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# Gender diversity in the audit committee and the efficiency of internal control and financial reporting quality

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## ABSTRACT

This research investigates the relationship between the expertise of female audit committee (AC) chairs and financial reporting quality (FRQ). Also, it examines the moderating effect of the expertise of AC female chairs on the relationships between internal control (ICS), components of ICS, and FRQ. This study analyses 302 firms listed on the Pakistan Stock Exchange from 2010 to 2016. Data on ICS, FRQ, and other corporate governance indications are collected manually from annual reports. This study concludes that the accounting expertise of AC female chairs enhances FRQ better than their male counterparts. Also, the accounting expertise of AC female chairs improve corporate governance mechanisms and ICSs (i.e., Control Environment, Control Activities, and information and communication). This research offers implications for shareholders and regulators. The accounting expertise of female AC chairs (WACCH) improve monitoring that enhances shareholder value and investor confidence. The regulator needs to be stricter regarding the requirements for AC chairs.

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gender; accounting expertise; internal control (ICS); female audit committee chairs (WACCH); audit committee (AC)

## JEL CLASSIFICATION

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## 1. Introduction

Gender diversity on boards is under-researched, indicating that measuring board efficiency in this aspect is difficult. Regarding the inclusion of women on boards, prior research found mixed results. Bear et al. (2010), concluded that women on boards

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increase firm reputation, resulting in highly-rated corporate social responsibility. Hillman et al. (2002), suggested that women on boards must possess the professional experience to enhance firm performance. These women are also found to restrict earnings management (Kyaw et al., 2015). On the flip side, the association between the expertise of female audit committee (AC) chairs and earnings management is irrelevant (Sun et al., 2011), and no relationship exists between gender diversity and firm performance (Gregory-Smith et al., 2014). Moreover, Bédard and Gendron (2010) discussed that 57% of researchers agreed that the financial expertise of AC chairs matters for monitoring purposes, but 33% have opposite opinions. The reason for these mixed results could be because gender in the AC is not considered (Zalata et al., 2018). To the best of authors' knowledge, the prior research paid little attention to the relationship between the expertise of female AC chairs (WACCH) and financial reporting quality (FRQ) in the context of the efficiency of the internal control systems (ICS). Therefore, this research aims to fill the gap and settle the issue regarding the mixed results on women on boards by considering the accounting expertise of WACCH.

Female executives possess better transformational leadership qualities than their male counterparts (Burke & Collins, 2001). Moreover, their leadership qualities make females more cooperative towards their subordinates and improve earnings quality (Francis et al., 2015). However, leadership quality needs high cohesion among directors and a matched mindset; such an agreement is necessary to apply strategies (García-Sánchez et al., 2017). Also, synergy among directors supports gender diversity on boards, thereby enhancing FRQ (Gull et al., 2017; Thiruvadi & Huang, 2011; Zalata et al., 2018).

This study uses an ICS that can be a proxy for signalling forthcoming ICS weaknesses. This research modifies the index of Chen et al. (2017) by incorporating the rules and regulations of the Security Exchange Commission of Pakistan (SECP), Sharia Law of Pakistan, and the Pakistan Stock Exchange. The SECP mandated that the ACs of firms must comprise three members with a minimum of one independent director. AC chairs must maintain and review the ICSs (Krishnan, 2005). Financial expert(s) and independent director(s) on boards not only improve the ICS mechanism but also mitigate earnings management. Furthermore, females on boards increase the efficiency of boards and improve monitoring mechanisms (Francis et al., 2015; García-Sánchez et al., 2017).

The study contributes to the literature in many ways. First, by considering ICS efficiency this research extends gender literature on the AC and FRQ. The findings report the importance of the WACCH in mitigating earnings management. Moreover, it is a pioneering document to address questions raised in previous research regarding gender diversity on boards and its link with the efficiency of ACs (Bilal et al., 2018; García-Sánchez et al., 2017; Zalata et al., 2018). Second, this research is the first to report the effect of accounting expertise of WACCHs and efficient ICS, its components, on FRQ. The findings suggest that due to the accounting expertise of WACCHs, they are less likely to report earnings management than male AC chairs (MACCH), whereby agency conflict is mitigated. Third, the prior literature found mixed findings regarding females on boards, and this research argues that the leadership role of female directors on subcommittees – ACs particularly – justifies the reasons for females on boards.

The rest of the article is organised as follows: Section Two discusses the literature review and hypothesis development; Section Three describes the data, variables, and econometric models; Section Four provides the empirical analysis and discussion; Section Five presents the robustness and certain additional tests; Section Six concludes the article.

## 2. Literature review and hypothesis development

### 2.1. Theoretical framework

Gender diversity on boards, broadly, and the AC, specifically, support many theories. However, Agency Theory and Resource Dependence Theory (RDT) explain the reasons and benefits of having WACCHs.

Agency Theory demonstrates that a principal (shareholder) hires an agent to work in the best interests of the principal; however, agency conflict increases agency costs when the agent does not act the way the principal directs (Jensen & Meckling, 1976). Agency Theory further elaborates that the principal increases monitoring expenditures, including restructuring boards by hiring new directors, hiring financial experts for the AC, and gender diversity, to monitor the agent, where high expenditure reduces firm value (Zalata et al., 2018). However, organisational structures and the market mechanism mitigates agency conflict (Fama & Jensen, 1983). Bathala and Rao (1995), stated that external directors improve monitoring; thus reducing the agency problem. Gender diversity on boards establishes robust corporate structures that enhance firm performance (Green & Homroy, 2018). Gender diversity also moderates the relationship between research and development, and investment (Midavaine, Dolfsma, & Aalbers, 2016). Regarding the AC, recent studies conclude that financial experts and gender diversity improve monitoring mechanisms but discourage earnings management (Zalata et al., 2018). The AC oversees the internal audit and the ICS process and implementation (Goh, 2009). Moreover, independent female directors reduce earnings management practices (García Lara et al., 2017). Gender diversity on boards and an efficient ICS mechanism mitigate agency conflict.

