

Short Sellers' Fraud Allegations, Chinese Reverse Mergers, and Simultaneity of Corporate Financial Trilogy

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Abstract

This study investigates the impact of short sellers' fraud allegations on corporate financial trilogy (investment, financing, and dividends) of Chinese Reverse Merger (CRM) firms listed in US. Using short activist dataset for the period of 2009-2015, we identify a sample of 57 firms that were accused of fraud by short sellers. Results indicate that fraud accusations of short sellers have significantly negative effect on the financing, investment, and dividends payouts of the CRMs. Furthermore, the 3SLS results seem to substantiate the claim that due to resulting information asymmetry and market imperfections of fraud discovery, corporate investment, financing, and payout decisions are jointly determined as implied by the flow-of-funds framework. The strength of interdependence increases in the post fraud allegation period. The study findings offer new insights that short sellers bring severe market imperfections for alleged firms that subsequently increase the simultaneity among corporate financing, investment, and payout decisions, and reduces managerial flexibility in adjusting those corporate decisions in response to resulting market penalties of fraud.

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1. Introduction

Reverse Mergers (RMs)¹ have significantly outnumbered IPOs as a mechanism for going public in the United States since 2002. Especially, from 2001 to 2002, Chinese Reverse Mergers (CRMs) accounted for 85% of foreign-based RMs and 34% of all RMs listed in the US (Appadu, Faelten, & Levis, 2014). This rapid growth in the number of CRMs listed on U.S. markets drew considerable attention recently when a number of them were accused of fraud by short sellers². For example, on June 28, 2010, Muddy Waters Research, issued its first report with a strong sell recommendation on Orient Paper, Inc., alleging accounting fraud (Muddy Water Research, 2010). Although this allegation proved wrong after investigation, it gave birth to an industry of short sellers targeting the Chinese companies³. Consequently, between 2010 and 2011, short sellers accused 62 CRMs of fraud, leading to an almost 50% reduction in the CRMs' equity value (Liu, Xu, & Ye, 2015). Recent studies have also documented that target companies experience a significant drop in stock prices on fraud accusations by short sellers (Darrrough, 2015; Gillis, 2014; Karpoff & Lou, 2010; Lang & McGowan, 2013).

Despite this outcry, little had been systematically studied until recently about the implications of short sellers' attacks on the corporate financial decision of CRMs companies. This inquiry is motivated by the fact that fraud allegation damages the firm's reputation and create information asymmetry (Armour, Mayer, & Polo, 2010; Deng, Willis, & Xu, 2014; Karpoff & Lott Jr, 1993). For instance, Darrrough (2015) report that fraud allegations by short sellers tarnish the reputation of CRMs companies. Meanwhile, the US Securities Exchange Commission (SEC) also urged investors to exercise caution when dealing with CRM stocks—displaying serious distrust of the CRM firms' accounting disclosure quality⁴. The prior literature on fraud also documents that fraud revelation creates an environment of information asymmetry where investors revise their estimation risk and increase the required rate of return due to uncertain future cash flows of firms

¹ According to Damjan DeNoble, is a process whereby a company, usually a small to midsize firm, buys the corporate shell of a defunct American company still trading on the penny stock exchange, and then offers a secondary offering of the shares premised on its own growth potential.

² Among the criticisms leveled at Chinese reverse-merger (CRM) firms, the most alarming is the series of Muddy Waters Research reports that accused CRM firms of overstating assets by billions of dollars and funneling money to undisclosed subsidiaries.

³ For instance, Citron Research, Alfred Little, and Anonymous Analytics.

⁴ On June 9, 2011, the Securities and Exchange Commission (SEC) issued an investor bulletin cautioning investors about investing in RM firms, stating that they may be prone to fraud and other abuses. The Securities and Exchange Commission and the Public Company Accounting and Oversight Board ("PCAOB") took steps to focus on securities fraud by reverse mergers companies. The SEC issued investor bulletins warning of the risks of Chinese reverse merger issuers' potential for securities fraud. Both the SEC and PCAOB prepared accounting bulletins relating specifically to publicly traded Chinese companies. These market alerts raised not only public concerns but also genuine academic interest in the financial reporting quality of foreign reverse-merger firms in the U.S.

