RESEARCH ARTICLE

Gender diversity of boards and executives on real earnings management in the bull or bear period: Empirical evidence from China

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Abstract

This study investigates whether gender diversity in the roles of executives, boards of supervisors and management impacts real earnings management during the bullish and bearish periods from 2000 to 2017. The sample is separated by bullish (11,616 firm-year observations) and bearish (14,436 firm-year observations) periods. The results suggest that female participation on supervisory boards and executives tend to kerb real earnings management during bearish and bullish periods. Another important finding is that female CEOs are more cautious in real earnings manipulation due to their risk-averse nature during the bearish period, while female CFOs are more likely to constrain real earnings management in the bullish period. This study failed to find the relation of gender diversity on boards of management to real earnings management; however, the study has found that female executives (excluding CEOs and CFOs) who are also directors are more likely to limit earnings manipulation.

KEYWORDS

female directors, female executives, female supervisors, gender diversity, real earnings management

1 | INTRODUCTION

Recently, the proportion of women in senior executive committees or boards in China has reached 11%, much higher than the 3% recorded in Japan or South Korea (Chen, 2019). According to Chen (2019), 35% of management positions in China were held by women in 2018, while the average in the European continent was 30%. While the percentage of female directors and executives in firms has risen rapidly in recent years, this proportion of female participation in firms is still not a considerable figure. If the association of female directors and executives with the level of earnings management is successfully determined, it will add more evidence to help the corporations to realize the important role of female top-level leadership, including female directors and supervisors on boards as well as executives. Moreover, public are paying more attention to firms with increasing female

participation. Many of the researchers have explored the extent to which female directors and executives might benefit or improve the value of firms. A growing number of researchers believe that female executives and increased female participation on boards can help to kerb earnings management and increase the quality of financial reports. In particular, previous studies concluded that female directors and females within senior management roles are helpful to improve the quality of financial reporting, such as less earnings management (Adams & Ferreira, 2007; Alqatan, 2019; Hillman, Shropshire, & Cannella, 2007). For instance, Adams and Ferreira (2007) found that gender diversity on management boards helps to increase board attendance for male and female directors and improve accountability for managers' poor performance. Hillman et al. (2007) indicated that female participation in the board brings different experiences and enriches board communication, thereby improving the quality of board decisions. According to Alqatan (2019), the earnings management of firms with greater gender diversity becomes more effective because gender-equal corporate management teams are more conservative and cautious about spending and other forms of management. However, the impact of gender diversity in the management boards and executives with regard to the quality of earnings management is inconclusive. Some studies fail to prove the relationship of gender diversity on boards and within executive roles to earnings management (Kuo, Ning, & Song, 2014; Joecks, Pull, & Vetter, 2013; Hili & Affes, 2012; Peni & Vahaamaa, 2010). More specifically, Joecks et al. (2013) argued that the relatively low proportion of women's participation on boards is unlikely to have an influence on earnings manipulation.

In addition, the agency problem in reality prompts managers to use flexible accounting policies to manipulate financial statements (Man, Locke, & Wellalage, 2018), which may impair the interests of shareholders. The incorrect reporting of numbers in financial statements would impair the confidence of investors and misguide them, causing them to be unwilling to invest in stock markets and damage the economy (Arioglu, 2019). Earnings management is divided by two main kinds of strategies: the accrual-based earnings management and real earnings management (Luo, Xiang, & Huang, 2017; Sun, Lan, & Liu, 2014). The accrual-based earnings management is to increase or decrease reported income temporarily according to the accounting principles (Zhu & Tian, 2009), while manipulations to actual activity are usually managed by altering the timing and scale of sales, investments or financing transactions (Luo et al., 2017). A number of studies have suggested that firms are more likely to manipulate earnings by real activities as the methods of real activity manipulations are harder to detect and constrain (Cohen, Cohen, Dey, & Lys, 2008; Ge & Kim, 2014). For instance, Chinese firms are more likely to use real activity

manipulations (Kuo et al., 2014; Talbi, Omri, Guesmi, & Ftiti, 2015). China is now an emerging economy and the largest recipient of foreign direct investment among developing countries (Man et al., 2018). Also, the institution of real earnings management in China is not perfect and the management cost is relatively low, therefore managers tend to choose real earnings management (Kuo et al., 2014). For these reasons, female participation on boards and executives may play an important role in restraining real earnings management as compared with accrual-based earnings management in Chinese firms.

Furthermore, the extent of firms' earnings management and the policies they employ are different in different periods, for instance, in the bull or bear period. When firms are in a downtime, management may increase revenue and avoid losses to manipulate earnings (Habib, Bhuiyan, & Islam, 2013). For example, in the 2008 financial global crisis, stock return decreased due to inflation and the subprime mortgage crisis, which significantly impacted the earnings management behaviours (Kumar & Vij, 2017). According to Jahmani, Niranjan, and Toney (2016), firms are more likely to engage in earnings management during a recession period, aiming to avoid the reporting of losses and declined earnings. However, Kumar and Vij (2017) hold the contrary opinion that the extent of earnings management is relatively low during the crisis period compared to the bullish period. When firms experienced bull periods, Kumar and Vij (2017) suggested that the level of earnings manipulation in a good economic condition is relatively high, while the Cimini (2015) argued that the extent of earnings management declined after the financial global crisis in 2008. Based on the above views, the policy and the degree of earnings management are different in diverse contexts, and the effect of gender diversity on boards and within executive roles in firms may also impact differently in different time periods.

Accordingly, the research into the effect of gender-balance on boards and executives of firms on real earnings management during bearish and bullish periods may prove interesting. There are many studies about the association of gender diversity on boards and executive and earnings management (Adams & Ferreira, 2007; Alqatan, 2019; Davies, 2011; Hillman et al., 2007). Also, many scholars contributed to research on the level of earnings management under good or bad economic conditions (Cimini, 2015; Demirkan & Platt, 2009; Habib et al., 2013; Jahmani et al., 2016; Kumar & Vij, 2017). However, the studies related with earnings management to gender diversity on boards and executive during the bear and bull periods have limited scope in the literature. In consideration of this knowledge gap, this study explored the relationship of gender diversity on boards and in executive roles to real earnings management and any potential differences in the relationship during

bearish and bullish periods. In order to achieve this, the real earnings management model was chosen to test the level of earnings management on the basis that it is more appropriate for the Chinese context (Kuo et al., 2014; Talbi et al., 2015). The independent and control variables were boards and executives. The independent variables included directors, independent directors, boards' supervisors, CEOs and CFOs and these were selected because these factors significantly impacted on earnings management in previous literature (Adams & Ferreira, 2007; Gavious, Segev, & Yosef, 2012; Gul, Fung, & Jaggi, 2009; Hillman et al., 2007). Control variables included board size, firm size, return on assets, return on equity, debt leverage, book-to-market ratio, sales growth, firm loss and Big4 external auditors, for which there was a high correlation with earnings manipulations (Arioglu, 2019; Arun, Almahrog, & Aribi, 2015; Cornett, Marcus, & Tehranian, 2008; Rahman & Ali, 2006; Watts & Zimmerman, 1990; Wei & Xie, 2015; Yu, Du, & Sun, 2006).

The novel contribution of our research considers the following aspects: female supervisors on boards and executives are correlated with degree of real earnings management both in bear and bull periods. Our paper also highlighted that the choices made by CEOs and CFOs in earnings management during bullish and bearish periods are different. Moreover, key evidence to support the important role of female top leadership and may encourage companies to improve the proportion of female directors and executives, and therefore make full use of the role of females on firms' boards and executives. Lastly, female directors and independent directors are not related to real earnings management in both periods. This study contributes to the literature by considering the impact of gender diversity of boards (management boards and supervisory boards) and executives on real earnings management during bear and bull periods. The remainder of this paper is designed as follows. Section 2 summarizes the relevant literature about real earnings management; Section 3 presents a detailed methodology and sample selection, Section 4 tests the hypotheses developed based on the research findings and comprehensively explains the empirical results derived by all models. Section 5 concludes and summarizes the full study.

