollinearity, a general rule is that if there is a high pairwise correlation between two explanatory variables that exceeds 0.80, then there is severe multicollinearity in the model (D. Gujarati & Porter, 2009). All pairwise correlation coefficients between the explanatory variables in Table 3 are below 0.80 (except between PEG and MPEG; %FD and D_FD; %FD and %INDFD; %INDFD and D_FD; BODSIZE and

BODIND; ACSIZE and ACIND), as multicollinearity is a problem between two different independent variables, so multicollinearity between PEG and MPEG will not bias the estimated coefficient. However, the multicollinearity between %FD and D_FD; %FD and %INDFD; %INDFD and D_FD is above 0.80, so there is a high probability of multicollinearity. To address this issue, We will conduct a variance inflation factor (VIF) test after the regression analysis in Table 5.

Regression Analysis

Table 5 presents the results for H1. This analysis uses

Table 5: Regression analysis

Panel A: Regression analysis									
Variables	**Panel A**								
	PEG		**VIF**	**PEG**		**VIF**	**PEG**		**VIF**
%FD	-0.079***	[-3.14]	1.18						
D_FD				-0.015***	[-3.03]	1.27			
%INDFD							-0.081***	[-2.60]	1.10
IND_SPEC	-0.036***	[-3.52]	1.20	-0.036***	[-3.45]	1.20	-0.037***	[-3.57]	1.20
ROA	-0.138***	[-12.54]	1.25	-0.137***	[-12.49]	1.25	-0.138***	[-12.55]	1.25
LNSIZE	0.005**	[2.33]	1.57	0.006**	[2.38]	1.58	0.005**	[2.28]	1.57
BTM	0.026***	[7.27]	1.21	0.026***	[7.27]	1.21	0.026***	[7.29]	1.21
BETA	-0.785***	[-5.74]	1.35	-0.786***	[-5.75]	1.35	-0.791***	[-5.79]	1.35
LEVERAGE	-0.016	[-0.97]	1.30	-0.016	[-0.97]	1.30	-0.017	[-1.00]	1.30
|DAC|	0.062***	[3.85]	1.19	0.061***	[3.77]	1.19	0.061***	[3.79]	1.19
BODSIZE	-0.002**	[-2.21]	1.59	-0.002*	[-1.68]	1.67	-0.002**	[-2.31]	1.59
BODIND	-0.042**	[-2.36]	1.19	-0.042**	[-2.36]	1.20	-0.043**	[-2.38]	1.20
ACSIZE	0.003	[1.49]	1.33	0.003	[1.39]	1.33	0.003	[1.32]	1.32
ACIND	0.017	[0.39]	1.08	0.016	[0.36]	1.08	0.018	[0.42]	1.08
Constant	0.105***	[2.91]		0.103***	[2.86]		0.108***	[3.00]	
Observations	3,183			3,183			3,183		
Adjusted R-square	0.163			0.163			0.162		
F-statistics	19.32			19.30			19.21		
Probability	0.000			0.000			0.000		
Industry FE	Yes			Yes			Yes		
Year FE	Yes			Yes			Yes		
Durbin-Watson	1.57			1.57			1.57		
Panel B: Regression analysis									
%FD	-0.103 ***	[-3.77]	1.18						
D_FD				-0.021***	[-3.77]	1.27			
%INDFD							-0.112***	[-3.32]	1.10
IND_SPEC	-0.041***	[-3.69]	1.20	-0.040***	[-3.60]	1.20	-0.042***	[-3.75]	1.20
ROA	-0.126***	[-10.69]	1.25	-0.126***	[-10.63]	1.25	-0.126***	[-10.70]	1.25
LNSIZE	0.009***	[-3.48]	1.57	0.009***	[3.55]	1.58	0.009***	[3.43]	1.57
BTM	0.027***	[7.08]	1.21	0.027***	[7.07]	1.21	0.028***	[7.09]	1.21
BETA	1.503***	[10.22]	1.35	1.502***	[10.22]	1.35	1.495***	[10.16]	1.35
LEVERAGE	-0.041**	[-2.28]	1.30	-0.041**	[-2.27]	1.30	-0.042**	[-2.31]	1.30
|DAC|	0.078***	[4.49]	1.19	0.076***	[4.39]	1.19	0.077***	[4.42]	1.19
BODSIZE	-0.002*	[-1.86]	1.59	-0.001	[-1.22]	1.67	-0.002**	[-1.97]	1.59
BODIND	-0.033*	[-1.74]	1.19	-0.033*	[-1.72]	1.20	-0.033*	[-1.74]	1.20
ACSIZE	0.002	[0.98]	1.33	0.002	[0.87]	1.33	0.002	[0.78]	1.32