(Armstrong, Core, Taylor, & Verrecchia, 2011; Kaplanski & Levy, 2012; McLaughlin, Safieddine, & Vasudevan, 1998). These revisions of estimation risk and beliefs of market participants may, in turn, affect the accused firms' corporate financial policies.

Given the arguments that fraud allegation damages firms' reputation, brings market imperfections, and information asymmetry (Karpoff & Lott Jr, 1993), independencies of corporate decisions may not hold as proposed by Modigliani and Miller (1958), and Miller and Modigliani (1961). Therefore, in post-fraud allegation settings, corporate decisions including investment, financing, and payout are likely to be interdependent and must be determined jointly. The single equation frameworks may be misspecified, which potentially leads to incomplete and biased results. A simultaneous framework, therefore, is likely to provide greater insight into the inter-relationships that may exist among the set of corporate decisions, improving our knowledge of corporate decision-making processes in the context of fraud. This study, therefore, aims to investigate the effect of short sellers' fraud allegations on the simultaneity of financial trilogy of financing, investment, and dividend decisions of Chinese reverse mergers.

We organize the remainder of this paper in various sections. Section 2 presents a brief literature review. Section 3 describes data and sample. Section 4 reports and analyzes the results. Section 5 discusses the robustness tests. Section 6 concludes the paper.

2. Literature Review

The wave of short sellers' attacks on Chinese Reverse Mergers between 2010 and 2011 raised substantial concerns regarding the quality of CRM. Until early 2010, CRMs were generating remarkable returns along with the bigger and stronger non-RM Chinese firms listed on the US capital market (Darrough, 2015). However, starting in early 2010, there have been reports of accounting irregularities at the CRM firms, an extraordinary flurry of regulatory actions, auditor resignations and lawsuits against the CRM firms (Alpert, 2012; Scannell; Shalal-Esa & Lynch, 2011). Prior studies show that reverse merger (RM) firms have a bad reputation for accounting fraud as the lack of rigorous scrutiny by underwriters, investors, and regulators during the going-public process create opportunities for manipulation and fraud (Armstrong & Gardner, 2005; Flatt, 2011). Several studies confirm that RM firms generally have lower earnings quality than the IPO firms (Chen et al., 2012; Chu et al., 2012; Givoly et al., 2012).

Despite these long-standing serious reservations about reverse mergers among investors, the media and regulators (Adjei et al., 2008; Aydogdu et al., 2007; Armstrong & Gardner, 2005; Flatt, 2011; Floros & Sapp, 2011; Gleason et al., 2008; Hahn, 2003; McMahon, 2011; Rapoport, 2011; Templin, 2012), there has been little evidence on the financial consequences of short sellers' fraud allegations on financial decisions (i.e. financing, investment, and dividends) of CRM companies. In this regard, the recent literature on corporate fraud in the US confirms the adverse consequences of fraud on external financing of fraudulent firms (Chen, Cheng, & Lo, 2013; Hutton, Peterson, & Smith, 2014; Lin, Song, & Sun, 2012; Yuan & Zhang, 2014). It is due to the fact that the alleged firms face revisions of estimation risk by investors because they become more careful and vigilant of provided information by such firms, and takes into account other aspects to scrutinize firm performance, thus increasing the estimation of risk of future profitability (Armstrong et al., 2011; Graham, Li, & Qiu, 2008; Kaplanski & Levy, 2012; McLaughlin et al., 1998). With respect to investment decision, studies show that accused firms face a decline in investment due to the increase in the hurdle rate for investment projects (Dasgupta & Sengupta, 2003). Similarly on dividends, studies show that given the financial constraint due to expensive external financing and to avoid the underinvestment issues, companies tend to save more cash (Almeida, Campello, & Weisbach, 2004; Chen & Wang, 2012; Faulkender & Wang, 2006; Lin, Song, & Sun, 2013; Opler, Pinkowitz, Stulz, & Williamson, 1999). Conventional wisdom then suggests that companies will be left with less cash to pay out cash dividends. Overall, the literature documents the adverse consequences of fraud allegation on firms' financial decisions. However, these decisions are treated as independent decisions and examined in isolation by researchers.