2 | LITERATURE REVIEW

2.1 | Real earnings management in bull or bear market

2.1.1 | Real earnings management

Healy and Wahlen (1999) pointed out that managers used their own judgement to change financial reports and

structured transactions when managing earnings, so that stakeholders could misunderstand the company's basic economic performance. Accrual-based earnings management and real earnings management are two main strategies for earnings manipulations (Cohen et al., 2008; Luo et al., 2017). Managers control accrual accounting methods or participate in real activity management to adjust earnings, misleading stakeholders about the company's potential economic performance (Sun et al., 2014).

With regard to accrual-based earnings management, a large amount of existing literature uses the discretionary accrual as the determinant to it (Ghazali, Shafie, & Sanusi, 2015; Mohanram, 2003; Wei & Xie, 2015). Mohanram (2003) suggested that corporates with positive discretionary accruals are likely to up earnings manipulation, while corporates with negative discretionary accruals are likely to down earnings manipulation. Moreover, a few researchers pointed out that earnings management based on accrual is difficult to be recognized and scrutinized by nonprofessional outsiders as long as following allowable accounting and estimation methods to manage earnings (Dechow & Skinner, 2000; Kothari, Leone, & Wasley, 2005). This is, therefore, a popular way to manage earnings.

However, some existing literature has argued that real earnings management is a more practical way to examine whether firms manipulate earnings. Since firms tend to choose the methods of real activity manipulations, those are harder to detect and constrain (Cohen et al., 2008; Ge & Kim, 2014; Kuo et al., 2014). In the results of Cohen et al. (2008), firms within their sample were exercising the real earnings management rather than accrual-based earnings management, since the corporate governance and ethics rules in firms are not enough to limit the use of real activities manipulations, while accrual earnings management is easier to be managed. Kuo et al. (2014) also reported that, after the split-share reform in China, Chinese enterprises switched to real earnings management from accrual manipulation because the possibility of real activity manipulations being discovered could be ignored. For instance, the use of real activity in earnings management occurs when firms breach the debt contract (Kim, Lisic, & Pevzner, 2010) and issue their new bond (Ge & Kim, 2014) to mislead rating agencies, causing bond yield spreads to fall. Furthermore, Roychowdhury (2006) detected real earnings management through three methods, including sales acceleration, overproduction and discretionary expense decrease. The first method was to smooth the earnings management of current profits by accelerating sales or changing sales time. When managers expect that the current operating results are not satisfactory or cannot meet expectations, managers usually have the incentive to attract customers by providing sales discounts or relaxing credit policies, temporarily increasing the sales volume of enterprises and accelerating revenue (Sun et al., 2014).

Similarly, when managers believe that it is necessary to smooth the operating profit of the company, they will delay the sales time to adjust the sales income in different periods to achieve the purpose of earnings control (Dechow & Skinner, 2000). Secondly, it is also possible to increase the operating profit by increasing the output to reduce the cost per unit of product, reducing the production cost of the sold product (Sun et al., 2014). Thirdly, it is possible to increase or decrease discretionary expenditures. Discretionary expenditures refer to that expense that can be determined by management, such as research and development expenses, publicity fees and employee training fees (Wei & Xie, 2015). These expenses are usually future-oriented and have little impact on the company's current production activities. Discretionary fees can easily become a mean for managers to control their earnings. Therefore, real earnings management is more suitable to this research based on Chinese background.

2.1.2 | The bull or bear market

Bull and bear markets are representative of cycles in stock prices. Previous studies such as Chauvet and Potter (2000) as well as Cheng, Lee, and Lin (2013) defined the bull or bear market where stock prices experience up or down movements in continuous periods. Specifically, Cheng et al. (2013) took the Taiwan stock market as an example to identify the bull (bear) market by examining three consecutive months of upward (downward) trend of stock return in the market. There are two main measurements, including the Markov-switching model and BB algorithm (Bry & Boschan, 1971). The Markov-switching model was implemented by Girardin and Liu (2003) as well as Chi, Brooks, Bheenick, and Tang (2016) in order to examine the movement of the stock market. Girardin and Liu (2003) used the Markov-switching model to study the changes in China's Shanghai A-share market from 1995 to 2002. They found that, on the whole, the bear and bull periods of the Chinese stock market were very short due to speculative investors. Chi et al. (2016) also tested the Chinese bull and bear market using the Markov-switching model, and found that the significant overlap in the bear market helps to explain the long cycle of the bear market in China. However, Yan, Powell, Shi, and Xu (2007), who distinguished the market trend cycles in Chinese stock market during 1991–2006 by BB algorithm, argued that the BB algorithm (Bry & Boschan, 1971), compared with the Markov-switching model, is much closer to the standard perception of bull and bear cycles. Also, according to the opinion of Canova (1998), who utilized the BB algorithm, the period of rising or falling stock prices must last for 12 months to be recognized as a bear market or a bull market.

In the bullish period, the economic environment is one of prosperity, and pressure on the institutional investors' own earnings is relatively low, thus the tendency of pressure on listed companies' management to manage earnings is relatively low (Jahmani et al., 2016). Moreover, Cimini (2015) suggested that the extent of earnings management declined after the financial global crisis in 2008. Nevertheless, firms in bullish may also be more likely to manage earnings by expanding equity investment. Kumar and Vij (2017) suggested that firms are more likely to engage in earnings management during pre-crisis and post-crisis times, which means that there is a high level of earnings manipulation in good economic conditions. In the bearish period, institutional investors and listed company managers need to attract investors' attention through earnings management and, therefore, the tendency of institutional investors to promote earnings is more obvious (Jahmani et al., 2016). For instance, Habib et al. (2013) proposed that corporate managers may use this opportunity to manipulate returns by choosing different accounting methods, such as increasing profits and avoiding losses when they encounter financial crises. However, Demirkan and Platt (2009) held the opposite view, that companies that are already in trouble reduce earnings management because they run out of earnings management tools before they get into trouble. Also, when the bearish period arrives, the public are more tolerant to the lower earnings reported by firms because almost all firms underperform in their financial reports during that downtime (Ahmad, Campbell, & Goodacre, 2011). Therefore, there are many different patterns of decisions and activities by corporate management to manipulate earnings in bull or bear markets.

2.2 | Gender diversity on boards and in the roles of executives

2.2.1 | Gender diversity on boards

The correlation between the quality of earnings management and board members, researchers also explored the relationship between the gender diversity of board composition and the influence of earnings management level. However, the results of these prior studies are inconclusive. Some studies did find that gender diversity in the boardroom helps improve the quality of earnings management, as gender diversity on boards may lead to the broadest pool of talent as well as the better and more responsible corporate governance (Adams & Ferreira, 2007; Davies, 2011; Hillman et al., 2007). On the contrary, some studies in this field have shown that the correlation between board gender diversity and earnings management has not been proved

successful in the research process (Carter, Souza, Simkins, & Simpson, 2010; Haslam, Ryan, Kulich, Trojanowski, & Atkins, 2009).

A more gender-diversified boardroom provides a better supervisory role and an adequate number of female directors can form an effective supervisory management structure in firms (Adams & Ferreira, 2007; Hillman et al., 2007). Adams and Ferreira (2007) stated that gender-balanced boards can effectively increase the attendance of both male and female directors. Women's participation on the board brings different experiences and enriches board communication, thereby improving the quality of board decisions and effectiveness of monitoring (Hillman et al., 2007). Moreover, women are often good at collecting personal information, to reduce the information asymmetry between female directors and managers. On the other hand, women are more conservative and less aggressive than men. They tend to be more willing to disclose specific information (Srinidhi, Gul, & Tsui, 2011). Therefore, a high proportion of female directors on management boards may help to kerb managers' manipulations and increase the quality of earnings management, thereby being seen to be more friendly to other stakeholders.

Furthermore, diversification enhances independence and promotes procedural justice to ensure the best interests of shareholders and stakeholders (Carter, Simkins, & Simpson, 2003; Temile, Jatmiko, & Hidayat, 2018). Companies with a high percentage of independent directors can effectively constrain management's opportunistic behaviour and enhance the effectiveness of board control (Talbi et al., 2015). Moreover, in Chinese firms' boards, more female independent directors were required from 2002, as set out by China Securities Regulatory Commission (CSRC). Thus, the female independent directors probably also affect the earnings management.