ACIND	-0.009	[-0.20]	1.08	-0.011	[-0.24]	1.08	-0.008	[-0.17]	1.08
Constant	0.070*	[1.80]		0.067*	[1.74]		0.073*	[1.90]	
Observations	3,183			3,183			3,183		
Adjusted R-square	0.146			0.146			0.145		
F-statistics	16.99			16.99			16.88		
Probability	0.000			0.000			0.000		
Industry FE	Yes			Yes			Yes		
Year FE	Yes			Yes			Yes		
Durbin-Watson	1.43			1.43			1.43		

*Notes: The sample with all the controls included comprises 3,183 firm-year observations for the period 2001-2015. All variables are defined in Appendix A. Panel B of Table 5 presents the regression analysis. All the continuous variables are winsorized at the top and bottom 1 percent of their distribution to mitigate the effect of outliers. *, **, *** indicates significance at the p<0.10, p<0.05, p<0.01, respectively*

two different measures for the cost of capital: PEG and MPEG. This study also uses three measures for female directors: %FD, D_FD, and %INDFD. The coefficient on %FD, D_FD, and %INDFD for both measures of the cost of capital is negative and significant, indicating firms having female directors incur a lower cost of capital (coefficient of -0.079, -0.015, and -0.081) respectively for three measures of female directors, significant at 1% in %FD, D_FD, and %INDFD for PEG. In terms of economic significance, the reported coefficient of %FD measure means that a one standard deviation increase in the %FD leads to a decrease of 79 basis points in PEG: 0.079 (the coefficient on %FD) x 0.10 (SD of %FD). The coefficient estimates suggest that a one-standard-deviation increase in D_FD and %INDFD is associated with a decrease of 73.5 and 64.8 basis points in PEG, respectively. Therefore, the results support that the female director's existence reduces the firm's cost of capital.

For the MPEG measure, the coefficient on %FD, D_FD, and %INDFD of the cost of capital are negative and significant (coefficient of -0.103, -0.021, and -0.112, respectively, for three measures of female directors, significant at 0.1% in %FD, D_FD; and in %INDFD. Concerning the sign and significance of the control variables, this study finds a negatively significant coefficient of IND_SPEC on the cost of capital, which indicates auditor's extensive knowledge about the client's business environment reduce information asymmetry and leads to lower cost of capital, moreover, significant negative coefficient of ROA on the cost of capital suggesting that the profitable firms may have to spend less on capital raising activities rather non-profitable. For that reason, ROA has an inverse relation with the cost of capital. However, |DAC| is signifying as a measure of financial reporting quality, which shows that positive and significant indicates firms with low financial reporting quality increase their cost of capital, and the cost of capital decreases as the quality of information increases (Coffie, Bedi, & Amidu, 2018). This study constantly documents a positive relation between book-to-market ratios (BTM) and the cost of equity (Fama & French, 1992; Khurana & Raman, 2004; Boone *et al.,* 2006). Furthermore, LEVERAGE, BODSIZE, BODIND, ACSIZE, and ACIND show no significant relation with the cost of capital. With respect to Panels A & B, the adjusted R-squares are 16.2 to 16.3 and 14.5 to 15.6 percent, respectively, showing the strong explanatory power of the regression model.

