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Is there any association between real earnings management and crash risk of stock price during uncertainty? An evidence from family-owned firms in an emerging economy

Huma Fatima^{1,2*}, Abdul Haque³ and Muhammad Usman⁴

Abstract

This research work intends to analyze the association between real earnings manipulation and stock price crash. Further, we also analyze the spillover outcome of the crash as a result of applying real earnings management. It is hypothesized that there is a positive and statistically significant association between real activities manipulation and crash risk. It is also assumed that this spillover outcome is more noticeable during uncertainty. By applying data of family firms for the time period 2005–2018, empirical results provide the proof that real manipulation has a significant impact on stock crash for a developing economy like Pakistan among family-based companies. This research work also gives a statistical insight that spillover outcome is more notable for firms facing uncertainty. Our statistical estimations are in support of the assumed hypotheses of the study. This study has very significant and practical implications for academic researchers, standard setters, and investors.

Keywords: Spillover, Earnings management (REM), Stock price crash, Uncertainty, Family-owned business

Introduction

Earlier studies of accounting have reported the use of management's own judgment in order to reduce the alteration while realizing the income of company [7]. These changes in earnings are done by using AEM and through using real earnings management REM.

REM happens when management purposely takes different choices identified with activities that can have positive cash flow results with the goal of moving accounted benefits. For delineation, an organization may introduce a decrease in costs and can introduce progressively reasonable credits condition to the customers to expand the sales

temporarily. Also, the management may limit the opportunity looking behavior in order to minimize the operating costs to inspect diminishing outlays referenced in a profit and loss statement [17]. However, most of the earlier academic work is mainly focused on AEM while REM got less attention from academic researchers irrespective of the fact that REM is more prevalent in practice as compared to AEM. According to a survey conducted by Graham et al. [22] it shows that chief financial officers disclose that 78% of managers apply REM practices in order to smooth their earnings. Irrespective of the fact that REM is likely to damage the worth of shareholders, less evidence in literature is available related to manipulation due to REM. To bridge this void in the literature, this research work tries to analyze the association between REM and crash risk of prices of shares. This research work also studies the spillover outcome of crashes in stock prices of group-owned business who are

*Correspondence: huma.fatima@yahoo.com

¹ Department of Management Sciences, COMSATS University Islamabad, Lahore Campus, Lahore, Pakistan
Full list of author information is available at the end of the article

also suspect to REM. Moreover, this work also studies the spillover outcome of family owned having uncertainty.

Jin and Myers [35] state that REM may overstate earnings which in turn may show negative earnings outcomes and REM supports and smoothes the hoarding of bad news. Another study by Acharya and Lambrecht [2] reveals that REM can be used to manage the presupposition of investors. Using REM methods for manipulation may also facilitate to conceal nonprofitable projects for longer years which results in a higher probability of SPC [21]. REM may also influence that stock price crash either via the circulation of information from the company to market place or it can effect through the actual decision taken by managers. Based on the fact that REM may have an influence on the movement of company-related information or real transactions, it is assumed that REM has a positive and significant association with the risk of a stock price crash.

This research work also analyzes spillover outcomes of the crash of stock prices within family-owned firms as a result of REM and also spillover consequences among family-owned firms having uncertainty. Moreover, family-owned firms are defined as firms whose controlling shares are in possession of a single group or a family. Several studies An et al. (2015), Francis et al. [21], and Kim and Zhang [40] revealed the reasons of stock price crashes, but despite the economic significance of business owned by a single-family in developing economies, very less academic work is available about spillover outcomes of stock price among family-owned firms.

This research-based study aims to study the association between SPC due to the application of REM practices and further to analyze the spillover outcome of crash among family-owned firms. Moreover, spillover outcomes among family firms facing uncertainty are also analyzed.

This research work is motivated due to underlying considerations: According to a study by [1] EM practices are more frequently applied in countries having slow growth rates, feeble judiciary, and underdeveloped equity markets. There is an abundance of literature which discloses that earnings management practices can be overcome by applying adequate corporate governance practices in Pakistan [45]. But according to Griffin [23, 9] and Ahmad [3] corporate governance can only be effective to control EM practices when a country has a strong legal framework and companies have a system that has ownership separate from management. So, due to these facts, this research work is trying to REM practices in Pakistan and its association with stock price crashes for family-owned firms from the time period 2005–2018. Secondly, Haque et al. [24] disclose a higher level of uncertainty in developing economy Pakistan. So, this study also analyzes the association between REM and SPC during uncertainty. Thirdly, businesses owned by families are a critical and innate component of the developing economy of Pakistan.

A research work by Zaidi et al. [55] discloses that eighty percent of companies registered on PSX are directly or indirectly family-owned businesses. An ample of research literature is available related to family-owned business highlighting various aspects of family-owned firms, for instance, the structure of ownership or financial distress among family-owned firms [52], EM and concentration of ownership among family firms [8], financial outcome and tunneling of a group-owned businesses [4, 31]. However, Spillover outcome among family-owned firms due to REM is not yet explored in academic literature and also in practical research. This research work attempts to cover this void in the literature as all above listed factors guide us to the real significance of analyzing REM with SPC and spillover outcome among firms owned by same family having uncertainty. To explore our assumptions, we employ Roychowdhury [51] model to study REM, which is based on three methods. First method is based on accumulation of selling, R&D cost and marketing cost. Second method is based on expense of goods sold (COGS) and alteration in inventory. Third method uses OCF to find REM practices. SPC is estimated by applying three approaches (i) COUNT (ii) NSKEW (iii) DUVOL. Uncertainty is taken as standard deviation of returns (weekly). Empirical estimations are in support of our hypotheses by disclosing a positive and statistically significant association between REM and SPC. Also, best of apprehension of authors, this one is going to be pioneer research work, to explore the association REM and SPC and spillover outcome during uncertainty or family-owned firms in developing economy Pakistan.