Some studies have failed to find any relationship between gender diversity on boards with earnings management (Hili & Affes, 2012; Joecks et al., 2013; Kuo et al., 2014). For instance, Hili and Affes (2012) found that earnings management has nothing to do with women's participation in the board. Moreover, if female participation in boards is relatively low, it is unlikely to have a major impact on corporate decisions (Joecks et al., 2013). Moreover, some Chinese companies show that the incidence of earnings management is still relatively high, so that the female directors suppressing earnings management effects is not obvious. It may be because the demand for high-quality earnings management and the litigation risk of earnings management is relatively low, so that manipulating earnings of companies in China is not a difficult thing (Kuo et al., 2014; Liu & Tian, 2012). Therefore, the economic impact of board gender diversity on earnings management remains a controversial topic.

2.2.2 | Gender diversity in the roles of executives

Executives are more likely to engage in earnings manipulations by exploiting flexibility accounting policies for resolving agency problems (Man et al., 2018). If there is gender diversity on management, earnings management will become more effective because gender-equal corporate management teams are more conservative and cautious about spending and other forms of management (Alqatan, 2019). Female executives, especially CEOs and CFOs, may also influence the quality of earnings management due to their involvement in financial reporting processes and accounting decisions (Francis, Hasan, Park, & Wu, 2015). Francis et al. (2015) proposed that female CEOs and CFOs tend to be more cautious and risk-averse than men due to conservative nature of females in financial disclosure. Similarly, Gavious et al. (2012) found that the level of earnings management with female CEOs is lower than that of companies with male CEOs, and there is a negative correlation between female executives and the degree of earnings management. Gul et al. (2009) also reported that female CFOs play an important role in the company because their primary responsibility is financial reporting, and they tend to use more conservative reporting and corporate strategies than male CFOs. However, Peni and Vahaamaa (2010) found no association of CEOs gender and earnings management. Therefore, whether gender diversity in CEO and CFO roles contribute to better management in earnings is still not clear.

2.2.3 | Gender diversity on board of supervisors

According to company law in China, a company must have a board of supervisors and no less than three members. Directors and senior management must not serve as supervisors. Panzer and Muller (2015) stated that firms with female supervisors on board are more conservative in the choice of financial reporting policy and standard. Therefore, the supervisory board may limit senior management to manage earnings. Also, since there is little known in terms of the relation of female supervisors on boards and real earnings management, their relationship is worth examining within the scope of this study.

2.3 | Hypotheses development

Firstly, previous studies reveal that gender diversity on the management board, executive roles and supervisory boards is likely to affect the quality of earnings

management, and female directors, executives and supervisors may play an important role to constrain earnings management (Adams & Ferreira, 2007; Davies, 2011; Francis et al., 2015; Hillman et al., 2007).

Secondly, previous studies found that real earnings management is more practical in underperforming firms (Cohen et al., 2008; Kuo et al., 2014) and standard models for discretionary accruals may not be reliable when applied to companies with extreme performance (Dechow, Sloan, & Sweeney, 1995). Furthermore, in China, the firm tends to manage earnings by real activity, because it is harder to detect than accrual earnings management (Kuo et al., 2014). Thus, real earnings management is a more practical index as a dependent variable to examine the hypotheses in this study.

Thirdly, the methods and decisions of firms in earnings management are different in different time periods, such as bull or bear period. And the effects of female participation on boards and executives on real earnings management are also different in bullish and bearish periods. When firms are in recession conditions, managers may increase revenue and avoid losses to manipulate earnings (Habib et al., 2013), but Kumar and Vij (2017) reported that the extent of earnings management is relatively low during the crisis period than bullish period. When firms are in the bull period, the level of earnings manipulation is relatively high (Kumar & Vij, 2017), but Cimini (2015) argued that the extent of earnings management would decline in this period. Plus, managers choose appropriate strategies and decisions under the supervision of the board of management (Sun et al., 2014; Talbi et al., 2015). Thus, the impact of gender diversity on boards and executives in bear market or bull market on real earnings management is likely to prove significant research.

Overall, this study will predict that the association of gender diversity on the board of management (independent directors and directors), executives (senior management, CEOs and CFOs) and supervisors of boards to real earnings management during bull (bear) period are highly correlated. Accordingly, the hypotheses are formulated as follows:

H1. *The proportion of female directors on boards and real earnings management during bull or bear market are significantly correlated.*

H2. *. The proportion of female independent directors on boards and real earnings management during bull or bear market are significantly correlated.*

H3. *The proportion of female executives and real earnings management during bull or bear market are significantly correlated.*

H4. *The proportion of female CEOs and real earnings management during bull or bear market are significantly correlated.*

H5. *The proportion of CFOs and real earnings management during bull or bear market are significantly correlated.*

H6. *The proportion of supervisors on boards and real earnings management during bull or bear market are significantly correlated.*

3 | METHODOLOGY

3.1 | Data and data sources

The main purpose of this study is to examine the impact of boards' gender diversity and executives on real earnings management in bull and bear market. To address it, all variables in the data in the Chinese listed firms of A-share of Shanghai and Shenzhen stock exchanges for the period 2000–2017 were calculated. The data were obtained from the China Stock Market and Accounting Research (CSMAR) database. Firms that experienced losses and belonged to ST[1] (special treatment) or financial industry[2] were eliminated. Accordingly, the data sample selected was a total of 26,052 firm-year observations including 2,891 unique firms after dropping the missing and duplicate values. The sample was separated by the bullish (11,616 firm-year observations) and bearish (14,436 firm-year observations) period and the distribution of this is set out in Table 1, which shows that most of the industries are manufacturing.

3.2 | Dependent variables

Roychowdhury (2006) and Cohen et al. (2008) identified three determinants of real earnings management, including sales acceleration, discretionary expenditure (DE) and overproduction (OP). Thus, OCF, DE and OP, as real activity manipulation, are estimated by ordinary least squares (OLS) regressions for each year, respectively, and formulated as follows:

$$OCF/A_{i,t-1} = \beta_0 + \beta_1(1/A_{i,t-1}) + \beta_2(S_{i,t}/A_{i,t-1}) + \beta_3(\triangle S_{i,t}/A_{i,t-1}) + \varepsilon_t, \tag{1}$$

$$DE/A_{i,t-1} = \beta_0 + \beta_1(1/A_{i,t-1}) + \beta_2(S_{i,t}/A_{i,t-1}) + \varepsilon_t \text{ and,} \tag{2}$$

$$OP/A_{i,t-1} = \beta_0 + \beta_1(1/A_{i,t-1}) + \beta_2(S_{i,t}/A_{i,t-1})$$
$$+ \beta_3(\triangle S_{i,t}/A_{i,t-1}) + \beta_4(\triangle S_{i,t-1}/A_{i,t-1})$$
$$+ \varepsilon_t, \text{Model}$$

$$(3)$$

where i is firm; t is year; OCF is operating cashflow; DE is the sum of sales expenses and administrative expenses; OP is the sum of the cost of goods sold (COGS) and inventory variation ($\triangle$ INVT); A is total assets; S is net sales.

According to Roychowdhury (2006) and Cohen et al. (2008), real earnings management (REM) is the sum of three standardized residuals calculated from three separate regression models (model 1, model 2 and model 3). AB_OCF, AB_DE and AB_OP will represent three results of standardized residuals of model 1, model 2 and model 3, respectively. The level of REM depends on the results of calculation in regression models as below:

$$REM = AB\_OP - AB\_OCF - AB\_DE, \qquad (4)$$

where AB_OCF is abnormal level of operating cash flow (the residual of model 1); AB_OP is abnormal level of production (the residual of model 2); AB_DE is abnormal level of discretionary expenses (the residual of model 3).

3.3 | Independent variables

According to previous studies (Adams & Ferreira, 2007; Davies, 2011; Francis et al., 2015; Hillman et al., 2007)

and hypotheses of this study, the proportions of female directors (PFD), independent female directors (PFID), female executives (PFE) and female supervisors on boards (PFSP) are independent variables. The female CEOs (ISCEO) and CFOs (ISCFO) act as dummy variables, using code 1 to represent female CEOs and CFOs in firm, and 0 otherwise. These variables, during the bullish and bearish periods, are used to measure the effect of female participation of boards and executives on REM in this study.