In the context of fraud, corporate decisions may not work as independent decisions. As there is no direct literature on the interdependence or simultaneity of corporate decisions in the context of fraud, we take the support of flow of fund framework by Dhrymes and Kurz (1967) and the arguments established above that fraud brings market penalties, revisions of estimation risk by investors and creditors, and market imperfections. For instance, many studies highlight the importance of financial constraints for corporate decisions [see for example, (Fazzari, Hubbard, & Petersen, 1987; Lamont, 1997; Shen & Lin, 2016)]. They report that under financial constraints, investment of the companies is sensitive to internally generated funds. In the same vein, Aggarwal and Zong (2006) report that firms facing financial constraints follow pecking order to finance the capital funds. Guariglia (2008) further indicates that investment-cashflow sensitivity is stronger in

firms with limited access to external finance. Overall, these findings suggest that under market imperfection and information asymmetry, we may observe the interaction between financing and investment decisions of firms. For dividend under asymmetrical environment and market imperfections, studies also document the dependence of firms' dividends decisions on their investment and financing decisions (Baskin, 1989; DeAngelo, DeAngelo, & Skinner, 2004; DeFusco, Dunham, & Geppert, 2007; Meng, 2013; Sarig, 2004).

Given the empirical and theoretical support⁵ of the interdependencies of corporate decisions, there are also few studies that find an insignificant association between corporate decisions. For instance, Fama (1974) and Pruitt and Gitman (1991) report that investment and dividend decisions are independent. Overall, there are mixed empirical findings on the possible simultaneity of financing, investment, and dividends. However, all these studies have been conducted without considering any firm's crisis such as fraud allegation. Therefore, this study believes that following the fraud allegations by short sellers, these decisions become interdependent and the strength of the simultaneity increase in post allegation period. Particularly, based on the flow of fund framework in the context of fraud allegation, the study expects the negative relationship between investment and dividend payouts; a positive relationship between investment and financing; and, positive relationship between dividends and financing. Further, the study expects that level of these relationships increases in post fraud period.

3. Data and Sample

The data on short sellers' allegations on Chinese Reverse Mergers (CRMs) companies is collected from activist shorts database which is an independent database dedicated to tracking activist short-seller campaign. Table 1 shows the short campaigns against CRMs for the period of 2009-2015. Most frauds were exposed after short attacks. We identify 163 short sellers' attacks identified from activist shorts database on 81 Chinese Reverse Mergers Companies. Nearly 30 percent of the companies were accused of fraud by more than one short seller. As this study considers short sellers attacks in the US only, therefore, we exclude the campaigns of short sellers in Hong Kong, Singapore, Taiwan, and Canada. The sample selection criteria are given in Table 2.

⁵ Various theories support the interdependence of corporate decisions. These include perfect market hypothesis, agency theory, financial constraints models, and the flow of fund model,

Table 1: Shot sellers' campaigns

Year	Number of Campaigns	China Short Campaigns				
		US	Hong Kong	Singapore	Taiwan	Canada
2009	3	3	-	-	-	-
2010	18	18	-	-	-	-
2011	63	60	2	-	-	1
2012	20	16	4	-	-	-
2013	13	10	2	1	-	-
2014	27	20	5	1	1	-
2015	19	8	9	2	-	-
Total	163	135	22	4	1	1

Source: Activist Shorts

Table 2: Sample selection criteria

Description	Total
Total Number of CRMs firms accused of fraud identified from Activist Shorts Database	81
Deduct:	
Non-US listed Chinese Reverse Mergers (i.e. listed in Hong Kong, Canada, and Singapore)	(7)
Financial Companies	(6)
Companies with missing data	(11)
Final Sample of CRMs firms accused of fraud by Short Sellers	57

Source: Activist Shorts Database and Media Sources, 2009-2015

Table 3: Yearly distribution of the sample

Year	No. of Firms
2009	2
2010	9
2011	21
2012	9
2013	8
2014	6
2015	2
Total	57

Table 3 provides the yearly distribution of the sample. Nearly 37 percent of the short sellers' campaigns occurred in 2011. Between 2010 and 2011, short sellers accused 62 CRMs of fraud, leading to an almost 50% reduction in the CRMs' equity value. Short sellers clearly acted as crucial "fraud detectors" in the process, because most of these scandals started with short sellers' reports that questioned the credibility of the firms' financial reports. In Table 4, the study distribution the short sellers' attacks based on the type of allegation. Major business fraud comprises 55 percent of the total fraud allegations. This is followed by accounting fraud which constituted almost 25 percent of the fraud allegations.