This research work is organized into the following sections: the first section is for introduction, second is for literature and formation of hypotheses, third is for data and methodology, fourth is for empirical findings, discussion of statistical output and robustness check of main results and last section is for a conclusion.

Review of previous studies

Earnings management is one of the paramount and overriding decisions taken by management. According to Cornett et al. [16], EM is a censorious adjustment for the purpose to disclose better financial earnings. Previous studies identified two domains of EM; one is accrual and the second is real manipulations of earnings. In the former category; managers apply their own opinion at the time of reporting accruals in order to sketch the financial position of their company in either direction, up or downturn without infracting the rules of financial disclosures, whereas, for real manipulation practices, income is organized by arranging the timings or the base of transactions, for example, shrinking the marketing expenses for a certain time period or an increase in discounts for a certain period [20].

In theory, according to Jin and Meyers (2006) stock crash occurs mostly when management holds bad news for a

prolonged period and hence, bad news piled up for a specific period. Other studies by Joe and Oh [36] and Kothari et al. (2009) state that if management holds the flow of bad information, then outcomes will be asymmetric. But, eventually, when this bad information gains a maximum point of a threshold, this information will trigger toward the market and its output will be crash in stock price.

Corporate crimes in the 2000s and global financial downfall in 2007–2008 grabbed the concentration of academic researchers, stakeholders, and investors. The prevalence of asymmetry, the flawed system for auditing, and the presence of accruals give permission to managers to manipulate income in order to have personal advantages [28]. This process of tampering of income is named as EM. According to Healy and Wahlen [17, 26] EM happens when managers use judgment in money related announcing and in organizing exchanges to adjust monetary reports to either delude a few partners about the hidden financial presentation of the organization or to impact legally binding results that rely upon detailed bookkeeping numbers. An extra definition by Comiskey and Mulford (2002) states that income of the board is the "dynamic control of income toward a foreordained objective, which might be set by the board, a conjecture made by investigators, or a sum that is predictable with a smoother, progressively reasonable profit stream". While these definitions vary, they have some shared characteristics: they center around the mediation in the budgetary detailing procedure to accomplish some private addition, which is verifiable of shrewd practices. Literature divides EM into two categories AEM and REM.

There are two ways through which REM may have an impact on SPC. It can be through movement of information towards the market or it can also be due to real activities of management. As the first method is concerned for the movement of information, it facilitates the managers to keep the bad news hidden for a certain time period which results in an overstatement of income for a short duration and results in higher prices of shares, but after some time it will not be possible for management to hold this news and it will dribble towards the market and its outcome will be SPC.

REM practices may have an impact on SPC either due to its impact on the movement of information from the firm to market or it might have an impact on SPC through real actions and decisions of management. By using informational role management might keep bad news hidden for a specific period, which may cause to increase in the prices of shares. But, ultimately, the firm will disclose this bad news to the market, as it will be difficult for managers to hold this news for more time. As soon as a firm will disclose this news, it will result in SPC [35]. While on the other side, managers can also use real activities to hold unfavorable or bad news [34], while, taking into consideration the above-stated literature, given below hypotheses is framed.

H₁: REM has a positive impact on and SPC (stock price crash) risk.

Several studies provide evidence about spillover outcomes [37, 27], but till now spillover outcomes of SPC not yet gained considerable attention from academic researchers. Family-owned businesses share both financial and nonfinancial resources like human capital [6, 53, 14]. According to law, family-owned businesses are separate legal entities from their owners' personal wealth but despite the fact, these companies shared and linked with each other in several ways, for instance, internal capital sourcing, common investment ventures, purchasing, and selling transactions. These common factors result in the valuation of stock prices in the same way or direction. So, when any firm holds bad news for a specific time, and then later it is disclosed to market it will affect the share price of all other businesses owned by the same group. La Porta et al. [50]. Summing up, it is concluded that the owner's family has the power and ability to hold bad outcomes from the market and all other stakeholders. But, when this outcome reaches or attains a threshold level, it will break out and will effect to share price of all other companies owned by the same group. By keeping all above-stated studies together, following hypotheses results in as given below:

H₂: SPC of a suspect company may spillover to any other business sharing the same ownership.

At the next level, spillover outcome for a suspect firm facing uncertainty is analyzed as due to more agency cost, SPC is higher for firms having uncertainty [38, 39]. According to Demsetz and Lehn [19], during uncertainty, it is very easy for management to practice REM and hence, there are more chances of SPC. Till now, only one study by Haque et al. [24] is about REM and uncertainty in Pakistan and this study discloses the positive effect of uncertainty on EM. But so far, the relationship between REM and SPC is still unexplored during uncertainty. So, based on the above arguments, the following hypotheses are framed:

H₃: Spillover outcome is more noticeable for suspect family-owned business while facing micro-level uncertainty.