The regressions reported in Table 5 were conducted with several diagnostics. As stated in the sample section, the continuous variables are winsorized at the top and bottom 1 percent of this distribution to control any outlier effect. This study also calculates the variable inflation factor (VIF) and the variable range from 1.08 to 1.59, showing that the model is not biased due to multicollinearity , as 10 is the maximum acceptable level of VIF (Joseph F. Hair *et al.,* 1998; Gujarati, 2003; Gujarati & Porter, 2009; Wooldridge, 2009; Kajola, Olabisi, Soyemi, & Olayiwola, 2019; Rumsey, 2007). With respect to the Durbin-Watson (DW) statistic, we conduct a test for autocorrelation in the residuals from a statistical regression analysis. Durbin-Watson value of 1.57, 1.43 respectively, means the model is free of serial autocorrelation problem as the value 1 to 3 indicates the acceptable limit of autocorrelation (Gujarati, 2003; Alsaeed, 2005; Gujarati & Porter, 2009; Wooldridge, 2009).

Additional Test

Control for the Self-Selection of Female Directors

Appointing a woman director in a company to reduce a firm's cost of capital is a nonrandom decision. The endogeneity problem happens if the unobservable issues that influence this decision may also be correlated with the firm-level cost of equity capital. Selection bias, which is one form of endogeneity problem, can lead to improper inferences about treatment effects. Selection bias for the reason of unobservable factors appears because researchers utilize a small set of observations. In the extant literature, for controlling this source of bias, the Heckman two-stage error correction method has been the most popular and widely used approach.

To execute the Heckman test (1979), we have proceeded as follows. We model firms' decisions to appoint female directors using some observable firm characteristics. Following Usman, Zhang, Farooq, Makki, & Dong (2018), we have chosen ROA, LNSIZE, LEVERAGE, BODSIZE, and BODIND as the determinants of female directors' existence. Lennox, Francis, & Wang (2012) claimed that it is important to enforce exclusion restrictions in executing the Heckman two-stage regression, even though the Inverse Mills Ratio (IMR) can be identified by its nonlinear arguments. This study estimate the following PROBIT model in the first stage of regression analysis:

$$Pr(D\_FD)_{i.t} = \partial_0 + \partial_1 FD\_IND + \partial_2 ROA_{it} + \partial_3 SIZE_{it} + \partial_4 LEVERAGE_{it} + \partial_5 BODSIZE_{it} + \partial_6 BODIND_{it} + INDUSTRY\ DUMMY + YEAR\ DUMMY + \varepsilon_{i.t} \quad (4)$$

We have included FD_IND (industry average of female directors) as the exclusion variable, which means correlated with the existence of women directors on the board but not associated with the cost of capital (Usman *et al.,* 2018). This should be related positively to the dependent variable, which in our case is a dum

variable coded 1 for firms with at least 1 female director and 0 otherwise (D_FD). Consistent with the previous analysis, it has been found that profitable large firms with a large board and independent directors have a positive association with female directors' presence on the corporate board (Usman *et al.,* 2018). Moreover, a company with enormous debt or high leverage tends to recruit female directors. We have also calculated the Inverse Mills Ratio (IMR) from the first-stage probit model (equation 4) and include it as an additional independent variable in the second-stage regression model.

Table 6 reports the regression results for the pooled sample. Consistent with the baseline results, we have found that the coefficients on %FD, D_FD and %INDFD to be negative and significant for both the PEG and the MPEG measures; for example, the coefficient on %FD is -0.073 (t-stat -2.85, $p < 0.01$), D_FD is -0.014 (t-stat -2.74, $p < 0.01$), and that on %INDFD is -0.073 (t-stat -2.30, $p < 0.05$) for the PEG measure. Similarly, the coefficient on %FD is -0.097 (t-stat -3.53, $p < 0.001$), D_FD is -0.019 (t-stat -3.52, $p < 0.001$), and that on %INDFD is -0.104 (t-stat -3.06, $p < 0.01$) for the MPEG measure. Therefore, this analysis proves that the model is free from selection bias.