RDT states the utilisation of internal resources can reduce not only the dependency on external environments but also the influence of other firms (Pfeffer & Salancik, 2003). Pfeffer and Salancik (1978), called the organisational system the 'organisation ecology' whose dependency on other environments is unconditional. Other firms' power, technology, efficient boards, unique skills, directors, and efficient managers are the external factors that can directly or indirectly affect firms. Torchia et al. (2018) concluded that organisations become innovative because of women's presence on boards. Campbell and Mínguez-Vera (2008), argued that gender diversity on boards is linked with monitoring and controlling to enhance firm performance. Female directors' monitoring styles are different from male directors (Adams & Ferreira, 2009). However, independent female directors are also essential because their presence increases the sustainability of reporting quality (Nguyen et al., 2015). Therefore, gender diversity on boards and the AC play critical roles in improving governance mechanisms, enhancing investor trust, and improving monitoring and conservative financial reporting, hence support RDT.

## 2.2. Female AC chair and FRQ

Hillman et al. (2002), explained that female directors with non-business careers or financial expertise could bring different experiences, knowledge, and ideas to the boards they are serving. The diverse backgrounds and other demographic characteristics of female directors on board and AC chairs enhance efficiency to measure risks and deter financial misstatements. Also, female directors with diverse experiences make the AC vigilant and enhance disclosure quality. Sultana et al. (2015), stated that AC chairs with accounting expertise improve the timeliness of FRQ. Dhaliwal et al. (2010), explained that industry knowledge and the economy knowledge of AC members also enhance the efficiency of ACs. Furthermore, the status of AC chairs, i.e., independence, gender, and financial expertise, detect irregularities timely and discourage restatements (Badolato et al., 2014).

Female directors are change agents, provide competitive platforms to change traditional policies, and develop robust monitoring mechanisms whereby CEOs are more accountable (Srinidhi et al., 2011). Therefore, a higher proportion of female financial experts on ACs have a more pronounced effect on earnings management than their male counterparts (Zalata et al., 2018). Other characteristics also make female directors more distinctive, such as being more risk-averse and more accounting conservative (Faccio et al., 2016), being more sensible towards ethics (Ibrahim et al., 2009), and having more transformational leadership qualities (Burke & Collins, 2001). Having such distinctive leadership qualities, the accounting expertise of WACCHs could perform better than MACCH with accounting expertise. Based on the previous discussion, the following hypotheses are formulated:

*H1:* The accounting expertise of WACCHs has a more pronounced impact on FRQ than that of MACCHs;

*H1a:* The accounting expertise of WACCHs has a significant impact on FRQ;

*H1b:* The accounting expertise of MACCHs has a significant impact on FRQ

## 2.3. Female AC chairs, ICS, and FRQ

Prior research found mixed results regarding gender diversity on boards. Gregory-Smith, Main and O'Reilly (2013), concluded a high probability of replacing new female directors with their female predecessors. Ahern and Dittmar (2012), revealed that gender diversity and performance have a negative relationship. This finding is expected because the underrepresentation of females on boards, or their representation, merely fulfils regulatory requirements (Green & Homroy, 2018, p. 21). Such underrepresentation causes low monitoring, its impact on firm performance can be detrimental, and agency conflict may arise (Kanadli et al., 2018). However, extant research agrees that gender diversity on boards and the AC improve firm performance and enhance FRQ (Conyon & He, 2017). Gender diversity also supports voluntary disclosure (Tejedo-Romero et al., 2017). Therefore, the adequate representation of women on boards makes the board teams professionally sound and results in having a director with multidisciplinary advance degrees makes the boards efficient (Hillman et al., 2002).

AC attributes, such as independence, committee size, females present, and financial expertise of chairs, deter restatements and improve earnings quality (Baxter & Cotter, 2009). AC members must not hold multiple directorships and have low tenure to enhance FRQ (Dhaliwal et al., 2010). The accounting experts (financial experts) in the female AC members are important to understand the ICS, measure all potential risks, and maintain FRQ. Therefore, financial experts in the AC can detect problems in the ICS early (Hoitash et al., 2009; Krishnan, 2005; Krishnan & Visvanathan, 2008). Gender diversity is important to constrain earnings management (Thiruvadi & Huang, 2011). Therefore, gender diversity of ACs enhances monitoring and FRQ. The more efficient the AC chair, the more efficient the AC, and the more robust ICS and FRQ. Additionally, female directors have entirely different approaches to monitoring and prompt response to fraud. Therefore, it can be assumed that the WACCHs restrict monitoring, which constrains earnings management. Based on the prior discussion, the following hypotheses are formulated.

*H2: The accounting expertise of WACCHs moderates the relationship between ICS efficiency and FRQ*

*H2a: The accounting expertise of WACCHs moderates the relationship between the components of ICS efficiency and FRQ*

### **3. Research methodology**

#### **3.1. Sample**

Following Chen et al. (2017), ICS data was manually collected from annual reports and developed an index. Initially, a sample of 409 non-financial companies was selected from the Pakistan Stock Exchange from 2010 to 2016. Seventy-five companies were excluded due to the unavailability of financial reports and 34 companies for missing data of control variables and the unavailability of corporate governance and accruals data. The final balanced panel data consists of 302 non-financial companies. Data on corporate governance, earnings management, and ICSs were manually collected from annual reports. The SECP introduced a code of corporate governance in 2002, amended in 2008, whereby the importance of women on boards and financial experts were made mandatory for ACs. Also, the characteristics of members and chairs of boards were defined. Therefore, to capture the impact of the regulatory reforms, the sample was taken between 2010 and 2016. A generalised least squared (GLS) regression model was employed to test the hypotheses.