Methods

For statistical analysis of this study, nonfinancial firms from the period 2005–2018 are selected. The only nonfinancial sector is selected as the financial sector has a different regulatory environment and works under different rules and regulations [54]. At the first stage, only those family-owned firms are included which are registered on PSX throughout the period of study and have data of all dependent and independent variables of the study. At next, by applying the method of Roychowdhury [51], suspect companies are filtered. After that,

by following Nazir and Afza [47] Z score is applied to remove outliers in the data set. At the last level, suspect firms are further divided into firms having a higher level of uncertainty, and a lower level of uncertainty detail is discussed in Sect. 3.3. All data for statistical analysis are collected from electronic resources, e.g., PSX, business recorder, and from the data portal of the Central bank of Pakistan.

In a total of 380 registered companies (only nonfinancial), 177 are owned by families. According to Anderson and Reeb [5] a firm will be a family business if it falls in any of the following categories: (i) A family owns maximum shares, (ii) family have twenty-five percent rights for voting, and (iii) family holds a supervisory position or is in BOD of a firm. All data about ownership of family-owned companies are taken from respective company web resources or are manually collected.

Sample distribution

Sr. No	Sectors	Listed firms	Initial sample	%	Final sample	%
1	Automobile Assembler	22	17	92	17	77
2	Cable and Electrical Goods	8	4	50	4	50
3	Cement	22	15	68	14	64
4	Chemicals and Fertilizers	36	27	75	24	67
6	Food and Personal Care Products	21	14	64	14	64
7	Glass and Ceramics	10	5	50	5	50
9	Paper and Board	9	5	56	4	44
10	Pharmaceutical	10	6	60	6	60
11	Power Generation and Distribution	19	6	32	6	32
12	Sugar and Allied Industries	35	23	66	23	60
13	Technology and Telecommunication	10	6	60	6	60
14	Textile	152	49	31	46	31
	Total	389	177	56	169	53

Proxy for SPC

Earlier studies identified 3 approaches that can be used as a proxy for SPC (15; An and Zhang 2013) [12]. To calculate these proxies returns (weekly) are used as weekly data of returns to facilitate more accurate estimations. The market-based model is used for the calculation of price crashes. Below is the market model is given

$$r_{j,t} = \alpha_j + \beta_{1,j}r_{m,(t-1)} + \beta_{2,j}r_{m,t} + \beta_{3,j}r_{m,(t+1)} + \beta_{5,j}r_{i,(t-1)} + \beta_{6,j}r_{i,t} + \beta_{7,j}r_{i,(t+1)} + \epsilon_t \quad (1)$$

where $r_{j,t}$ for stock return j during weekly time t ; r_m for weekly market return; r_i for weekly industry returns. The crash week is during which returns (weekly) are greater of the given standard deviation that is 3.09. When standard deviation is greater than 3.09, then this week is declared as jump week and it facilitates in the calculation of SPC proxies. COUNT is the first proxy for SPC and is measured as a difference of SD lesser than a mean value of 3.09 and greater than a mean value of 3.09.

The second proxy for SPC is NSKEW which is estimated as given below:

$$NSKEW_j, i = -[n(n-1)^{3/2} \sum_j j, t] / [(n-1)(n-2) \{ \sum_j j, t \}^{3/2}] \quad (2)$$

N for total observations. Higher the value of NSKEW higher will be the chances that the value of the stock will crash. Third and last proxy for SPC is down, up volatility and it is measured as follow:

$$DUVOL_j, i = \log \left\{ (n_u - 1) \sum_{Down}^{W 2_j} t / (n_d - 1) \sum_{Up}^{W 2_j} t \right\} \quad (3)$$

where n_u for up weeks; n_d for down weeks. All the above-given measures are widely used in the literature to estimate SPC [14].

Proxy for REM

Roychowdhury [51] suggested the following three methods for estimations of REM practices: Overproduction (RProd), sales-related manipulation (ROPCF), and manipulation related to discretionary cost (RDISX). All three methods are used for the purpose of estimating REM. The first method is the summation of general and sales-related costs and R&D costs. By following the study of [29] R&D cost is equal to zero if data are not obtainable about this variable. The discussion about each proxy is as below:

$$RDISX_{it}/A_{it-1} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(S_{it-1}/A_{t-1}) + \varepsilon_{it} \quad (4)$$

where $RDISC_{it} = R\&DE_{it} + S\&AE_{it} + ADVE_{it}$, $R\&DE_{it}$ = Research & Development cost for any company during time t , $S\&AE_{it}$ = Sales related cost for any company i during period t , $ADVE_{it}$ = Advertisement related cost for any company i during period t , S_{it-1} = Sales revenue for any company i at the time $(t-1)$, and A_{t-1} = total resources (assets) for any company i during the period $(t-1)$

To attain uniformity for residuals, they are multiplied by -1 and negative output indicates the use of RDISX practices by firm.