3.4 | Control variables

There are various firms-specific characteristics as control variables to predict the REM. Size is included in the regression, which helps to control the potential impact of firm size and board size on the REM. Xie, Davidson III, and DaDalt (2003) and Rahman and Ali (2006) imposed board size (BS) to examine the potential effects on earnings management, which is calculated by total number of directors on a board. The size of the board of directors maybe positively or negatively correlated to earnings management. Smaller boards may be more functional and more accountable for financial reporting. Directors of larger boards are likely to be experienced in financial reporting, raising the possibility of profit management prevention (Xie et al., 2003). It is also stated by Fama and Jensen (1983) that boards with the optimal size are more likely to make internal communication and

TABLE 1 Sample distribution by year and industry

Panel A: Sample distribution by year and industry during bullish periods (see the completed Table A1 in Appendix)							
	Year						
Industry	Code	2000	2005	2006	2007	2017	Total
Agricultural	1	13	27	...	29	40	252
Mining	2	9	19	...	22	39	223
Manufacturing	3	462	712	...	715	1,502	7,752
...	...	...	...	...	...	...	...
Total		755	1,116	1,097	1,123	2,051	11,616
Panel B: Sample distribution by year and industry during bearish periods (see the completed Table A2 in Appendix)							
	Year						
Industry	Code	2001	2002	...	2014	2016	Total
Agricultural	1	18	20	...	42	39	303
Mining	2	12	15	...	43	37	279
Manufacturing	3	552	598	...	1,370	1,418	9,524
...	...	...	...	...	...	...	...
Total		884	955	...	2,036	1,937	14,436

TABLE 2 Model and variables definitions

Dependent variable	
Real activities manipulation (REM):	The sum of the three standardized residuals of AB_OCF, AB_OP and AB_DE, in which AB_OCF is abnormal level of operating cash flow measured from model 1; AB_OP is abnormal level of overproduction measured from model 2; AB_DE is abnormal level of discretionary expenses measured from model 3
Independent variables	
PFID	The proportion of female independent directors in each sample firms
PFD	The proportion of female directors in each sample firms
PFSP	The proportion of board of female supervisors in each sample firms
PFE	The proportion of female executives in each sample firms
ISCEO	Code 1 is designated that CEOs in firms are female, and 0 otherwise.
ISCFO	Code 1 is designated that CFOs in firms are female, and 0 otherwise.
Control variables	
Board size (BS)	The total number of directors on a board
Firm size (FS)	The total number of employees in firms
ROA	The ratio of return to total assets
ROE	The ratio of return to equity
LEV	The ratio of total liabilities to total assets
Book-to-market (BM) ratio	The ratio of stock price to book value per share at the end of the year
SALES	The sales growth rate for year t-1 to t
LOSS (dum1)	Code 1 indicates when the firms have a negative net income, and 0 otherwise
BIG4 (dum2)	Code 1 indicates when the firms' external auditor belongs to Big 4 auditors, that is, Deloitte, PWC, EY and KPMG, and 0 otherwise
Industry/year	Each variable correspond to an industry and year that are controlled in regression analysis

decision-making easier. Firm size (FS) is considered as one of the influences on earnings management, which is measured by the number of employees. Cornett et al. (2008) argued that firms with a larger size tend to manipulate earnings as the market pressure is greater for big-sized firms.

ROA is a determinant for firm profitability, which can be calculated by return divided by total asset. Watts and Zimmerman (1990) reported that firms with a higher performance of profitability are more likely to manage earnings downwards. Return on equity (ROE) is related to earnings management in Chinese listed firms that can be a control variable as highlighted in Yu et al.'s (2006) previous study, where they suggested that Chinese listed firms are more likely to manage earnings for meeting the ROE requirement. ROE is the ratio of return to equity. LEV is a ratio of total liabilities to total assets used as a proxy for debt covenant violation, which has two opposite conclusions on relationship with earnings management. That is, LEV is negatively or positively related to earnings management (Arun et al., 2015).

Book-to-market (BM) ratio is negatively correlated to earnings management, while sales growth (SALES) is positively associated with earnings management (Butler, Leone, & Willenborg, 2004; Wei & Xie, 2015). Firm loss (LOSS) represents the poor financial condition of the firm and is often employed in studies to test the impact on earnings management (Arun et al., 2015; Luo et al., 2017). A poor financial condition may incentivize the earnings management for increasing income (Jaggi & Lee, 2002). Thus, BM, SALES and LOSS will be control variables. LOSS uses code1 to represent the negative net income and 0 otherwise.

External auditor (Big 4), as independent audit companies, is more able to constrain earnings management compared to non-Big four independent audit companies because they are more concerned about reputation issues (Arioglu, 2019; Francis & Wang, 2008). Because independent auditing is fairly new in China, the quality of auditing in China maybe more variable and harder to be measured, and this is likely to contribute to explaining the incidence of fraud (Zhu & Tian, 2009). Thus, Big 4 as a variable is designated code 1 for that a firm is audited by Big 4 auditors, and 0 otherwise. Finally, the industry and year indicators are used to control the effects of industry and year because the degree of regression results tends to be different over time and across industries. All defined variables including dependent, independent and control variables are listed in Table 2.

3.5 | Model of the impact of gender diversity on boards and executives on real earnings management

Hypotheses were tested by the OLS regression model and the heteroscedasticity adjusted in this study. When the value of variance inflation factor (VIF) is below 10, the multi-collinearity can be avoided effectively (Gujarati, 2003). The outlier is dropped in the regression model to avoid the bias of results. The model equation is formulated as below:

$$REM_{i,t} = \beta_0 + \beta_1(PFD) + \beta_2(PFID) + \beta_3(PFE)$$
$$+ \beta_4(ISCEO) + \beta_5(ISCFO) + \beta_6(PFSP)$$
$$+ \beta_7(BS) + \beta_8(FS) + \beta_9(ROA) + \beta_{10}(ROE) \quad (5)$$
$$+ \beta_{11}(LEV) + \beta_{12}(SALES) + \beta_{13}(MB)$$
$$+ \beta_{14}(LOSS) + \beta_{15}(BIG4) + \varepsilon_{i,t}.$$

3.6 | The bull and bear period

Compared with the Markov-switching model, Bry and Boschan are much closer to standard in the judgement of the bull and the bear market time periods (Yan et al., 2007). The BB algorithm model (1971) suggested that the bull (bear) market period is represented by stock prices rising (falling) for 12 months consecutively. On the other hand, all variables are picked from annual financial statements so that the bull or bear period should last at least 1 year. Accordingly, the bull market or bear market period, in this study, will be represented by the period of annual increase or decrease in stock prices. The overall index level of Shanghai and Shenzhen A-share and the bull (bear) period distribution are introduced in Table 3.

4 | RESULTS

4.1 | Descriptive statistics

As can be seen in Table 4, the number of observations is 11,616 and 14,436 in bull market periods and bear market

TABLE 3 Shanghai and Shenzhen A-share index level from 2000 to 2017
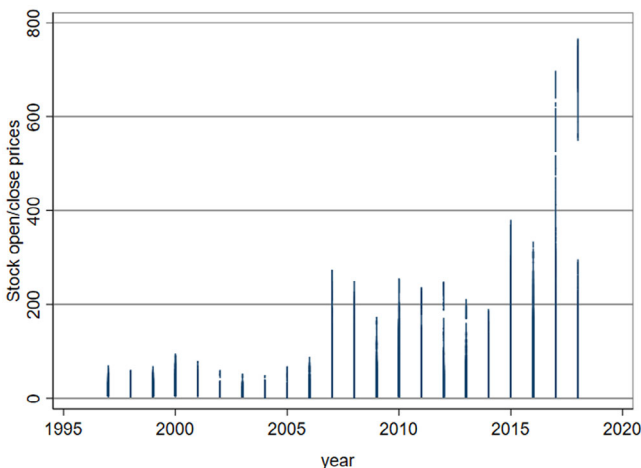
Bullish year: 2000, 2005, 2006, 2007, 2010, 2012, 2015, 2017
Bearish year: 2001, 2002, 2003, 2004, 2008, 2009, 2011, 2013, 2014, 2016

periods separately. The mean value of REM in the bull period is positive, at 0.002, while in bear periods indicates a negative mean value, at −0.017. The result suggests that firms in China, on average, tend to be more conservative in REM during bear market periods or prefer to manipulate the sales, discretionary expenses and overproduction during bull periods, which is similar to Ghazali et al. (2015) who suggest that financial distress and earnings management are negatively related. It may mean that firms in dangerous conditions, such as the bear market condition, may not be able to manage earnings successfully.