#### **3.2. Variables**

This section defines the dependent, independent, and control variables. FRQ is the dependent variable. The independent variables are the expertise of WACCHs and the efficiency of ICS. The control variable is mentioned in a later subsection.

### 3.2.1. Dependent variable: F.R.Q

Consistent with prior research (Banbhan et al., 2018; Kusnadi et al., 2016), accrual quality was used as a proxy for FRQ. To measure the relationship between gender in the AC, the efficiency of ICSs and FRQ accrual quality should capture earnings manoeuvring. Therefore, a modified version of John's model (1995) was used to measure FRQ

$$TAcc_{it}/TA_{it-1} = \beta_0 + \beta_1 * (1/TA_{it-1}) + \beta_2 * (\Delta Sale_{it} - \Delta ARv_{it})/TA_{it-1} + \beta_3 * PPE_{it}/TA_{it-1} + \varepsilon_{it}, \quad \text{)Eq.1}$$

where  $TAcc$  is the total accrual and  $TA$  the lagged value of the total asset.  $\Delta sale$  and  $\Delta ARv_i$  are, respectively, the change in the sale and the receivable from  $t$  to  $t-1$ .  $PPE$  refers to plant property and equipment. Based on Eq.1, the absolute value of the residual value ( $\varepsilon_{it}$ ) is earnings management (DAC) and the proxy for FRQ, as mentioned in Appendix A.

### 3.2.2. Independent variables: expertise of AC chairs and Efficiency of ICSs

Certain studies conclude that AC characteristics, such as financial expertise, low tenure of ACs members, AC compositions, independent directors, and size and gender in the ACs, are negatively associated with earnings management (Sultana, 2015). Based on previous research, the expertise of WACCHs or expertise of MACCHs is '1' if they have served as a finance head, controller, CFO, treasurer, and organisation treasurer as well as holding a university accounting degree, are chartered accountants, or have obtained certification from the Institute of Chartered Accountants Pakistan or equivalent, and '0' otherwise (Ghafran & Yasmin, 2018).

Based on the Committee of Sponsoring Organization of Treadway Commission (COSO, 1992) framework, an index was developed to measure an effective ICS. COSO states that the five components of an effective ICS are: control environment (CONTR), risk assessment (RISK), control activity (CGS), information and communication (INFORM), and monitoring (MONTR), as mentioned in Appendix A. Chen et al. (2017), developed an index that measures the efficiency of the ICS of Chinese firms. Such efficiency varies with the business environment, accounting settings, and the rules and regulations of a country; hence, an ICS index was developed by incorporating the rules and regulations of the SECP, Zakat, Usher Ordinance, and the Pakistan Stock Exchange. The Analytic Hierarchy Process is employed to develop this index. This index is distributed into five levels (components of the COSO framework) – 86, 26, 18, and 5 items in the fifth, fourth, third, and second levels to develop the efficiency of ICS and such an efficiency of ICS was obtained at the first level.

### 3.2.3. Control variables

The control variables are defined in Appendix A. CEOs influence earnings management and firm performance (Campbell & Mínguez-Vera, 2008; Conyon & He, 2017; Torchia et al., 2018). Therefore, the CEO duality (CEOD) and accounting expertise of a CEO (CEOAC). was controlled. CEOD is '1' if the CEO is also the chair of the



board, and '0' otherwise. CEOAC is a dummy variable, which is '1' if the CEO has an educational background in accounting, and '0' otherwise. Moreover, firm performance and information and performance quality vary with the firm; its effect varies with the board members (Gill & Mathur, 2011; Piot, 2004). To control that effect, board size (BS), 'big four' audit firms (Big4), and AC size (AS) were controlled. BS is the sales growth from  $t$  to  $t-1$ . BS also refers to board size; that is, the total number of directors serving the board. AS is the total number of members serving the AC. Big4 is a dummy variable, which is '1' if the external auditor is one of the 'big four' audit firms, and '0' otherwise. Consistent with previous research, other control variables are market-to-book ratio (MBR) and return on assets (ROA) (Baxter & Cotter, 2009; Campbell & Mínguez-Vera, 2008; Roychowdhury & Watts, 2007).

### 3.3. Research models

Panel cross-sectional regression was employed to measure the relationship between the expertise of AC chairs and FRQ. The regression model is presented in the following equation:

$$DAC = \beta_0 + \beta_1 * X_{it} + \beta_2 * MBR + \beta_3 * ROA + \beta_4 * BS + \beta_5 * Big4 + \beta_6 * AS + \beta_7 * ACind + \beta_8 * CEOAC + \beta_9 * CEOD + \varepsilon_{it},$$

(Eq. 2)

where DAC is the earnings management, its value measured by Eq. 1.  $X_{it}$  represents the accounting expertise of WACCH and MACCH. Consistent with Zalata et al. (2018), the financial expertise of WACCHs has a negative relationship with earnings management and increases FRQ. Therefore,  $\beta_1$  for WACCHs is higher than that for MACCHs, indicating that  $\beta$  (WACCH) >  $\beta$  (MACCH). ACind refers to AC independence, which is '1' if an independent director is in the AC. CEOAC is a dummy variable, and its value is '1' if the CEO has accounting expertise or educational background in accounting. CEOD is '1' if the CEO is also the chair of the board.

$$DAC = \beta_0 + \beta_1 * Z_{it} + \beta_2 * WACCH + \beta_3 * WACCH * Zit + \beta_4 * MBR + \beta_5 * ROA + \beta_6 * BS + \beta_7 * Big4 + \beta_9 * AS + \beta_{10} * ACind + \beta_{11} * CEOAC + \beta_{12} * CEOD + \varepsilon_{it},$$

(Eq. 3)

where  $Z_{it}$  is the efficiency of the ICS and its components (i.e. CONTR, RISK, CGS, INFORM, and MONTR). WACCH is the accounting expertise of WACCHs. WACCH is a dummy variable which is '1' if the AC chair is a female with accounting expertise, and '0' otherwise. Based on the prior literature (i.e. Baxter & Cotter, 2009; Bilal et al., 2018; Gull et al., 2017; Thiruvadi & Huang, 2011),  $\beta_3 < 0$  is expected.