Overproduction (OvProd) is the second proxy for REM. Per unit fixed expense used to decrease as a result of a higher level of production and lower per-unit expense will result in higher income from operations for the current time period. When REM uses OvProd practices, then it results in a higher level of storage cost in order to carry overproduced items and it results in more cash flow from operations as compared to revenue from sales. The normal level of production is estimated as given below

$$\begin{aligned} \frac{RProd_{i,t}}{A_{i,t-1}} = & \beta_0 + \beta_1 \left(\frac{1}{A_{i,t-1}} \right) + \beta_2 \left(\frac{sales_{i,t}}{A_{i,t-1}} \right) \\ & + \beta_3 \left(\frac{\Delta sales_{i,t}}{A_{i,t-1}} \right) + \beta_4 \left(\frac{\Delta S_{i,t-1}}{A_{i,t-1}} \right) + \varepsilon_{i,t} \end{aligned} \quad (5)$$

where $RProd_{i,t} = COGS_{i,t} + \Delta Inventories_{i,t}$, $COGS_{i,t}$ = goods sold cost for any company i during period t , $\Delta Inventories_{i,t}$ = change in the stock of inventory ($Inventories_{i,t} - Inventories_{i,t-1}$) for any company i during period t , $S_{i,t}$ = revenue from Sales for a firm i during time t , $S_{i,t-1}$ = Sales for firm i during time $t-1$, $\Delta S_{i,t}$ = variation in sales ($S_{i,t} - S_{i,t-1}$) for any firm i at period t , $\Delta sales_{i,t-1}$ = change in sales ($S_{i,t-1} - S_{i,t-2}$) for firm i at time $t-1$, $A_{i,t-1}$ = firm's Assets during time $t-1$ for any firm i .

Third and last proxy to observe REM practices is the OCF method. By applying this method, managers can show an increase in their revenues artificially. It can be done either by offering frequent discounts or offering lenient terms for credit sales. Dechow et al. [18] proposed the following method to estimate normal OCF. Later, several academic researchers are applying this method [51, 15, 10]

$$\begin{aligned} \frac{ROPCF_{it}}{A_{it-1}} = & \beta_0 + \beta_1 \left(\frac{1}{A_{it-1}} \right) + \beta_2 \left(\frac{sales_{it}}{A_{it-1}} \right) \\ & + \beta_3 \left(\frac{\Delta sales_{it}}{A_{it-1}} \right) + \varepsilon_{it} \end{aligned} \quad (6)$$

where $ROPCF_{it}$ = cash flow due to operations of any firm i during period t .

Lastly, suspect companies are shortlisted based on the method suggested by Roychowdhury [51]. Suspect firms are those who are engaged in REM and it is short-listed who have revenue before extraordinary items higher than 0 and lower than 0.005.

Uncertainty proxy

To capture the level of uncertainty for any firm [38] method is applied. According to which SDR is used as a yardstick to estimate uncertainty for a specific firm. If the value of the firm median is more than the median of sample, then that specific firm has a higher level of uncertainty, and if the value of the firm median is lower than the median of sample, then that specific firm has lower uncertainty.

Econometric analysis

Firstly, below given regression model is employed to estimate a comprehensive association between REM and SPC.

$$\begin{aligned} COUNT_{i,t} = & \beta_0 + \beta_1 REM_{i,t} + \beta_2 \sum Control_{i,t} \\ & + Industry_FE + Year_FE + \varepsilon_{i,t} \end{aligned} \quad (7)$$

$$\begin{aligned} NSKEW_{i,t} = & \beta_0 + \beta_1 REM_{i,t} + \beta_2 \sum Control_{i,t} \\ & + Industry_FE + Year_FE + \varepsilon_{i,t} \end{aligned} \quad (8)$$

$$\begin{aligned} DUVOL_{i,t} = & \beta_0 + \beta_1 REM_{i,t} + \beta_2 \sum Control_{i,t} \\ & + Industry_FE + Year_FE + \varepsilon_{i,t} \end{aligned} \quad (9)$$

where $NT_{i,t}$, $NSKEW_{i,t}$, $DUVOL_{i,t}$ are the SPC for any company i at duration t , $REM_{i,t}$ for real earnings management and $Control_{i,t}$ is a set of control variables as highlighted by earlier studies. We expect the β_1 to be positive and significant as our first hypothesis states a positive effect of REM on SPC. Next, given below equations are used to evaluate the spillover outcome of SPC due to REM of other firms belongs to the same family.

$$\begin{aligned} COUNT_{i,t} = & \beta_0 + \beta_1 (COUNT_{i,t} - i) + \beta_2 Control_{i,t} \\ & + Industry_FE + Year_FE + \varepsilon_{i,t} \end{aligned} \quad (10)$$

$$\begin{aligned} NSKEW_{i,t} = & \beta_0 + \beta_1 (NSKEW_{i,t} - i) + \beta_2 Control_{i,t} \\ & + Industry_FE + Year_FE + \varepsilon_{i,t} \end{aligned} \quad (11)$$

$$\begin{aligned} DUVOL_{i,t} = & \beta_0 + \beta_1 (DUVOL_{i,t} - i) + \beta_2 Control_{i,t} \\ & + Industry_FE + Year_FE + \varepsilon_{i,t} \end{aligned} \quad (12)$$

where $COUNT_{i,t} - iNSKEW_{i,t} - i$, $DUVOL_{i,t} - i$ mean of crash price risk of family firms except for the firm i . $COUNT_{i,t}, NSKEW_{i,t}, DUVOL_{i,t}$ is a stock price crash for a specific firm i at time t . Lastly, to analyze the third hypothesis, model (10) to model (12) are estimated again after dividing the samples into categories of higher and lower uncertainty.