Table 6: Control for self-selection of female directors and the association between female directors and the cost of capital

Variables	Probit result		PEG						MPEG					
%FD	-	-	-0.073***	[-2.85]	-	-	-	-	-0.097***	[-3.53]	-	-	-	-
D_FD	-	-	-	-	-0.014***	[-2.74]	-	-	-	-	-0.019***	[-3.52]	-	-
%INDFD	-	-	-	-	-	-	-0.073**	[-2.30]	-	-	-	-	-0.104***	[-3.06]
IND_SPEC	-	-	-0.036***	[-3.52]	-0.036***	[-3.46]	-0.037***	[-3.58]	-0.041***	[-3.70]	-0.040***	[-3.61]	-0.042***	[-3.75]
ROA	0.399***	[3.34]	-0.126***	[-10.32]	-0.125***	[-10.29]	-0.126***	[-10.32]	-0.115***	[-8.81]	-0.115***	[-8.77]	-0.115***	[-8.81]
LNSIZE	0.140***	[5.25]	0.009***	[3.15]	0.009***	[3.20]	0.009***	[3.13]	0.012***	[3.97]	0.012***	[4.03]	0.012***	[3.94]
BTM	-	-	0.027***	[7.44]	0.027***	[7.44]	0.027***	[7.46]	0.028***	[7.21]	0.028***	[7.20]	0.028***	[7.23]

LR chi2 /F-statistics	Pseudo/ Adjusted R2	Observations	Constant	IMR	FD_IND	ACIND	ACSIZE	BODIND	BODSIZE	|DAC|	LEVERAGE	BETA
757.21	0.176	3,183	-4.153***	-	1.407***	-	-	1.358***	0.181***	-	0.135	-
			[-17.55]	-	[6.99]	-	-	[6.74]	[14.87]	-	[0.75]	-
18.94	0.164	3,183	-0.030	0.040**	-	-0.018	0.003	-0.002	0.001	0.061***	-0.011	-0.773***
			[-0.44]	[2.27]	-	[-0.42]	[1.49]	[-0.10]	[0.80]	[3.78]	[-0.67]	[-5.65]
18.92	0.164	3,183	-0.032	0.040**	-	-0.017	0.003	-0.002	0.002	0.060***	-0.011	-0.774***
			[-0.46]	[2.27]	-	[0.38]	[1.40]	[-0.09]	[1.03]	[3.70]	[-0.66]	[-5.66]
18.84	0.164	3,183	-0.030	-0.040**	-	-0.019	0.003	0.002	0.001	0.060***	-0.011	-0.778***
			[-0.43]	[2.32]	-	[0.44]	[1.33]	[-0.08]	[0.79]	[3.72]	[-0.69]	[-5.69]
16.63	0.146	3,183	-0.052	0.036*	--	-0.008	0.002	0.002	0.001	0.077***	-0.037**	1.514***
			[-0.70]	[1.91]		[-0.18]	[0.98]	[0.10]	[0.67]	[4.43]	[-2.02]	[10.29]
16.63	0.146	3,183	-0.054	0.036*	-	-0.010	0.002	0.002	0.002	0.075***	-0.037**	1.513***
			[-0.72]	[1.90]	-	[-0.22]	[0.88]	[0.10]	[0.96]	[4.33]	[-2.01]	[10.29]
16.52	0.145	3,183	-0.051	0.036*	-	-0.007	0.002	0.002	0.001	0.076***	-0.037**	1.506***
			[-0.68]	[1.94]	-	[-0.15]	[0.79]	[0.11]	[0.65]	[4.36]	[-2.04]	[10.24]

Probability	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Industry FE	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes		Yes		Yes	