## 4. Analysis and discussion

### 4.1. Descriptive statistics

Table 1 presents the descriptive statistics of all variables. The average value of DAC is 0.025 (standard deviation = 0.019), and the minimum and maximum values are 0.00049 and 0.281, respectively. Moreover, 3.3% are WACCHs with accounting expertise, and 9.4% are MACCHs with accounting expertise. The average value of MACCH is 0.094, with accounting expertise that is three times more than that of WACCH with accounting expertise (mean = 0.033). The average value of ICS efficiency is 0.611, with a minimum value of 0.327 and a maximum value of 0.781. The average values of the ICS components are 0.493 for CGS, 0.14 for RISK, 0.795 for CONTR, 0.658 for INFORM, and 0.195 for MONTR. Therefore, firms are involved in CONTR, CGS, and INFORM. These findings are similar to those of Chen et al. (2017). Moreover, 54.5% of firms are audited by the ‘big four’ audit firms. In Pakistan, more than eight directors are on BS, and more than three directors are on AS. Furthermore, 20.9% of firms have CEOD, and 5.1% of CEOs have accounting expertise. Moreover, the power of sample size is shown in Figure 1. The power sample size is known and fixed, and sample power is fixed but unknown. Therefore, to meet the power of sample 0.9, the minimum sample size should be 1,422 firm years.

Column 1 in Table 2(a) presents the correlation between DAC and WACCH; MACCH is also shown as negative. The correlation between DAC and ICS is negative. These results indicate that the accounting expertise of AC chairs and ICS decreases earnings management and enhances FRQ. However, MACCH shows to be more highly correlated with DAC than WACCH. Also, Table 2(b) shows that the Variance Inflation Factor (VIF) values are less than 10, and the results show that multicollinearity does not exist among dependent variables.

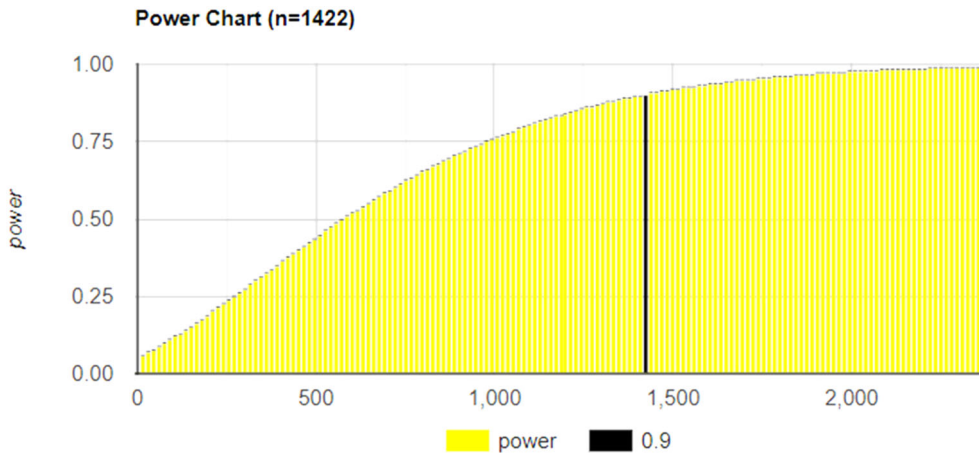
### 4.2. Female AC chair and F.R.Q

Table 3 presents a comparison between the financial expertise of female and MACCHs. In Columns 1 and 2, the association between the expertise of WACCHs

**Table 1.** Descriptive statistics.

Variable	Mean	Q1	Median	Q2	Std. Dev.	Min	Max
DAC	0.025	0.014	0.022	0.0316	0.019	0.00049	0.281181
WACCH	0.033	0	0	0	0.18	0	1
MACCH	0.094	0	0	0	0.291	0	1
ICS	0.611	0.587	0.597	0.62	0.047	0.327	0.781
CGS	0.493	0.373	0.439	0.554	0.207	0.215	2.881
Risk	0.853	0.852	0.852	0.882	0.074	0.603	1.177
CONTR	0.795	0.782	0.782	0.782	0.055	0.371	1.293
INFORM	0.658	0.506	0.506	0.546	0.346	0.506	1.58
MONTR	0.195	0.193	0.193	0.193	0.021	0.039	0.261
Mbr	1.092	0.301	0.67	1.37	1.209	-0.1155	4.61
ROA	7.352	0.16	6.27	13.25	12.77	-6	46.48
BS	8.009	7	7	9	1.474	5	15
Big4	0.545	0	1	1	0.498	0	1
AS	3.313	3	3	3	0.666	2	7
ACind	0.239	0	0	0	0.427	0	1
CEOAC	0.051	0	0	0	0.221	0	1
CEOD	0.209	0	0	0	0.407	0	1
LEV	0.625	0.409	0.563	0.721105	0.586	0.016833	12.1631

Source: Author source.