Control variables

Earlier academic researches highlighted various instruments that may have an impact on SPC (Wang and Zhang 2016; 42). A few of the control instruments also incorporated in this work which have a possible effect on the regression model. These instruments are discussed below: return volatility ($SIGMA$); previous returns (RET) as [14] proposed that previous returns may also be an indicator for future SPC. Other variables include *Size*; financial leverage (LEV); Return on Assets (ROA); (MktTB) for the market to book ratio. Opacity is controlled by using ($AbDAcc$) discretionary accruals, and it is measured by applying modified Jones (1995) model [32]. Spread for an annual average of daily spread scaled as the midpoint of the bid and ask price.

Results and discussion

Table 1 shows the descriptive analysis of the variables used for the sample of 2366 number of observations from 2005 to 2018. The min, mean, median, max, and *SD* (standard deviation) values are reported. Following Roychowdhury [51], this study applied three measures as a proxy for real earnings management. $RDISX$ is for discretionary expenses at a normal level. The mean value for real earnings management practices through discretionary expenses is -0.782 and the standard deviation is 0.380 while for $RCFO$ mean is 0.691 and the standard deviation is 4.36, for $RPROD$ mean value is 1.489 and the standard deviation is 1.702 which shows real earnings management practices for sample companies registered on Pakistan Stock Exchange for period 2005–2018. The usage of LEV is quite high for selected sample firms having a mean value of 0.465 and with a standard deviation of 0.236. ROA with mean value 0.06 and standard deviation 0.09 indicates that the selected sample size is quite profitable during the period of study, i.e., 2005–2018. Accounting conservatism (C_score) is measured by Khan and Watts [38]

model, and it has a maximum value of 7.63 and a minimum value of -7.60 with a standard deviation of 1.73. The mean value is greater than unity which shows that the explanatory power of bad news is greater than the good news [11, 46].

Table 2 reports the estimated results for H_1 , which states that REM has a statistically significant and positive association with SPC. From columns numbered as (1) to (3) $COUNT$ is used as a predicted variable, from $col(4)$ to $col(6)$, $NSKEW$ is a regressand variable for SPC and from $col(7)$ to $col(9)$ $DUVOL$ is applied for SPC, while REM is estimated by [51] approach and three measures $RDIS$, $RProd$, and $RCFO$ are applied.

Empirical output depicts the statistically significant and positive association between REM and SPC for all proxies of REM and SPC reporting that higher the practice of REM, greater will be chances for the crash of stock prices as evident by literature [21, 39, 43, 30]. Empirical estimations for control instruments are also supported by earlier studies. For instance, C_score is statistically significant and has a negative effect on SPC by supporting the rationale that more conservative firms have lower chances of SPC [40]. Moreover, $AbDAcc$ is statistically positive indicating that more accrual management a company used to do, more will be the risk of SPC [21].

Table 1 Descriptives

Variables	Min	Mean	Median	Max	SD
ROPCF _{it}	-0.825	0.951	-0.365	21.22	2.355
RProd _{it}	0.235	1.91	0.222	12.12	3.412
RDISX _{it}	0.321	0.123	0.973	5.23	0.125
COUNT _{it}	-3.053	2.68	1	7.65	2.66
DUVOL _{it}	-0.29	-0.36	0	-0.53	3.98
NSKEW _{it}	-3.110	0.0455	-0.132	3.055	0.479
COUNT _{it} - i	-2	-0.129	0	2	0.340
DUVOL _{it} - i	-1.294	-0.185	-0.163	0.741	0.360
NSKEW _{it} - i	-0.650	-0.137	-0.141	0.344	0.186
Size _{it}	1.701	2.44	2.625	3.008	0.420
LEV _{it}	4.605	0.465	1.189	12.49	2.36
MktTB _{it}	1.609	11.632	13.053	20.05	4.045
C_Score _{it}	-7.60	-1.28	-0.52	7.63	1.73
Spread _{it}	-2.30	3.001	2.830	8.979	1.485
ROA _{it}	21.43	0.06	2.89	74.4	0.09
PVolatility _{it}	3.60	2.68	7.35	1.46	2.36
Returns _{it}	-0.68	12.78	13.66	23.78	4.36
AbDAcc _{it}	.098	1.19	3.56	12.38	2.83
SIGMA _{it}	0.124	0.164	0.128	0.131	0.136

All-inclusive, empirical estimations are in support of the first hypotheses of study by proving that higher REM practices result in more risk of SPC.

In Table 3 hypotheses, 2 empirical estimations are reported. Hypothesis 2 is about the spillover outcome of SPC among family businesses in Pakistan. SPC is measured by *COUNT*, *NSKEW*, and *DUVOL*. In *col(1)*, *COUNT* – *i* is an explanatory variable and it is obtained by taking a mean of the variable count after eliminating the specific firms whose share price has crashed. Similarly, *NSKEW* – *i* and *DUVOL* – *i* are calculated. The coefficient of empirical estimations is significantly positive among all the measures of spillover outcome of stock price crash indicating and disclosing that SPC spillover to all other firms belongs to the same group which is in line with our second hypotheses. Our findings are also supported by the study of Kwon et al. [44].

In *col(2)* and *col(3)*, we reanalyzed H_2 with other proxies of SPC, i.e., *NSKEW* – *i* and *DUVOL* – *i*. Results are the same as with the other proxies of the crash indicating that SPC of a company is influenced by the crash of a specific firm. Control variables *Size*, *LEV*, *MktBTA*, *ROA*, *AbDAcc* also have significant results as predicted. *LEV* has a negative and significant impact showing that higher the leverage higher the chances of the spillover effect of the stock price crash. Moreover, *ROA* has a positive and significant impact revealing that a more profitable firm is, lesser is the chance of the crash risk [21, 48, 49]. Overall, the statistical results in Table 3 reinforce H_2 . The estimations indicate that the SPC of any firm within a group is highly tie in with each other, depicting that firms in a group having the same ownership are systematized for hiding bad information for group-level projects.