Table 4: Distribution of sample by type of fraud allegation

Type of Fraud Allegation	No. of Firms	Percentage
Accounting fraud	14	24.56
Major business fraud	31	54.39
Misleading accounting	5	8.77
Other overvaluation	5	8.77
Over-levered	2	3.51

4. Estimation Results

In Table 5, we present univariate analysis of our main research variables. For the purpose, we find the averages of financing, investment, and payout of fraudulent firms 3 years before and after fraud discovery. The results for financing indicate that financing is reduced by almost 63,3 % after fraud. The results for investment and dividends also show a significant decline of 35.71% and -56.41% respectively in post fraud period. Overall, the results give us preliminary support for adverse effects of fraud on corporate decisions.

Table 5: Univariate Analysis

Variables		Mean	Median	SD
Financing	Pre-Fraud	0.0060	0.0001	0.0726
	Post-Fraud	0.0022	0.0001	0.0608
	Difference in Mean and Median (Post-Pre)	-0.0038***	0.0000***	-
Investment	Pre-Fraud	0.0098	0.0060	0.0277
	Post-Fraud	0.0063	0.0035	0.0208
	Difference in Mean and Median (Post-Pre)	-0.0035***	-0.0025**	-
Dividends	Pre-Fraud	0.0039	0.0000	0.0767
	Post-Fraud	0.0017	0.0000	0.0377
	Difference in Mean and Median (Post-Pre)	-0.0022**	0.0000*	-

This table presents the descriptive statistics and compares corporate financing, investment, and dividend before and after fraud accusation. The superscripts *, **, and *** indicate the significance of differences in mean and median at the 10%, 5% and 1% levels, respectively.

4.1 Multivariate analysis

In this section, we first estimate the effect of fraud allegations on each decision of CRMs firms separately. We investigate the changes in financing, investment, and dividend decisions of accused firms around fraud accusation dates. For the purpose, we employ the following models:

$$Fin_{it} = \beta_1 + \beta_2 PostFraud + \beta_3 Fin_{it-1} + \beta_4 Size_{it} + \beta_5 Tan g_{it} + \beta_6 MTB_{it} + \beta_7 CF_{it} + \sum_i Firm_i + \sum_t Year_t + \eta_{it}, \quad (1)$$

$$Inv_{it} = \alpha_1 + \alpha_2 PostFraud + \alpha_3 Inv_{it-1} + \alpha_4 MTB_{it} + \alpha_5 CF_{it} + \sum_i Firm_i + \sum_t Year_t + \varepsilon_{it} \quad (2)$$

$$Div_{it} = \gamma_1 + \gamma_2 PostFraud + \gamma_3 Div_{it-1} + \gamma_4 Size_{it} + \gamma_5 MTB_{it} + \gamma_6 INOW_{it} + \gamma_7 CF_{it} + \gamma_8 R.E / TE_{it} + \sum_i Firm_i + \sum_t Year_t + \zeta_{it}. \quad (3)$$

In equation (1), (2), and (3), Fin_{it} , Inv_{it} , and Div_{it} are the dependent variables for financing, investment, and dividend respectively. $PostFraud$ is a dummy variable in all the three equations that equals 1 for the 3 years following the fraud revelation and zero for the 3 years before the fraud announcement. For financing equation, we follow the pecking order theory Frank and Goyal (2003) to control for firm size ($Size_{it}$), tangibility ($Tan g_{it}$), market to book (MTB_{it}) ratio, and cash flow (CF_{it}). In equation 2, we control for tangibility ($Tan g_{it}$), cash flow (CF_{it}), and firm prior investment (Inv_{it-1}). Similarly, for dividend equation, inside ownership ($INOW_{it}$) and retained earnings ($R.E / TE_{it}$) are additional control variables along with size, tangibility, and cash flow. The measurements of all the variables are provided in Table 6.