The average ratio of female directors to total directors on boards (PFD) is 12.1% and 11.7% during the bear and bull periods respectively, which is slightly higher than 10.2% as reported by the study of Luo et al. (2017) for a Chinese sample. The mean value of the proportion of female independent directors (PFID) and female executives (PFE) is around 14% in two kinds of periods and the max value is 100%, which illustrates that all of the independent directors on boards or executives of some Chinese firms are women. These findings indicate that China has made a great change in increasing female participation on boards. Similarly, the mean proportion of female supervisors (PFSP) is higher than the proportion of female directors and executives, at around 23.5% during the two periods.

The mean ROE and sales growth (SALES) have a big differential between the bull and bear period. The average ratio of ROE is 4.5% in the bull period while that in the bear period is 2.4%. The average rate of SALES is 2.377 in the bull period while that in the bear period is 0.348. This result shows that the financial condition in bullish time is much better than that in bearish time. In addition, few firms use Big4 auditor, at around 1.6% in the two periods. Finally, the mean values of other control variables are similar in bullish and bearish periods.

4.2 | Correlation matrix

The correlation coefficients of all variables of the study are displayed in Table 5. Almost all of the independent variables (PFD, PFSP, PFE, ISCEO, ISCFO and PFSP) are correlated at 1% significance level. As expected, PFE and PFSP are correlated with REM at 3.8% (at 1% significance level) and 2.4% (at 5% significance level), respectively, in bullish periods, while that in bearish periods is 3.0% (at 5% significance level) and 2.3% (at 1% significance level). This finding supports Hypothesis 3 and Hypothesis 6 that female executives and supervisors are able to kerb real earnings management.

Gujarati (2003) argued that ±80% of the coefficients are suspected of multi-collinearity problems, which are

TABLE 4 Descriptive statistics

Bull periods						Bear periods				
Variable	Obs	Mean	SD	Min	Max	Obs	Mean	SD	Min	Max
REM	11,616	0.002	0.216	−1.231	1.283	14,436	−0.017	0.233	−2.031	2.266
PFD	11,616	0.121	0.114	0	0.714	14,436	0.117	0.113	0	0.833
PFID	11,616	0.140	0.191	0	1	14,436	0.134	0.189	0	1
PFE	11,616	0.140	0.154	0	1	14,436	0.136	0.151	0	1
ISCEO	11,616	0.087	0.281	0	1	14,436	0.088	0.284	0	1
ISCFO	11,616	0.277	0.448	0	1	14,436	0.270	0.444	0	1
PFSP	11,616	0.237	0.285	0	1	14,436	0.233	0.278	0	1
BS	11,616	9.921	2.432	4	25	14,436	10.09	2.524	4	26
FS	11,616	5,031	16,094	7	552,698	14,436	4,891	15,541	11	477,780
ROA	11,616	0.036	0.061	−0.628	0.762	14,436	0.033	0.082	−2.746	4.837
ROE	11,616	0.045	0.339	−16.72	2.776	14,436	0.024	0.718	−30.66	14.78
LEV	11,616	0.422	0.208	0	0.994	14,436	0.425	0.208	0	0.997
SALES	11,616	2.377	112.4	−4.411	10,026	14,436	0.348	3.683	−6.077	215.7
MB	11,616	4.530	7.479	0.206	322.5	14,436	4.193	13.94	0.152	941.0
LOSS	11,616	0.114	0.318	0	1	14,436	0.116	0.321	0	1
BIG4	11,616	0.016	0.126	0	1	14,436	0.019	0.136	0	1

Abbreviations: BIG4, coded 1 if firm is audited by Big4 auditing firms, and 0 otherwise; BS, board size; FS, firm size; ISCEO, coded 1 if CEO in the firm is female, and 0 otherwise; ISCFO, coded 1 if CFO in firm is female; LEV, financial leverage; LOSS, coded 1 if firm has loss, and 0 otherwise; MB, market-to-book ratio; PFD, proportion of female directors on boards; PFE, proportion of female executives; PFID, proportion of female independent directors on boards; PFSP, proportion of female supervisors on boards; REM, real earnings management; ROA, return on assets; ROE, return on equity; SALES, growing sales.

detrimental to the results of regression analysis. Table 5 shows that the highest correlation coefficient of 64.9% exists in the relationship between the PFD and PFID during the bullish and bearish periods, showing a 1% significance level. Therefore, there is no multi-collinearity between independent variables.

4.3 | Regression results

Table 6 presents the estimation of the results of the bullish and bearish periods through the pooled OLS regression model. The results in both the bullish and bearish periods as set out in Table 6 suggest that the coefficients of PFE and PFSP are negatively significant at 1% related to REM. These results imply that firms with female executives and female board supervisors are better to kerb the manipulation of actual activities in both periods, which is consistent with reports of Alqatan (2019) as well as Panzer and Muller (2015). Thus, Hypothesis 3 and Hypothesis 6 are supported.

Moreover, the coefficient of ISCEO is positively associated to REM with 5% significance during bullish time. This result suggests female CEOs are more likely to manipulate the earnings management during the bullish

time, perhaps because CEOs are not willing to give up the chance of raising money in this kind of prosperous economic environment. In the bearish time, the relationship of ISCEO with REM is positive but not significant, which means that the probability of female CEOs manipulating earnings declined in a downtime due to the characteristic of conservative. In other words, female CEOs limit earnings manipulation during bearish periods compared with that in bullish periods, supporting Hypothesis 4.

In addition, the association of ISCFO with REM is positive but insignificant during bullish time, while that in bearish time is positively significant at 10%. This implies that female CFOs are more likely to manage real earnings in bearish time than in bullish time. It may be because female CFOs are more sensitive to the depressed economic environment and are not willing to tolerate loss in the bearish period. Therefore, female CFOs kerb REM in bullish time compared to that in bearish time, supporting Hypothesis 5.

It is known that executives in firms are including CEOs, CFOs and other managers so that the relationships between REM with female executives, CEOs and CFOs are more likely to be similar. However, an interesting result is shown in Table 6, which suggests that the PFE (the