**Figure 1.** Power of sample size. Source: Author source.

and FRQ is measured. Columns 2 and 4 report the relationship between the accounting expertise of MACCHs and FRQ.

Consistent with recent research (Ghafran & Yasmin, 2018; Goh, 2009; Zalata et al., 2018), the coefficients for WACCH are negatively and statistically significant at the 1% level, as shown in Columns 1 and 2 of Table 3. Similarly, the coefficients for MACCH are significant at the 1% level, as shown in Column 3 and significant at 5% level, as shown in Column 4; such coefficients, also, have a negative association with earnings management; thereby enhancing FRQ. High coefficients of WACCH demonstrate that the accounting expertise of WACCHs has a more pronounced impact on FRQ than that of MACCHs, confirming H1. Panel B of Table 3 shows the difference between WACCH and MACCH and indicates that the coefficient on accounting expertise of WACCH is higher than their male counterparts; hence  $\beta$  (WACCH) >  $\beta$  (MACCH). These results indicate that the versatility of leadership accounting gender enhances the performance of the AC and has an impact on FRQ. These findings are consistent with previous research (Zalata et al., 2018). Moreover, female directors are cooperative towards subordinates, conservative towards financial disclosures, and actively participate in board meetings; these factors deter misstatements and fraud (Burke & Collins, 2001; Francis et al., 2015; Tejedo-Romero et al., 2017; Ud Din et al., 2018). AC chairs with accounting expertise increase FRQ and firm performance (Kusnadi et al., 2016; Sultana, 2015). Female directors possess transformational leadership styles (Burke & Collins, 2001), and transformational leadership enhances innovation (Bin Saeed et al., 2019). Column 1 in Table 3 shows that the coefficients of WACCH are significant and have a negative association with earnings management, thus, supporting H1a. The estimated coefficients of MACCH are negative and significant, as presented in Column 3, which is consistent with H1b.

#### **4.3. Accounting expertise of AC chairs and the efficiency of ICS and FRQ**

Table 4 reports that the expertise of WACCHs moderates the association between the efficiency of ICS and FRQ. In Column 1, the coefficient of WACCH\*ICS is negative

**Table 2** (a). Correlations.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) DAC	1.000								
(2) WACCH	-0.017	1.000							
(3) MACCH	-0.063*	-0.060*	1.000						
(4) ICS	-0.075*	0.051	0.129*	1.000					
(5) CGS	0.091*	-0.012	0.042	0.045	1.000				
(6) Risk	0.034	0.134*	0.061*	0.148*	0.128*	1.000			
(7) CONTR	0.069*	-0.011	-0.021	0.132*	0.085*	0.172*	1.000		
(8) INFORM	0.009	-0.031	-0.027	0.169*	0.214*	0.100*	0.136*	1.000	
(9) MONTR	-0.029	-0.015	-0.063*	0.077*	0.026	0.096*	0.193*	0.054*	1.000
(10) Mbr	-0.040	-0.012	0.007	0.059*	-0.027	0.006	0.084*	-0.047	-0.005
(11) ROA	-0.222*	0.023	0.113*	0.163*	0.035	0.023	-0.108*	0.036	0.033
(12) BS	0.019	-0.053*	0.255*	0.140*	0.118*	-0.142*	0.030	0.047	-0.058*
(13) Big4	-0.142*	0.038	0.131*	0.127*	-0.030	-0.004	0.057*	0.052*	0.062*
(14) AS	0.008	-0.014	0.138*	0.134*	0.157*	-0.053*	0.013	0.082*	0.009
(15) ACind	-0.038	-0.027	0.042	0.153*	0.032	0.069*	0.012	-0.012	0.115*
(16) CEOAC	-0.015	-0.043	-0.029	0.001	-0.033	-0.014	-0.064*	-0.043	0.065*
(17) CEOD	0.078*	-0.001	-0.099*	-0.084*	-0.012	-0.016	-0.002	-0.019	-0.076*
(18) Leverage	0.3210*	-0.052*	-0.0367	-0.098*	0.0380	0.0005	0.0999*	-0.064*	-0.0570*
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(10) Mbr	1.000								
(11) ROA	0.164*	1.000							
(12) BS	0.057*	0.115*	1.000						
(13) Big4	0.090*	0.317*	0.278*	1.000					
(14) AS	0.023	0.142*	0.519*	0.302*	1.000				
(15) ACind	0.078*	0.056*	0.102*	0.100*	0.142*	1.000			
(16) CEOAC	-0.009	0.031	0.123*	0.078*	0.105*	0.027	1.000		
(17) CEOD	-0.092*	-0.180*	-0.187*	-0.260*	-0.187*	-0.175*	-0.009	1.000	
(18) Leverage	-0.0187	-0.3475*	0.0375	-0.1882*	-0.0590*	-0.0650*	-0.0014	0.2151*	1

\* $p < 0.05$ .

Source: Author source.

**Table 2** (b). Test of multicollinearity.

Variable	VIF	1/VIF
WACCH	1.04	0.959459
MACCH	1.09	0.916782
ICS	1.14	0.873937
CGS	1.15	0.870728
Risk	1.12	0.894337
CONTR	1.11	0.903747
INFORM	1.13	0.885062
MONTR	1.06	0.941843
Mbr	1.22	0.821344
ROA	1.48	0.67698
BS	1.32	0.758217
Big4	1.48	0.673844
AS	1.39	0.721861
ACind	1.04	0.964622
CEOAC	1.14	0.874481
Mean VIF	1.32	

Source: Author source.

and significant at the 1% level, indicating fewer report earnings management and that FRQ is improved; hence, supporting H2.