Empirical estimations for H_3 are reported in Table 4 which analyzes the spillover outcome of SPC during uncertainty. For the purpose of analysis of H_3 suspect, companies within a group are divided into two categories having higher uncertainty and lower uncertainty. SPC is measured by *COUNT*, *NSKEW*, and *DUVOL*. In *col(1)*, *COUNT* – *i* is an explanatory variable and it is obtained by taking the mean of the variable count after eliminating the specific firms whose share price has crashed. Similarly, *NSKEW* – *i* and *DUVOL* – *i* are calculated. Empirical estimations reports that SPC is more noticeable for the firm also facing uncertainty. Column (2) and column (3) describe the statistical output with other proxies of

SPC. These results support our earlier estimation output. *AbDAcc* has a statistically significant and positive coefficient indicating higher discretionary accruals cause a higher ratio for SPC [21]. All other control indicators also have statistical outputs as predicted and also supported by the results of hypothesis 1 and hypothesis 2. Overall, the empirical output in Table 4 reinforces hypothesis 3. The statistical output stipulates that the SPC of firms belonging to a group is highly centralized and this end result is more distinct during uncertainty.

Robustness check

By applying the alternative measure of SPC Risk

Earlier studies adapted different measures for SPC. In this study, to check robustness, another measure of SPC is employed [33]; Kim et al. 2011a). SPC is used as an indicator variable having a value of 1 if at least one-time weekly return is lesser than 3.09 (SD of the mean of returns) otherwise it is 0. Tables 5 and 6 report the results for hypothesis 1 and hypothesis 2. The empirical outcomes support the previously reported results by endorsing that REM results in SPC for the family business and also confirms that this crash spills out to other businesses of the same family. Hence, the results of the main investigation are robust to different definitions which are mostly used in previous studies.

Conclusion

Graham et al. [22] surveyed in 2005 and reported that almost 78% of CFO are engaged in the practice of REM. Acharya and Lambrecht [2] state that management uses REM for the purpose to divert and mislead investors. As discussed in the literature review section REM has the potential to harm the worth of a firm but still, earlier work not yet studied implications of REM for SPC. So, this research work is an effort to analyze this unexplored area in the field of accounting. To explore this area, three hypotheses are formulated. The first hypotheses analyze the association between REM and SPC for family business registered on PSX. The second hypothesis explores the spillover out-turn of SPC within suspect firms. The third hypothesis investigates the second hypothesis under the condition of micro-level uncertainty for firms engaged in REM. To pursue all three hypotheses regression analyses are employed for 177 family businesses in Pakistan for the time period 2005–2018. Our

Table 2 REM and SPC

Variables	SPC	Predicted sign			COUNT			NSKEW			DUVOL		
		col (1)	col (2)	col (3)	col (4)	col (5)	col (6)	col (7)	col (8)	col (9)			
RD/S_{it}	+	0.610* (0.437)			0.0549*** (0.0376)			0.0205*** (0.1210)					
$RPROD_{it}$	+		0.0639*** (0.1077)			0.319*** (0.0575)			0.0085*** (0.0096)				
$RCFO_{it}$	+			0.102*** (0.1821)			0.860*** (0.1746)				0.0043*** (0.4105)		
$Size_{it}$	+	3.8742*** (5.231)	3.812*** (0.933)	3.442*** (0.521)	1.805*** (1.0785)	0.580*** (0.586)	0.405*** (0.885)	0.5981*** (0.3069)	0.681*** (0.869)	0.983*** (0.345)			
LEV_{it}	-	-0.1520*** (0.3758)	-0.203*** (0.3758)	-0.718*** (0.778)	-0.1128*** (0.0777)	-0.312*** (0.576)	-0.828*** (0.787)	-0.477*** (0.0222)	-0.567*** (0.034)	-0.467*** (0.052)			
$MktTB_{it}$	+	0.1572*** (0.5179)	0.523*** (0.919)	0.517*** (0.789)	0.2074*** (0.1034)	0.204*** (0.735)	0.289*** (0.673)	0.0563*** (0.3041)	0.756*** (0.541)	0.0653*** (0.345)			
C_Score_{it}	-	-0.0215*** (0.1897)	0.415*** (0.897)	0.525*** (0.634)	0.0850*** (0.0381)	0.986*** (0.681)	0.058*** (0.076)	0.0312*** (0.0407)	0.781*** (0.577)	0.674*** (0.347)			
ROA_{it}	-	0.0280*** (0.0227)	0.0801*** (0.322)	0.0281*** (0.074)	0.0005*** (0.0046)	0.565*** (0.066)	0.675*** (0.057)	-0.003*** (0.0049)	-0.037*** (0.056)	-0.023*** (0.567)			
$PVolatility_{it}$		-0.1744*** (0.2367)	-0.544*** (0.237)	-0.143*** (0.215)	0.0582*** (0.0444)	0.0243*** (0.0674)	0.782*** (0.894)	0.0055*** (0.0182)	0.065*** (0.821)	0.674*** (0.562)			
$Returns_{it}$	+	0.340*** (0.967)	0.356*** (0.457)	0.330*** (0.596)	0.0085*** (0.0169)	0.785*** (0.709)	0.0895*** (0.069)	0.1257*** (0.0510)	0.175*** (0.561)	0.146*** (0.450)			
$AbDacc_{it}$	+	0.1231*** (0.1704)	0.101*** (0.173)	0.137*** (0.874)	0.0444*** (0.0349)	0.064*** (0.879)	0.0478*** (0.075)	0.0089*** (0.0363)	0.067*** (0.672)	0.049*** (0.876)			
$SIGMA_{i,t}$		0.0251 (0.0697)	0.000 (0.0509)	0.093 (0.0291)	0.007 (0.054)	(0.838) (0.911)	0.004 (0.003)	0.088 (0.029)	0.087 (0.031)	0.002 (0.004)			
F Value		12.80***	13.94***	13.28***	15.15***	10.84***	11.80***	12.85***	10.34***	11.10***			
Adjusted R^2		0.1911	0.1315	0.1067	0.1455	0.1522	0.2998	0.2334	0.1377	0.3467			
RMSE		0.3112	0.2333	0.1035	0.1033	0.1034	0.1023	0.1014	0.1015	0.1023			