Table 6: Measurement of study variables

Variable	Acronyms	Measurement
Fraud Allegation	Postfraud	Postfraud is a dummy variable that equals 1 for the 3 years following the fraud revelation and zeroes for the 3 years before the fraud announcement.
Financing	Fin	The change in the book value of long-term debt.
Investment	Inv	The sum of the changes in book value of the net property, plant and equipment, and depreciation expenses
Dividends	Div	The reported total dividends paid on common stock.
Size of the firm	Size	Natural logarithm of total assets
Tangibility	Tang	The ratio of the book value of the net property, plant and equipment to the book value of total assets
Growth opportunities	MTB	The ratio of total assets minus book value of equity plus the market value of equity to total assets, where the market value of equity equals price per share
Cash flow	CF	Net income plus non-cash expenses
Inside ownership	INOW	The percentage of common share outstanding that are held by insiders
Retained earnings	RE/TE	The ratio of retained earnings to total equity
Capital stock	K	The book value of tangible fixed assets

In Panel A of Table 7, Model 1 reports the results for financing equations. The results indicate that the coefficient of Postfraud on financing is significantly negative which indicates that after fraud revelation, firms' financing decreases. The lagged financing variable has a significant and negative impact on the subsequent financing behavior of firms. These regression results are consistent with those of the univariate tests. That is, as revelation of fraud increases the perceived information asymmetry between investors and managers, firms experience greater difficulty in obtaining external financing. Moreover, we find the significantly negative effect of cash flow (CF) on financing. This is consistent with the pecking order theory of financing that under information asymmetry, firms follow financing hierarchy. Like financing, we find statistically significant and negative coefficient of Postfraud on investment which shows that fraudulent firms experience a decrease in investment after fraud revelation. Consistent with Laeven (2003), the lagged investment variable on future investment of firm is significant and positive. It suggests that companies find it easy to continue investment at some fraction of the prior year ratio. The result for growth opportunities (MTB) is statistically insignificant and positive. Finally, we find the positive coefficient of cash flow on investment.

Table 7: Regression Results

	Model 1		Model 2		Model 3	
Variables	Coefficient	S. E	Coefficient	S. E	Coefficient	S. E
Postfraud	-0.0845***	(0.0264)	-0.209***	(0.0416)	-0.0175***	(0.0031)
Fin t-1	-0.0009**	(0.0004)				
Div t-1					0.4361***	(0.0273)
Inv t-1			0.0011*	(0.0006)		
Size	0.0793***	(0.0178)			0.0161***	(0.0029)
Tang	1.4542***	(0.0866)				
MTB	0.0508***	(0.0133)	0.0617	(0.0473)	-0.0154***	(0.0035)
CF	-3.8541***	(0.317)	0.2030***	(0.0415)	-0.1101	(0.3461)
INOW					0.0009	(0.0020)
RE/TE					0.0046**	(0.0021)
Company dummy	Yes		Yes		Yes	
Year dummy	Yes		Yes		Yes	
Constant	0.468***	(0.0658)	0.0883*	(0.0486)	0.1100***	(0.0190)
Observations	342		342		342	

Notes: This table presents the results of OLS. Postfraud is a dummy variable that equals 1 for the 3 years following the fraud revelation and zeroes for the 3 years before the fraud announcement. Fin t-1, Inv t-1, and Div t-1 are the lagged variables of financing, investment, and dividends. Size, Tang, MTB, CF, INOW and RE/TE show the size of the firm, asset tangibility, market to book ration, cash flow, inside ownership and retained earnings respectively. The study controls for the firm and year effects using the company and year dummies. Standard errors are reported in the parenthesis. The *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels.