Columns 2 and 4 in Table 4 present the moderating effect of the accounting expertise of WACCHs on the relationship between ICS components and FRQ. The coefficient of WACCH\*ICS is statistically significant and has a negative relationship with earnings management. The accounting expertise of AC chairs enhances FRQ;

**Table 3.** Gender, accounting expertise on AC and FRQ

	AC female Chair		AC male Chair	
	GLS (1)	GLS (2)	GLS (3)	GLS (4)
WACCH	-0.149** (0.0706)	-0.138** (0.0676)		
MACCH			-0.108** (0.0436)	-0.125*** (0.0430)
Mbr		0.00155 (0.00139)		0.00164 (0.00139)
ROA		0.0111*** (0.00130)		0.0112*** (0.00130)
BS		-0.0125 (0.00985)		-0.0175* (0.0100)
Big4		0.0244 (0.0273)		0.0174 (0.0272)
AS		-0.0621*** (0.0218)		-0.0620*** (0.0217)
ACind		-0.0215 (0.0329)		-0.0204 (0.0328)
CEOAC		0.106* (0.0553)		0.121** (0.0553)
CEOD		-0.0654** (0.0321)		-0.0627* (0.0321)
Leverage		-0.0143 (0.0216)		-0.0108 (0.0215)
Year fixed effects	Yes	Yes	Yes	Yes
Constant	0.265*** (0.0284)	0.449*** (0.0818)	0.250*** (0.0287)	0.473*** (0.0823)
Log Likelihood	-520.8688	-469.4205	-519.9988	-467.31
Wald test	56.72	171.07	58.56	176.00
p-value	0.000	0.000	0.000	0.000
N	2114	2114	2114	2114

Panel B: Comparison between female AC chair and male AC Chair

$\beta$  (WACCH) >  $\beta$  (MACCH) 0.032 0.013

Note: the standard errors are in parenthesis. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Source: Author source.

hence, supporting H2. The significant and negative coefficients of WACCH\*CGS and WACCH\*CONTR indicate that the accounting expertise of WACCHs improves FRQ when CONTR and C.G.S. are well-structured. Surprisingly, the coefficients of WACCH\*INFORM are negative and significant at the 10% level, suggesting the improvement of FRQ. Therefore, WACCHs and INFORM are essential. These results reveal that the accounting expertise of WACCHs boosts their influence when effective CONTR, CGS, and INFORM are developed; thereby confirming H2a. These results are aligned with those of previous research (Gull et al., 2017) and contribute to Agency Theory and RDT. Moreover, the decision-making made by top management leadership depends on its qualification and expertise (Smith et al., 2006). Other ICS components are insignificant, and to maintain the brevity of these results, they are not reported here.

#### 4.4. Robustness test and additional test

##### 4.4.1. Performance adjusted accruals and auditor's opinion

Robustness is tested in two ways: replacing the dependent variable with an alternative measurement of FRQ (PDACQ) and an auditor's opinion. Following Frankel et al.

(2006) and Sun and Cahan (2012) employed the two-stage least squares (2SLS) to control the possible endogeneity of the expertise of AC chairs. Consistent with Kothari et al. (2005), performance-controlled modified John's model is used as an alternative measurement of discretionary accruals (Eq. 4). The auditor's opinion is one if he issues any adverse opinion on financial statements, and zero otherwise.

$$TAcc_{it}/TA_{it-1} = \beta_0 + \beta_1 * 1/TA_{it-1} + \beta_2 * (\Delta Sales_{it} - REC_{it})/TA_{it-1} + \beta_3 * PPE_{it}/TA_{it-1} + \beta_4 * ROA_{it-1} + \varepsilon_{it}, \quad (\text{Eq. 4})$$

**Table 4.** The mediation affect of AC chair's expertise on the relationship between ICS and FRQ

	Internal control efficiency (ICS) and AC female chair		Components of ICS and AC women Chair		
	GLS (1)		GLS (2)	GLS (3)	GLS (4)
ICS	0.0164*** (0.00578)				
WACCH	0.0219*** (0.00826)		0.0190*** (0.00129)	0.0408** (0.0162)	0.00796*** (0.00261)
WACCH*ICS	-0.0283** (0.0123)				
CGS			0.00674*** (0.00129)		
WACCH*CGS			-0.0286*** (0.00198)		
CONTR				0.00908 (0.00609)	
WACCH*CONTR				-0.0457** (0.0197)	
INFORM					0.000474 (0.000927)
WACCH*INFORM					-0.00662** (0.00294)
Mbr	0.000043 (0.000042)		0.000020 (0.000041)	0.000039 (0.000041)	0.000027 (0.000040)
ROA	0.000482*** (0.000024)		0.000378*** (0.000023)	0.000461*** (0.00024)	0.00027*** (0.000025)
BS	0.000068 (0.000213)		0.000180 (0.000195)	0.000119 (0.000211)	0.000300 (0.000239)
Big4	-0.000437 (0.000577)		0.000662 (0.000544)	-0.000188 (0.000598)	-0.00243*** (0.000615)
AS	0.00124*** (0.000358)		0.00139*** (0.000403)	0.00145*** (0.000370)	0.00163*** (0.000457)
ACind	0.00134** (0.000564)		0.00308*** (0.000326)	0.00163*** (0.000567)	7.11e-05 (0.000623)
CEOAC	0.00804*** (0.000860)		0.00885*** (0.000753)	0.00796*** (0.000833)	0.000720 (0.00145)
CEOD	0.000363 (0.000619)		-0.00448*** (0.000477)	0.000481 (0.000621)	-0.000433 (0.000774)
Leverage	-0.00386*** (0.00123)		0.00119 (0.00118)	-0.00351*** (0.00125)	0.00509*** (0.00110)
Constant	0.0130*** (0.00358)		0.0135*** (0.00151)	0.0142*** (0.00505)	0.0157*** (0.00198)
Year fixed effects	Yes		Yes	Yes	Yes
Log Likelihood	3130.934		3143.099	3130.025	3132.07
Wald test	698.33		3298.27	660.93	291.77
p-value	0.000		0.000	0.000	0.000
N	2114		2114	2114	2114

Standard errors in parentheses \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Source: Author source.