***significance for 0.01, **significance for 0.05, *significance for 0.1. parentheses show standard errors

Table 3 Spillover outcome of SPC

Independent variables	SPC	SPC		
		col (1)	col (2)	col (3)
Variables	Predicted sign	<i>COUNT</i>	<i>NSKEW</i>	<i>DUVOL</i>
$COUNT_{it} - i$	+	0.346*** (0.741)		
$NSKEW_{it} - i$	+		0.925*** (0.920)	
$DUVOL_{it} - i$	+			0.090*** (0.095)
$Size_{it}$	+	0.698*** (3.287)	0.532** (0.516)	0.142** (0.377)
LEV_{it}	−	−0.209* (0.667)	−0.682** (0.892)	−0.298* (0.221)
$MktTB_{it}$	+	0.246** (0.885)	0.989*** (0.988)	0.539*** (0.317)
$Spread_{it}$	+	−0.954 (0.480)	0.869 (0.378)	0.449 (0.216)
ROA_{it}	−	0.046** (0.833)	0.406*** (0.466)	0.009** (0.014)
$PVolatility_{it}$	+	−0.965** (0.149)	0.317* (0.567)	0.183** (0.182)
$Returns_{it}$	+	−0.670 (0.303)	0.401** (0.737)	0.260** (0.233)
$AbDAcc_{it}$	+	0.116** (0.368)	0.448* (0.350)	0.098** (0.112)
$SIGMA_{it}$		0.931 (0.129)	0.376* (0.024)	0.064** (0.543)
F Value		14.58***	16.24***	14.18***
Adjusted R^2		0.1056	0.1205	0.1027
RMSE		0.1098	0.1453	0.1232

***significance for 0.01, **significance for 0.05, *significance for 0.1. parentheses show standard errors

output of empirical estimations is supported by earlier work [12, 39] reports the statistically significant association between REM and SPC which spill out to other business operated by the same family and this association is stronger during uncertainty [38]. This study is an attempt to enhance the literature of accounting specifically related to REM and also to contribute to the literature of SPC during uncertainty. Although this study is a comprehensive attempt about the topic, but still it has few limitations which can be considered for future research directions. Future research can also incorporate economic uncertainty and can also study pecking order theory to analyze the association between two categories of EM, i.e., accrual and real EM. A single country study is a hindrance for generalizability. Incorporating more countries for the sake of statistical analysis can facilitate to overcome this limitation.

Appendix

Measurement of variables

	Description
Variable	
Real earnings Management	Measured by following. Roychowdhury [51], Cohen et al. (2008), and Cohen and Zarowin (2010) RCFO, RPROD, RDISX
Uncertainty	standard deviation of daily returns

Table 4 Spillover of SPC for suspect firms facing uncertainty

Variables	SPC	SPC						
		Predicted sign	COUNT		NSKEW		DUVOL	
			Higher uncertainty	Lower uncertainty	Higher uncertainty	Lower uncertainty	Higher uncertainty	Lower uncertainty
$COUNT_{it} - i$	+	0.112*** (0.222)	(0.019)* (0.248)					
$NSKEW_{it} - i$	+			0.181** (0.901)	0.121*** (0.143)			
$DUVOL_{it} - i$	+					0.546*** (0.145)	− (0.201) (0.364)	
$Size_{it}$	+	0.5761* (0.205)	0.182 (0.541)	0.844*** (0.006)	0.348** (0.528)	0.141*** (0.553)	0.387** (0.534)	
LEV_{it}	−	− (0.324)* (0.342)	0.233*** (0.231)	− (0.238)** 0.238	0.343* (0.345)	− 0.327 (0.047)	0.233* (0.456)	
$MktTB_{it}$	+	− (0.233) (0.429)	− (0.426)*** (0.341)	− (0.223)** (0.232)	0.236** (0.239)	0.232*** (0.465)	0.210** (0.218)	
$Spread_{it}$	+	(0.232) (0.008)	0.234** (0.531)	(0.239) (0.346)	0.3462** (0.233)	0.233** (0.347)	0.233** (0.338)	
ROA_{it}	−	0.232*** (0.423)	(0.343)** (0.263)	0.037* (0.016)	0.042** (0.342)	0.016** (0.330)	− (0.331)** 0.453	
$PVolatility_{it}$	+	− (0.523) (0.412)	− (0.347)** (0.355)	0.003** (0.030)	0.408*** (0.528)	0.014* (0.010)	0.213 (0.108)	
$Returns_{it}$	+	0.233** (0.037)	0.234** (0.141)	0.452** (0.045)	0.346 (0.313)	0.203*** (0.020)	0.026** (0.231)	
$AbDAcc_{it}$	+	0.455** (0.343)	0.419** (0.238)	0.060** (0.062)	0.173*** (0.168)	0.233 (0.360)	0.233** (0.236)	
$SIGMA_{it}$	+	0.395*** (0.945)	0.347*** (0.43)	0.416** (0.229)	0.249** (0.444)	0.0563** (0.004)	0.012*** (0.529)	
F Value		18.90***	15.94***	23.28***	19.23***	11.98***	12.20***	
Adjusted R^2		0.2011	0.235	0.1267	0.243	0.1925	0.5418	
RMSE		0.3522	0.4123	0.1123	0.3243	0.1334	0.1233	