The result implies that fraudulent firms use internally generated funds to finance the investment. Finally, for dividend equation, we also report a statistically significant and negative effect of fraud. The lagged dividend variable is statistically significant and positive as expected. It shows that dividends payers are reluctant to omit or cut down on dividends because of the sticky nature of dividends. In control variables, firm size is significant and positive. Consistent with prior studies (DeAngelo et al., 2006; Fuller & Blau, 2010), the result suggests that large firms pay more dividends than small firms. The coefficient of MTB ratio is negative and significant, which suggests that high growth firms are less likely to distribute dividends to the shareholders. The cash flow (CF) is statistically insignificant and negative. The results do not support the signaling hypothesis of dividends that firms use dividends as a signal about future firms' profitability. Moreover, inside ownership also has an insignificant effect on dividends. However, the coefficient of retained earnings RE/TE is statistically significant and positive. The results are consistent with the prediction of the lifecycle theory (DeAngelo et al., 2006).

4.2 Interdependence among the corporate financial triad

In the previous section, we established the adverse consequences of fraud allegations on financing, investment, and dividends separately. This section examines the changes in the interdependence of these decisions following the fraud allegation. For the purpose, we consider each decision as endogenous to the other and employ the following system of equations:

$$Fin_{it} = \beta_1 + \beta_2 PostFraud + \beta_3 Fin_{it-1} + \beta_4 Inv_{it} + \beta_5 Div_{it} + \beta_6 Size_{it} + \beta_7 Tan g_{it} + \beta_8 MTB_{it} + \beta_9 CF_{it} + \sum_i Firm_i + \sum_t Year_t + \eta_{it}, \quad (4)$$

$$Inv_{it} = \alpha_1 + \alpha_2 PostFraud + \alpha_3 Inv_{it-1} + \alpha_4 Fin_{it} + \alpha_5 Div_{it} + \alpha_6 MTB_{it} + \alpha_7 CF_{it} + \sum_i Firm_i + \sum_t Year_t + \varepsilon_{it} \quad (5)$$

$$Div_{it} = \gamma_1 + \gamma_2 PostFraud + \gamma_3 Div_{it-1} + \gamma_4 Inv_{it} + \gamma_5 Fin_{it} + \gamma_6 Size_{it} + \gamma_7 MTB_{it} + \gamma_8 INOW_{it} + \gamma_9 CF_{it} + \gamma_{10} RE/TE_{it} + \sum_i Firm_i + \sum_t Year_t + \zeta_{it}. \quad (6)$$

We have Fin_{it} , Inv_{it} and Div_{it} as the dependent variables for financing, investment and dividend respectively. The empirical literature provides support for the endogeneity of corporate decisions; therefore, we add Inv_{it} and Div_{it} in financing equation. Similarly, for investment and dividend

equations, we add Fin_{it} and Div_{it} in equation (5) and Fin_{it} Inv_{it} in equation (6). *PostFraud* is a dummy variable in all the three equations that equals 1 for the 3 years following the fraud revelation and zero for the 3 years before the fraud announcement. The data description of the rest of the variables in the equations is similar to equations (1), (2), and (3).

Although the empirical literature provides support for the endogeneity of corporate decisions⁶, we test the hypothesis for endogeneity before proceeding to the main analysis. For the purpose, we apply the Durbin and Wu–Hausman tests (Hausman, 1978; Wu, 1974) to the corporate decision variables. Both the tests assume variables under consideration as exogenous in their null hypotheses. The test results in Table 8 for endogeneity for financing, investment, and dividend equations are highly significant, which suggests that corporate decisions should be treated as endogenous variables.

Table 8: Endogeneity test

Equations	Endogenous	Durbin (score) chi2	Wu-Hausman F
Financing ^a	Div, Inv.	96.84 (0.000)	79.85 (0.000)
Investment ^b	Fin, Div	75.74 (0.000)	68.52 (0.000)
Dividend ^c	Inv, Fin	58.56 (0.057)	49.53 (0.000)

Notes: (a) Instrument variables in the regression include: Postfraud, Fin_{t-1} , Size, Tang, MTB, CF.

(b) Instrument variables for investment equation include: Postfraud, Inv_{t-1} , MTB, CF.

(c) Instrument variables for dividend equation include: Postfraud, Div_{t-1} , Size, MTB, INOW, CF, and RE/TE.