**Table 5.** 2S.L.S. regression model.

	PDACQ (1)	Auditor's opinion (2)
WACCH*	-0.162 (0.103)	-1.996** (0.975)
Mbr	5.01e-05 (0.000103)	-0.000326 (0.000984)
SIZE	-0.0124*** (0.00419)	-0.0839** (0.0399)
big4	-0.00413 (0.00679)	-0.0210 (0.0646)
AS	0.00145 (0.00271)	-0.0140 (0.0257)
BS	-0.00613* (0.00323)	-0.0671** (0.0305)
CEOD	-0.00203 (0.00388)	0.00688 (0.0369)
Leverage	0.0373*** (0.00785)	0.0663 (0.0749)
ROA		0.000960 (0.00130)
Year fixed effect	Yes	Yes
Constant	0.297*** (0.0778)	1.893** (0.744)
Observations	2114	2114
R-squared	0.461	0.67

Note: Standard errors in parentheses\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0$ . Instrumental variables used in first-stage regression are audit committee independence (ACind), audit committee meetings (ACTve), and AC chair is also chair of the board (AChair). Auditor's opinion is one if the auditor issued an adverse opinion, and zero otherwise. We employed the 2S.L.S. stata code ivregress.

Source: Author source.

Eq. 4 is similar to Eq. 1, except for the ROA during year  $t-1$ .  $\varepsilon_{it}$  is the absolute value of the residual used to capture the PDACQ. The 2SLS model, developed by Heckman (1976), was used. Column 1 in Table 5 presents the results. Consistent with prior research (Poretti et al., 2018; Sultana, 2015), instrumental variables, such as ACind, AC meetings (ACTve), and AC chair duality (AChair), are used in the first-stage regression model. ACind is '1' if an independent director is in the AC, and '0' otherwise. ACTve is the total number of meetings held in an accounting year. AChair is '1' when the chair of the board and the AC chair are the same, and '0' otherwise. Column 1 in Table 5 shows that the coefficient of WACCH\* is negative and significant at the 10% level. Thus, the accounting expertise of AC chairs, to an extent, mitigates earnings management; thereby confirming H1 and H1(a).

Firms are not likely to receive adverse opinions from external auditors if an efficient monitoring mechanism exists. Specifically, a structured financial reporting system and a robust monitoring mechanism enable firms to grow and perform well. Therefore, the relationship between a WACCH and an auditor's opinion was measured. The 2SLS is also employed to measure endogeneity. In the first-stage regression, instrumental variables (i.e. ACind, ACTve, and AChair) are used similarly as the alternative measurements of FRQ. Column 2 in Table 5 shows that the significant and negative coefficient of WACCH\* suggests a negative relationship between the WACCH and the auditor's opinion; hence confirming the main analysis.

**Table 6.** Accounting expertise of Female AC chairs: endogeneity test.

Variables	Whole sample		Highly litigation	Low-litigation
	(1)	(2)	(3)	(4)
WACCH	-0.130* (0.0751)		-0.212* (0.118)	-0.134 (0.105)
MACCH		-0.104** (0.0530)		
Mbr	0.00232 (0.00175)	0.00270 (0.00176)	-0.00516 (0.00799)	0.000806 (0.00219)
ROA	0.0112*** (0.00149)	0.0112*** (0.00149)	0.0137*** (0.00173)	0.00919*** (0.00158)
BS	0.00451 (0.0164)	0.00350 (0.0163)	0.00689 (0.0196)	-0.00841 (0.0263)
Big4	0.0406 (0.0371)	0.0360 (0.0367)	0.0107 (0.0436)	0.0751 (0.0552)
AS	-0.0364 (0.0274)	-0.0329 (0.0273)	-0.0571* (0.0329)	-0.0352 (0.0450)
ACind	-0.0816** (0.0335)	-0.0748** (0.0337)	-0.0977** (0.0416)	-0.0352 (0.0573)
CEOAC	0.0999 (0.0735)	0.110 (0.0729)	0.260*** (0.0896)	-0.127 (0.105)
CEOD	-0.0140 (0.0389)	-0.0112 (0.0388)	-0.0107 (0.0501)	-0.0484 (0.0572)
Leverage	-0.0424 (0.0259)	-0.0395 (0.0257)	0.242*** (0.0755)	0.0681** (0.0304)
Mills	-0.077* (0.046)	-0.0905* (0.0479)	-0.100* (0.0603)	-0.0206 (0.0741)
Constant	0.529*** (0.138)	0.568*** (0.138)	0.557*** (0.166)	0.374* (0.214)
Observations	2,114	2,114	1,262	852
Number of company1	203	203	160	121

Source: Author source.

#### 4.4.2. Endogeneity test

The main analysis can be subject to self-selection bias, whereas selecting and collecting the data of the expertise of female ACs and earnings management samples can lead to endogeneity; the findings could be spurious in this case. The Heckman (1976) two-stage procedure was considered. Consistent with the prior research (Ball & Shivakumar, 2005; Givoly et al., 2010; Sun et al., 2011); the probit regression model is employed to compute the inverse Mills ratio by controlling for AC size, BS, firm size, ROA, percentage of female to male directors, independent directors and sales growth capture the appointment of a female director on an AC. In the second stage regression model, the inverse Mills ratio is added to Eq. 2 and Eq. 3 – results are shown in Table 6. The coefficient of accounting expertise of WACCH is higher than the coefficient of accounting expertise of MACCHs. Therefore, this main analysis is not subject to self-selection bias and free from endogeneity.