***significance for 0.01, **significance for 0.05, *significance for 0.1. parentheses show standard errors

Table 5 REM and SPC

Variables	Predicted sign	SPC		
		col (1)	col (2)	col (3)
$RDIS_{it}$	+	0.0311* (0.231)		
$RPROD_{it}$	+		0.521*** (0.961)	
$RCFO_{it}$	+			0.231** (0.975)
$Size_{it}$	+	0.053 (0.069)	0.238 (0.076)	0.138*** (0.021)
LEV_{it}	–	– 0.977*** (0.622)	– 0.465*** (0.414)	– 0.457*** (0.412)
$MktTB_{it}$	+	0.963*** (0.041)	0.036*** (0.241)	0.213*** (0.345)
C_Score_{it}	–	0.982* (0.972)	0.234** (0.181)	0.074*** (0.217)
ROA_{it}	–	– .831*** (0.349)	– 0.347*** (0.346)	– 0.423*** (0.347)
$PVolatility_{it}$		0.255*** (0.382)	0.325*** (0.341)	0.245*** (0.342)
$Returns_{it}$	+	0.457*** (0.510)	0.375*** (0.256)	0.346*** (0.450)
$AbDACC_{it}$	+	0.489*** (0.363)	0.4367*** (0.232)	0.249*** (0.186)
$SIGMA_{it}$		0.288 (0.429)	0.387 (0.453)	0.032 (0.34)
F value		8.85***	13.34***	10.10***
Adjusted R^2		0.334	0.377	0.367
RMSE		0.014	0.015	0.023

Table 6 Spillover outcome of SPC

Variables	Predicted sign	SPC		
		col (1)	col (2)	col (3)
$SPC_{it} - i$	+	0.231 (0.210)		
$Size_{it}$	+	0.581*** (0.369)	0.061*** (0.069)	0.093*** (0.045)
LEV_{it}	–	– 0.077*** (0.022)	– 0.057*** (0.134)	– 0.467*** (0.352)
$MktTB_{it}$	+	0.563*** (0.041)	0.056*** (0.241)	0.653*** (0.145)
C_Score_{it}	–	0.312*** (0.865)	0.231*** (0.377)	0.174*** (0.611)
ROA_{it}	–	– 0.233*** (0.349)	– 0.027*** (0.326)	– 0.231** (0.521)
$PVolatility_{it}$		0.055*** (0.182)	0.265*** (0.121)	0.064*** (0.052)
$Returns_{it}$	+	0.257*** (0.510)	0.075*** (0.061)	0.046*** (0.050)
$AbDACC_{it}$	+	0.089*** (0.363)	0.167*** (0.272)	0.849*** (0.176)
$SIGMA_{it}$		0.881 (0.229)	0.9867 (0.231)	0.211 (0.344)
F value		2.85***	11.34***	14.10***
Adjusted R^2		0.214	0.1577	0.2367
RMSE		0.114	0.015	0.023

	Description
Stock price crash	Measured by COUNT, NSKEW and DVOL
<i>Control variables</i>	
Pvolatility	Average of monthly returns related to a specific firm
SIGMA	Standard deviation of weekly returns related to a specific firm
Size	Calculated as the FIRM's book value of equity
Sales	log of total sales revenue
ABDACC	Measured by modified Jones model (1995)
Spread	Spread is annual average of daily spread scaled as midpoint of bid and ask price
Leverage	Total debt(short term + long term)/total assets
Returns	Mean of weekly returns times 100
C_Score	Accounting conservatism measured by Khan and Watts [38] model

Abbreviations

REM: Real earnings management; AEM: Accrual earnings management; OCF: Operating cash flows; SPC: Stock price crash; R&D: Research and development; PSX: Pakistan stock exchange; BOD: Board of directors; SDR: Standard deviation of daily returns.

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Author details

¹ Department of Management Sciences, COMSATS University Islamabad, Lahore Campus, Lahore, Pakistan. ² University of Education, Lahore, Pakistan. ³ Department of Economics, COMSATS University Islamabad, Lahore Campus, Lahore, Pakistan. ⁴ Department of Management Sciences, COMSATS University Islamabad, Lahore Campus, Lahore, Pakistan.

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