TABLE 5 Correlation matrix

Panel A: Correlation matrix in bullish periods							
	REM	**PFD**	**PFID**	**PFFM**	**ISCEO**	**ISCFO**	**PFSP**	**BS**
REM	1							
PFD	−0.006	1						
PFID	−0.002	0.649***	1					
PFE	−0.038***	0.330***	0.040***	1				
ISCEO	0.0038	0.268***	0.024***	0.268***	1			
ISCFO	−0.007	0.172***	0.050***	0.535***	0.039***	1		
PFSP	−0.024**	0.117***	0.013	0.145***	0.070***	0.082***	1	
BS	−0.003	−0.046***	−0.008	−0.068***	−0.033	−0.009	−0.033***	1
FS	−0.041***	−0.074***	−0.029***	−0.076***	−0.017*	−0.037***	−0.060***	0.113***
ROA	−0.346***	0.007	0.001	0.020**	0.016*	0.013	0.001	0.009
ROE	−0.101***	−0.014	−0.020**	0.007	0.004	0.006	0.016*	0.019**
LEV	0.152***	−0.094***	−0.058***	−0.097***	−0.028***	−0.081***	−0.030***	0.051***
SALES	−0.011	0.010	0.001	−0.005	−0.003	−0.007	−0.006	0.012
MB	−0.008	0.017*	0.010	0.012	−0.007	0.003	0.011	−0.037***
LOSS	0.157***	−0.008	0.008	−0.016*	−0.014	0.002	−0.019**	0.012
BIG4	−0.024***	−0.066***	−0.049***	−0.046***	−0.035***	−0.030***	−0.027***	0.080***
	FS	**ROA**	**ROE**	**LEV**	**SALES**	**MB**	**LOSS**	**BIG4**
FS	1							
ROA	0.035***	1						
ROE	0.025***	0.503***	1					
LEV	0.089***	−0.307***	−0.137***	1				
SALES	0.002	0.007	0.004	0.003	1			
MB	−0.059***	−0.021**	−0.178***	0.111***	−0.001	1		
LOSS	−0.025***	−0.591***	−0.345***	0.143***	−0.008	0.081***	1	
BIG4	0.286***	0.024***	0.015	0.039***	−0.003	−0.022**	−0.014	1
Panel B: Correlation matrix in bearish periods							
	REM	**PFD**	**PFID**	**PFFM**	**ISCEO**	**ISCFO**	**PFSP**	**BS**
REM	1							
PFD	−0.004	1						
PFID	−0.006	0.630***	1					
PFE	−0.030**	0.339***	0.042***	1				
ISCEO	0.003	0.266***	0.011	0.265***	1			
ISCFO	−0.006	0.179***	0.053***	0.528***	0.038***	1		
PFSP	−0.023***	0.111***	0.004	0.158***	0.080***	0.080***	1	
BS	−0.007	−0.048***	−0.012	−0.057***	−0.030***	0.002	−0.041***	1
FS	−0.055***	−0.074***	−0.030***	−0.076***	−0.022***	−0.029***	−0.061***	0.108***
ROA	−0.267***	0.015	0.009***	0.036	0.004	0.026***	0.015*	0.009
ROE	−0.060***	0.004	−0.007	0.013	0.003	0.006	0.007	0.015*
LEV	0.144***	−0.084***	−0.051***	−0.097***	−0.025***	−0.086***	−0.030***	0.061***
SALES	−0.019**	−0.003	−0.007	−0.005	0.010	−0.009	0.002	0.006
MB	0.020**	0.001	−0.004	0.009	−0.004	0.00720	−0.002	−0.024***

(Continues)

TABLE 5 (Continued)

Panel B: Correlation matrix in bearish periods							
	REM	**PFD**	**PFID**	**PFFM**	**ISCEO**	**ISCFO**	**PFSP**	**BS**
LOSS	0.160***	−0.004	0.004	−0.022***	−0.004	−0.010	−0.022***	0.023***
BIG4	−0.0142*	−0.062***	−0.045***	−0.046***	−0.024***	−0.024***	−0.031***	0.057***
	FS	**ROA**	**ROE**	**LEV**	**SALES**	**MB**	**dum1**	**dum2**
FS	1							
ROA	0.035***	1						
ROE	0.017*	0.453***	1					
LEV	0.096***	−0.259***	−0.129***	1				
SALES	0.008	0.0362***	0.013	0.029***	1			
MB	−0.034***	−0.042***	−0.218***	0.111***	0.004	1		
LOSS	−0.032***	−0.498***	−0.243***	0.176***	−0.029***	0.084***	1	
BIG4	0.246***	−0.001	0.005	0.037***	−0.006	−0.013	−0.006	1

Abbreviations: BIG4, coded 1 if firm is audited by Big4 auditing firms, and 0 otherwise; BS, board size; FS, firm size; ISCEO, coded 1 if CEO in the firm is female, and 0 otherwise; ISCFO, coded 1 if CFO in firm is female; LEV, financial leverage; LOSS, coded 1 if firm has loss, and 0 otherwise; MB, market-to-book ratio; PFD, proportion of female directors on boards; PFE, proportion of female executives; PFID, proportion of female independent directors on boards; PFSP, proportion of female supervisors on boards; REM, real earnings management; ROA, return on assets; ROE, return on equity; SALES, growing sales.
*Correlation is significant at 10% level.
**Correlation is significant at the 5% level.
***Correlation is significant at the 1% level.

proportion of executives) is negatively related to REM in both periods, while the CEOs and CFOs are positively related to REM in both periods. This differs from the expectation. From the raw data in this paper, it is found that female executives that exclude CEOs and CFOs also serve as directors in firms. Although the mean proportion and number of female executives who are also directors are relatively low, it may still influence the regression results in Table 6. The reason for the different relationships of REM with female executives, CEOs and CFOs is perhaps that non-CEOs and non-CFOs in female executives who are also directors may help to kerb the real earnings management in both periods. Female executives are not only CEOs and CFOs, but also other managers. Other managers who serve as directors may constrain the agency problems of earnings management manipulated by CFOs and CEOs in both periods. Therefore, it is reasonable that the relation of REM to female executives is negative while the relation of REM to CEOs and CFOs is positive.

However, the associations between female directors and independent directors on the board with REM are insignificant during both bullish and bearish times, as shown in Table 6. This means that the directors and independent directors on the board have no impact on real activity manipulation in both periods. It may be because the proportion of female directors is relatively low in Chinese listed firms. According to Joecks et al. (2013), the relatively low proportion of women's participation in the

board is unlikely to have an influence on earnings manipulation. Thus, the low proportion is the main reason that the effect of female participation on management boards is not significant.

4.4 | Robustness checks

4.4.1 | Additional test for effect of the number of independent variables

The robustness of the preliminary results is examined in Table 7, changing the proportion of independent variables (PFD, PFID, PFE and PFSP) and dummy variables (ISCEO and ISCFO) to the number of these variables (NFD, NFID, NFE, NCEO, NCFO and NFSP).

The coefficients of NFE and NFSP are negatively correlated with REM at 1% significance level in both the bullish and bearish periods, consistent with the preregression results in Table 6, and also supporting Hypothesis 3 and Hypothesis 6. Moreover, the correlation of NCEO and NCFO with REM is all positive in both periods, but the significance level of NCEO in the bullish period and that of NCFO during the bearish period are positively significant related to REM at 5% and 1%, respectively. This finding is also consistent with previous results and means that female CEOs are not more likely to manipulate earnings in the bearish period and that

TABLE 6 Regression results for the relationship between the proportion of female directors, executives and supervisors with real earnings management during bullish and bearish periods

REM	Bullish periods	Bearish periods
PFD	0.026	0.029
PFID	−0.017	−0.018
PFE	−0.054***	−0.047***
ISCEO	0.016**	0.008
ISCFO	0.007	0.009*
PFSP	−0.017***	−0.015**
BS	−0.001	−0.002***
FS	−0.001***	−0.001***
ROA	−0.001***	−0.737***
ROE	0.057***	0.026***
LEV	0.095***	0.137***
SALES	−0.001	−0.001
MB	−0.001	0.001
LOSS	−0.048***	0.017**
BIG4	−0.007	−0.007
Number of obs	11,616	14,436
Adjust R^2	0.1501	0.1002
F	54.97	41.12
VIF	2.13	2.13

Abbreviations: BIG4, coded 1 if firm is audited by big4 auditing firms, and 0 otherwise; BS, board size; FS, firm size; ISCEO, coded 1 if CEO in the firm is female, and 0 otherwise; ISCFO, coded 1 if CFO in firm is female; LEV, financial leverage; LOSS, coded 1 if firm has loss, and 0 otherwise; MB, market- to- book ratio; PFD, proportion of female directors on boards; PFE, proportion of female executives; PFID, proportion of female independent directors on boards; PFSP, proportion of female supervisors on boards; REM, real earnings management; ROA, return on assets; ROE, return on equity; SALES, growing sales.
*Correlation is significant at 10% level.
**Correlation is significant at the 5% level.
***Correlation is significant at the 1% level.