#### 4.4.3. Additional test

Extant research suggests that the negative and positive residuals of discretionary accruals should be tested (Kothari et al., 2005; Zalata et al., 2018). Therefore, based on the increasing and decreasing earnings management, the sample is divided into positive DAC (DACCP) and negative DAC (DACCN), as shown in Table 7. The relationship between WACCH and DACCP is shown in Column 1, and Column 2 presents the



**Table 7.** Negative and positive values of FRQ

	DACCP (1)	DACCN (2)
WACCH	-0.000635* (0.000351)	-0.0185* (0.00979)
Mbr	0.00022 (0.000027)	0.000013 (.000011)
ROA	0.0000811*** (0.0000133)	0.000514*** (0.000017)
BS	-0.000277 (0.000077)	0.000274 (0.000220)
Big4	-0.000462** (0.000232)	0.000022 (0.000621)
AS	-0.000366** (0.000168)	0.00289*** (0.000413)
ACind	-0.000673*** (0.000219)	0.00243*** (0.000596)
CEOAC	0.000181 (0.000736)	-0.00281* (0.00146)
CEOD	-0.000431* (0.000229)	0.00182** (0.000718)
leverage	0.00141*** (0.000430)	0.000698 (0.00116)
Constant	0.00135* (0.000710)	0.0123*** (0.00199)
Wald test	48.14	869.37
p-value	0.000	0.000
Observations	2114	2114
Number of company	302	302

Standard errors in parentheses \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Source: Author source.

association between WACCH and DACCN. In Column 1, the coefficient of WACCH is significant and has a negative relationship with DACCP. The coefficient of WACCH in Column 2 is significant and has a negative association with DACCN. These results reveal that the primary analysis is free from the self-selection bias.

## 5. Conclusion

The aim of this study is to examine the relationships between the accounting expertise of WACCHs, ICS, and FRQ. Also, it compares the impacts of the accounting expertise of WACCHs and male chairs on FRQ. This is a pioneering document that highlights the importance of the leadership role of female directors with accounting expertise in ACs.

This research concludes that WACCHs with accounting expertise are essential to enhance the efficiency of ACs and have a more pronounced impact on FRQ than MACCHs (see summary in Table 8). It is because of the many differences between female and male directors, including leadership styles, investment behaviours, management styles, ethical considerations, accounting conservatism, and risk-taking behaviours; along with the accounting expertise of female ACs that there is a dire need for AC chairs to overcome irregularities and earnings management. Also, this study reveals that the impact of the accounting expertise of WACCHs can be seen with a robust mechanism of ICS, which is one of the prime responsibilities of board to secure shareholder rights (see summary in Table 8).

**Table 8.** Summary of hypothesis.

Hypothesis	Status
H1: The accounting expertise of WACCHs has a more pronounced impact on FRQ than that of MACCHs.	Accepted
H1a: The accounting expertise of WACCHs has a significant impact on FRQ.	Accepted
H1b: The accounting expertise of MACCHs has a significant impact on FRQ.	Accepted
H2: The accounting expertise of WACCHs moderates the relationship between ICS efficiency and FRQ.	Accepted
H2a: The accounting expertise of WACCHs moderates the relationship between the components of ICS and FRQ.	Accepted

Source: Author source.

This research has limitations. First, the characteristics of WACCHs include ethnic groups, experiences, and social and political nesting. However, the impacts of such characteristics on firm performance are not considered here. Future research can investigate this aspect. Second, gender diversity in ACs is not covered. Gender diversity can influence internal risks, including inventory, operational, and human resources risks. The pre-merger/post-merger, acquisition, and the link between gender diversity and firm exit are, also, not discussed.

This research offers implications for regulators and shareholders. The findings reveal that the accounting expertise of WACCHs improves corporate governance mechanisms and enhances FRQ. Therefore, for shareholders, the WACCH improves monitoring, restricts earnings management, and secures investor rights; this implication is consistent with prior research (Zalata et al., 2018). For regulators, the emerging and developing economies should encourage companies to designate female directors with accounting expertise, with a leadership role in ACs. Also, restrict the definition of financial expertise and the requirements of AC chairs.

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## Appendix A: list of variables

proxy	Explanation
Dependent variables	
DAC	It is the absolute residuals values of the modified Jones (1991) model.
PDACQ	It is the absolute residual values performance controlled accrual measure by (Kothari et al., 2005).
Independent variables	
WACCH	Dummy equal to 1 if AC chair is a female
MACCH	Dummy equal to 1 if AC chair is a male
ICS	It is an index of internal control (see, Chen et al., 2017).
CGS	The control environment is a component of COSO framework of internal control, using Analytical Hieratical Process (AHP) an index of control environment is measured
Risk	Risk Assessment is a component of COSO framework. Using AHP we calculated the index of Risk assessment.
CONTR	Control activity is a component of COSO framework, the index of control activity through AHP.
INFORM	By using AHP we calculated an index for information and communication that is a component of COSO framework.
MONTR	Monitoring is also essential element of COSO framework; the index for monitoring measured.
Control Variables	
Mbr	It value is market value of equity divided by book value of equity
ROA	Net income divided by total assets
BS	Total number of board member
Big4	Dummy equal to 1 if audit firm is one of the big 4 audit firms
AS	Total number of audit committee members
ACind	Dummy equal to 1 if atleast one independent director is member of AC.
CEOAC	Dummy equal to 1 if expertise of CEO's is accounting
CEOD	Dummy equal to 1 if CEO and Chair of the board is same