*Notes: The sample with all the controls included comprises 3,183 firm-year observations for the period 2001-2015. All variables are defined in Appendix A. Table 6 presents the regression analysis for robustness checks on female directors' existence and cost of capital to address the selection bias issue. All the continuous variables are winsorized at the top and bottom 1 percent of their distribution to mitigate the effect of outliers. *, **, *** indicates significance at the p<0.10, p<0.05, p<0.01, respectively*

CONCLUSION

This study examines the relationship between board gender diversity and a firm's cost of capital by investigating the role of female directors on corporate boards. It argues that increasing female representation on boards reflects good corporate governance and enhances organizational effectiveness. Female directors contribute to stronger monitoring, greater managerial expertise, and more effective decision-making, particularly through their participation in board committees and their professional experience. These governance improvements reduce information asymmetry and agency conflicts, thereby lowering the firm's cost of capital.

Unlike previous studies that primarily focus on corporate governance mechanisms such as earnings management, financial reporting quality, audit quality, and board independence, this research emphasizes female board representation as a governance mechanism influencing financing costs. The findings indicate that firms with gender-diverse boards tend to experience a lower cost of capital due to improved monitoring, transparency, and strategic decision-making. The study also suggests that organizations should increase female representation not only on corporate boards but also on key board committees to strengthen governance practices. A gender-diverse board promotes diverse perspectives, reduces decision-making biases, and enhances board effectiveness, ultimately improving firm performance and investor confidence. These findings provide valuable insights for corporate managers, investors, and policymakers seeking to promote sustainable governance practices and enhance organizational value through greater board gender diversity.

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Appendix A: Variables Definition

Variable	Definition	Measurement
Dependent variables		
PEG	Implied return rate	Measured as PEG (see equation 2)
MPEG	Implied return rate	Measured as MPEG (see equation 3)
Independent variables		
FD	Female/woman directors	This paper considered three different proxies of female/woman directorship (FD)
%FD	% of female/woman representation	Total number of female/woman directors divided by total board size
D_FD	Dummy variable	Assign a value equal to 1 if the firms have a female/woman director, otherwise 0
%INDFD	% of an independent female/woman director	Dividing the number of independent female/woman directors by the total board size

FD1	Dummy variable	Assuming value '1' if boards had only one female/woman director, '0' otherwise. Used as a proxy of tokenism
FD2	Dummy variable	Assuming value '1' if boards had two or more female/ woman directors, '0' otherwise
Committee_ membership	Dummy variable	Assigned value 1 when there is at least one female/woman director on the three committees (audit committee, the nomination and remuneration committee), otherwise 0.
FD TENURE	Dummy variable	Assigned value 1 if a female director has 7 or more than 7 years of service tenure, otherwise 0.
IND_SPEC	Industry specialization.	The auditor's industry specialization implies extensive knowledge of the client's business environment, its industry accounting practices, and potential "abusive" accounting practices.
ROA	Return on assets	Calculated as the ratio of earnings before interest and tax divided by total assets
LNSIZE	A natural log value of firm size	The natural log of the market value of equity to measure the firm size (LNSIZE).
BTM	Book-to-Market ratio	The ratio of the book value of equity to the market value of equity.
LEVERAGE	The leverage ratio of firms	This is the ratio of total debt to total assets
|DAC|	We use the absolute value of the modified Jones model after controlling for the prior performance (Dechow, Sloan, & Sweeney, 1995; Kothari *et al.,* 2005).	We estimate the model for all firms in the same industry (using the GICS two-digit industry code) with at least eight observations in an industry in a particular year using Equation (4). The NDAC is the predicted value of Equation (4). Therefore, the DAC is the residual from Equation (4).
BODSIZE	Board size	Total number of directors on the board
BODIND	Board independence	Measured by the proportion of independent directors on the total board
ACSIZE	Audit committee size	The total number of audit committee members.
AC_IND	Audit committee independence	Measured by the proportion of the independent members on the audit committee
FD_IND	Industry average of female/ woman directors	Each year, the industry-wise mean value of female/woman directors
IMR	Inverse Mills Ratio	Measured as IMR (see equation 4)