TABLE 7 The robust check result for the relationship between the number of female directors, executives and supervisors with real earnings management during bullish and bearish periods

REM	Bullish periods	Bearish periods
NFD	0.003	0.005
NFID	−0.006	−0.009**
NFE	−0.010***	−0.012***
NCEO	0.015**	0.008
NCFO	0.008*	0.013***
NFSP	−0.008***	−0.007***
BS	−0.001	−0.002**
FS	−0.001***	−0.001***
ROA	−1.495***	−0.735***
ROE	0.057***	0.026***
LEV	0.096***	0.138***
SALES	−0.001	−0.001
MB	−0.001	0.001
LOSS	−0.492***	0.016**
BIG4	−0.005*	−0.006
Number of obs	11,616	14,436
Adjust R^2	0.151	0.100
F	50.45	41.88
VIF	2.14	2.14

Abbreviations: BIG4, coded 1 if firm is audited by big4 auditing firms, and 0 otherwise; BS, board size; FS, firm size; LEV, financial leverage; LOSS, coded 1 if firm has loss, and 0 otherwise; MB, market-to-book ratio; NCEO, number of female CEO in firm; NCFO, number of female CFO in firm; NFD, number of female directors on boards; NFE, number of female executives; NFID, number of female independent directors on boards; NFSP, number of female supervisors on boards; REM, real earnings management; ROA, return on assets; ROE, return on equity; SALES, growing sales.
*Correlation is significant at 10% level.
**Correlation is significant at the 5% level.
***Correlation is significant at the 1% level.

female CFOs tend to be more conservative in REM in the bullish period. This supports Hypothesis 4 and Hypothesis 5. Furthermore, the correlation of REM with NFE and the correlation of REM with NCEO and NCFO are also opposite, consistent with the results of Table 6. In addition, the association of NFD with REM is still insignificant in both periods, which is consistent with the pre-results. Although the relationship of NFID and REM is negative significantly at a 5% level in the bearish time period in Table 7, which is not consistent with the previous result of Table 6, the relation of NFID to REM is also negative in Table 7. Overall, Table 7 shows that the main findings in this paper are robust as it is consistent with pre-regression results using the different measures of females.

4.4.2 | Separate tests by the three components of real earnings management

According to Roychowdhury (2006), sales alternation (AB_OCF), overproduction (AB_OP) and discretionary fees manipulation (AB_DE) are the three components of REM. AB_OCF, AB_OP and AB_DE are the proxies of REM, which are considered to be dependent variables in the robustness check respectively. Specifically, the REM is equal to AB_OP minus AB_OCF and AB_DE so that the AB_OCF and AB_DE are inverse and reflect the degree of REM. All values of AB_OCF and AB_DE should multiply by −1. The results of an additional test that uses three components of REM as an alternative measure are presented in Table 8.

T A B L E 8 The impact of female participation on the three components of real earnings management during bullish and bearish periods

	Bullish periods			Bearish periods		
	AB_OP	AB_OCF	AB_DE	AB_OP	AB_OCF	AB_DE
PFD	0.001	0.031**	−0.006	0.001	0.037***	−0.009
PFID	−0.003	−0.017**	0.002	−0.001	−0.019***	0.002
PFE	−0.037***	−0.0003	−0.017***	−0.022**	−0.008	−0.018***
ISCEO	0.008**	0.001	0.007***	0.010	0.005	0.003
ISCFO	0.005	0.0002	0.002	0.005*	0.001	0.004**
PFSP	−0.009**	0.003	−0.011***	−0.007*	0.001	−0.009***
BS	0.001	−0.002***	0.001	−0.001	−0.001***	−0.001
FS	−0.001***	−0.001***	−0.001**	−0.001***	−0.001***	−0.001***
ROA	−0.923***	−0.423***	−0.151***	−0.447***	−0.201***	−0.089***
ROE	0.025***	0.020***	0.012***	0.011***	0.008***	0.006***
LEV	0.054***	0.017***	0.024***	0.089***	0.251***	0.022***
SALES	−0.001	−0.001	−0.001	−0.004	0.003	0.001
MB	−0.001	0.001	−0.001	−0.001	0.001	−0.001
LOSS	−0.027***	−0.010***	−0.012***	0.010**	0.018***	−0.012***
BIG4	−0.001	−0.003	−0.003	−0.001	−0.003	−0.003
Number of obs	11,616	11,616	11,616	14,436	14,436	14,436
Adjust R^2	0.163	0.060	0.0272	0.1138	0.0534	
F	59.19	20.02	9.55	48.54	20.82	7.00
VIF	2.13	2.13	2.13	2.13	2.13	2.13

Abbreviations: AB_DE, real earnings manipulation in discretionary expense; AB_OCF, real earnings manipulation operating cash flow; AB_OP, real earnings manipulation in overproduction; BIG4, coded 1 if firm is audited by big4 auditing firms, and 0 otherwise; BS, board size; FS, firm size; ISCEO, coded 1 if CEO in the firm is female, and 0 otherwise; ISCFO, coded 1 if CFO in firm is female; LEV, financial leverage; LOSS, coded 1 if firm has loss, and 0 otherwise; MB, market- to- book ratio; PFD, proportion of female directors on boards; PFE, proportion of female executives; PFID, proportion of female independent directors on boards; PFSP, proportion of female supervisors on boards; ROA, return on assets; ROE, return on equity; SALES, growing sales.
*Correlation is significant at 10% level.
**Correlation is significant at the 5% level.
***Correlation is significant at the 1% level.

Table 8 shows that PFD and PFID have no significant relationship on AB_OP and AB_DE, which is similar to the pre-results in Table 6. However, there is a positive significant relationship between PFD and AB_OCF during the bullish and bearish period at 5% and 1%, respectively, as well as a significant negative association between PFID and AB_OCF during the bullish and bearish period at 5% and 1%, respectively. This means that female independent directors are more likely to kerb the operating cash flow manipulation.

Moreover, the coefficient of PFE is negatively significant at 1%–5% level related to AB_OP and AB_DE but not related significantly to AB_OCF in both the bullish and bearish periods. Accordingly, the results in the relationship of AB_OP and AB_DE with PFD, PFID and PFE in both periods are similar to pre-results in Table 6. However, the results in relation of AB_OCF to PFD, PFID and PFE in both periods are not consistent with the results in

Table 6. Table 8 shows that operating cash flow is highly related to female directors and independent directors but not significantly related to female executives in both periods, which perhaps means that female directors and independent directors can deal with agency problems effectively with regard to sales manipulations, and the female independent directors are more likely to restrain sales manipulations than female directors and executives.

Furthermore, PFSP has a negative relation to two categories of REM (AB_OP and AB_DE) in both periods but the significance level is different. It may mean that firms with female supervisors on board are likely to kerb overproduction and discretionary manipulation in both time periods. However, PFSP is not significantly related to AB_OCF in both periods, and this may indicate that female participation on supervisors' boards in kerbing REM occurs as a result of reducing discretionary expenditures and overproduction rather than by sales

manipulation. Accordingly, the relationship of PFSP with REM in Table 8 is similar with the pre-regression results in Table 6, which suggested that female supervisors on boards are likely to decrease the real earnings management, supporting Hypothesis 6.

The findings in Table 8 indicate that the coefficient of ISCEO is positively significant related to AB_OP and AB_DE in the bullish period, while ISCEO has no significant impact on AB_OP and AB_DE in the bearish period. Moreover, ISCFO is correlated to AB_OP and AB_DE in the bearish period, while the relationship of ISCFO to AB_OP and AB_DE are not significant in the bullish the period. The results show that female CEOs are not more likely to manipulate earnings through overproduction and discretionary expense, and this is decreasing in the bearish period, and that female CFOs tend to be more conservative in the bullish period, supporting Hypothesis 4 and 5. However, the AB_OCF is not significantly related to ISCEO and ISCFO during the bullish and bearish periods, which may indicate that the female CEOs and CFOs mainly implement REM by reducing discretionary expenditures and overproduction rather than by sales manipulation.

Overall, the robustness check in Table 8 is mostly consistent with previous findings in Table 6. However, during both periods, AB_OCF is not significantly related to the independent variables PFE, CEO, CFO and PFSP, but is significantly related to PFD and PFID. This may mean that female executives and supervisor directors are more likely to restrain manipulation of earnings with respect to discretionary expenditures and overproduction rather than sales.

5 | CONCLUSION

In this study, the roles of female directors and female supervisors on boards as well as female executives in kerbing real earnings manipulation during the bull and bear periods were investigated. The findings in this study concluded that firms with female executives and supervisors on their board are more able to restrain the real activity manipulation in both bull and bear periods. Moreover, female CEOs are more likely to limit the earnings manipulation during bearish periods compared with that in bullish periods, because the results in regression model show that CEOs are more likely to manipulate earnings management during the bullish time, but the same result in the bearish time period is not present. Also, female CFOs are likely to kerb REM in bullish time compared to that in bearish time for the reason that female CFOs in bearish time cannot tolerate loss in a depressed economic context, so that they are more likely to manage real earnings than

that in bullish time. However, the associations between female directors, independent directors in firms and REM during both bullish and bearish times failed to observe. This may be because the relatively low proportion of female participation on boards is unlikely to have an influence on earnings manipulation, according to Joecks et al. (2013). Although the results show that directors and independent directors on boards have no impact on the real activity manipulation during the bullish and bearish periods, female executives (excluding CEOs and CFOs) who are also directors are likely to kerb the REM in both periods. Overall, the findings demonstrate that female supervisors on boards and female executives, including CEOs and CFOs, are likely to restrain managers' real activities manipulation effectively during bear and bull periods to some degree. Importantly, the results of the robustness checks carried out via regression models are effective so that the tests in this study are rigorous.

There are novel contributions in this study. Firstly, there is limited literature exploring the relationship of gender diversity on boards and executive during bull and bear periods. This study concluded that female supervisors on boards and executives are correlated with the degree of REM both in bear and bull periods. The study also concluded that the choices made by CEOs and CFOs in earnings management during bullish and bearish periods are different. In addition, the female directors and independent directors are not related to REM in both periods. This study contributes to the literature by considering the impact of gender diversity of boards (management boards and supervisory boards) and executives on REM during bear and bull periods. Secondly, this study adds further evidence to support the important role of female top leadership and may encourage companies to improve the proportion of female directors and executives, and therefore make full use of the role of females on firms' boards and executives, ultimately improving the firm's performance and the quality of financial reporting by reducing the REM.

There are some policy recommendations arising from the results of this study. Firstly, the employment opportunities for supervisors of boards and executives in Chinese firms should be further increased to ensure gender-balance. In the Chinese context, traditional culture has made women face the predicament of "workplace marginalization" (Li & Luo, 2016). With the change of times, women play an increasingly important role in all fields of society and even the proportion of female participation on management boards and executives now exceeds Japan, South Korea and the European continent. However, still, only 11% of women hold senior executive roles or sit on boards, only 35% hold management positions in China (Chen, 2019), and this still reveals significant

under-representation. A policy of increasing the proportion of female participation on supervisory boards and executives in firms may help to kerb the REM effectively and improve the quality of financial reporting, and this is of benefit to firms' long-term development and the interests of its outsider investors. Furthermore, additional opportunities on boards and in executive roles for women could help to mitigate prejudice against women and increase their employment opportunities so that they can use their talents effectively in their fields. Secondly, this research shows there is an opportunity for companies to concentrate on the effect of employing female executives and supervisors in overproduction and discretionary expense manipulations when they try to control earnings management. Female executives and supervisors in firms are likely to restrain manipulate earnings in the aspect of discretionary expenditures and overproduction rather than sales alternation. Moreover, CEOs are more likely to manipulate to earnings in bullish periods and CFOs are more likely to manage earnings during bearish periods. Companies should consider the different time and context of the market when considering agency problems in earnings management, and the investor should be more cautious in both bullish and bearish periods. Thirdly, most of the listed firms in China were in the manufacturing industry, which provides an opportunity for the government to place increased attention to the earnings management within the manufacturing industry.

Finally, there are some limitations to this study. The sample country in this study is different from United Kingdom and United States, as we have selected only Chinese A-share listed companies. In addition, the corporate governance of the sample companies is relatively weak and the relevant institutions are not developed enough. Moreover, the effectiveness of female participation on boards and executives in firms of China is limited. Since the very large listed Chinese firms are included in the sample need to be analysed. These firms have a low proportion of females on boards and in executive roles. Thus, the actual impacts of female participation in firms on earnings management may be limited in the research. Furthermore, due to potential measurement errors, the measurement of REM is specific but incomplete, and perhaps since some time has moved on since the data were gathered, some of the data may be out of date or not completely accurate. Thus, for any further research, a better measurement should be developed to fully capture the exact extent of REM to make it more realistic. It would also be advantageous for the opinion and conclusions of research in this study to be tested in a more diverse background. At the same time, female participation on boards of management on REM in different contexts should be tested in more depth since this study failed to find the relationship between directors and -independent directors on REM during the bear or bull period.

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ENDNOTES

[1] The ST-firm means that they have experienced loss for two continuous years, in April 1998, the Shanghai and Shenzhen stock exchanges provided special treatment for stock transactions of listed companies with abnormal financial status or other conditions. Thus, the data in ST firms are not suitable for this study due to its speciality.

[2] The financial industry, especially the banking industry, is different from other industries. For instance, most of the revenues from banking are from off-balance sheet (transactions?). It is unreasonable and unconvincing to use data only from financial statements to analyse the listed firm within the financial industry. In this study, because all analyses are based on firms' financial statements data, thus the data of the financial industry should be excluded.

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APPENDIX

TABLE A1 Sample distribution by year and industry during bullish period

Bullish period										
		Year								
Industry	Code	2000	2005	2006	2007	2010	2012	2015	2017	Total
Agricultural	1	13	27	28	29	32	42	41	40	252
Mining	2	9	19	20	22	32	39	43	39	223
Manufacturing	3	462	712	703	715	912	1,344	1,402	1,502	7,752
Energy	4	20	41	42	47	56	57	54	30	347
Construction	5	11	21	23	25	36	46	48	42	252
Wholesales and retails	6	74	87	85	84	85	101	98	90	704
Transportation	7	17	32	30	39	54	66	69	31	338
Accommodation and restaurant	8	6	6	5	6	6	7	7	8	51
Information technology	9	25	36	32	37	58	116	136	151	591
Real estate	11	44	52	48	44	60	53	47	25	373
Business services	12	7	11	13	13	14	20	22	17	117
Special technical services	13	0	0	0	0	4	9	17	20	50
Environmental management	14	6	11	9	7	12	12	15	15	87
Electronic products	15	3	4	3	2	6	7	12	7	44
Journalism and publishing	18	4	4	4	4	6	11	14	17	64
Comprehensive	19	54	53	52	49	54	50	42	17	371
Total		755	1,116	1,097	1,123	1,427	1,980	2,067	2,051	11,616

TABLE A2 Sample distribution by year and industry during the bearish period

Bearish period											
		Year									
Industry	Code	2001	2002	2003	2004	2008	2009	2011	2013	2014	2016	Total
Agricultural	1	18	20	21	22	29	28	41	43	42	39	303
Mining	2	12	15	15	18	29	30	36	44	43	37	279
Manufacturing	3	552	598	638	674	827	858	1,163	1,426	1,370	1,418	9,524
Energy	4	23	28	34	37	53	56	59	58	58	31	437
Construction	5	12	13	15	19	32	33	39	50	49	37	299
Wholesales and retails	6	82	85	89	90	87	92	94	104	99	84	906
Transportation	7	20	23	26	31	53	52	60	73	70	32	440
Accommodation and restaurant	8	7	7	6	6	9	8	7	9	7	7	73
Information technology	9	26	29	32	38	42	48	90	134	129	134	702
Real estate	11	48	53	53	53	55	61	65	54	52	27	521
Business services	12	9	10	11	12	15	15	18	19	20	17	146
Special technical services	13	0	0	0	0	3	3	7	11	10	16	50
Environmental management	14	7	9	10	10	10	11	11	13	13	14	108
Electronic products	15	4	4	4	4	5	7	7	13	14	8	70
Journalism and publishing	18	4	4	3	3	5	5	11	15	14	14	78
Comprehensive	19	60	57	57	56	54	49	49	50	46	22	500
Total		884	955	1,014	1,073	1,308	1,356	1,757	2,116	2,036	1,937	14,436