After establishing the endogeneity of corporate decisions, one cannot proceed with OLS regression. Dhrymes and Kurz (1967) show that when variables are interdependent, OLS regression provides misleading results. Moreover, they suggest that one should only include the variables that are truly exogenous in OLS regression. However, the study does not aim to exclude the corporate decisions variables in the estimation because they are key study variables. The study uses equation (4), (5), and (6) to carry out simultaneous analyses. There are three alternative approaches, 2SLS, 3SLS and GMM estimations to estimate a simultaneous equations system⁷. In the majority of the previous studies, the selection between IV estimators and GMM was arbitrary. However, in order to decide

⁶ See for example (Fama & French, 2002; Harford, Klasa, & Maxwell, 2014; McCabe, 1979; McDonald, Jacquillat, & Nussenbaum, 1975; Meng, 2013)

⁷ Both 2SLS and 3SLS belong to instrumental variable (IV) class estimators. Hansen (1982) proposed a generalized method of moments (GMM) estimator that simplifies the linear and non-linear IV estimators of Sargan (1958). Compared to IV estimators, the GMM estimators are based on a weighting matrix that takes into account the heteroskedasticity, temporal dependence, and autocorrelation.

between IV estimators and GMM, this study follows Lee, Liang, Lin, and Yang (2016) by estimating the presence of weak instruments and heteroskedasticity⁸. We perform the first-stage F-statistic to test the weakness of instruments and Pagan and Hall (1983)'s test to detect heteroskedasticity.

Table 9 shows the results of weak instruments and heteroskedasticity. The value of adjusted R-square for financing, investment, and dividends show the significant strength of the instruments. The F-statistics for all the three variables is more than 10. These results indicate that instruments are strong. The p-values of PH-test for financing, investment, and dividends indicate that the errors are not heteroskedastic.

Table 9: Test for weak instruments and heteroskedasticity

Equations	Adj.R2	Average F-stat	PH-test (p-value)
Financing	0.9996	136.11	0.180
Investment	0.9919	129.69	0.268
Dividends	0.7575	99.53	0.209

Notes: The study used Ivreg2 for each equation separately for heteroskedasticity test by estimating "ivhetttest" in STATA. The null hypothesis of Pagan and Hall (1983)'s test is that errors are homoskedastic. In all the equations, the null hypothesis is accepted. The p-values are reported in the last column.

The results for both the weak instrument and heteroskedasticity tests indicate that IV estimators are preferable to GMM estimators. At this stage, the results have established the validity of IV estimators over GMM estimator. Next, to decide between 3SLS and 2SLS, Chen and Lee (2010) points out that the 2SLS is limited information method. Since the system of equations in this study involves endogenous variables from other equations, the study prefers full information method (3SLS). This is because 3SLS takes into account both the cross-equation correlation of errors and simultaneous bias. Moreover, the 3SLS estimation is the combination of 2SLS and SUR (seemingly unrelated regression). Therefore, the study uses 3SLS as its main estimation method.

Table 10 reports the results of 3SLS. In Panel A, the results for financing (Fin) show that fraud has a negative and significant impact on external financing. Hutton et al. (2014) who report the negative effect of fraud on corporate external financing. On the interaction of corporate decisions, the results indicate that investment has a significantly positive impact on financing decisions. The results are consistent with the findings of Lin et al. (2012), Yuan and Zhang (2014), and The results

⁸ Wang (2015) and Lee, Liang, Lin, and Yang (2016) test the weakness of instruments by looking at the F-statistics or R² of the first stage regression. If the F-statistics is greater than 10, then instrument variable estimators (2SLS & 3SLS) are reliable (Stock, Wright, & Yogo, 2002). Moreover, if errors are homoscedastic, it is suggested to use IV estimators.

support the prediction of agency theory and pecking order theory. For the effect of dividends on financing, the argument of Jensen (1986) that dividends and debts are perfect substitute to signal the market does not hold in this study. Instead, it is found that dividends have a significant and positive effect on financing.

Table 10: Results of three-stage least square model (3SLS)

	Panel A		Panel B		Panel C	
	Financing (Fin)		Investment (Inv)		The dividend (Div)	
Variables	Coefficient	S. E	Coefficient	S. E	Coefficient	S. E
Postfraud	-0.0517**	(0.0242)	-0.0691***	0.0217	-0.0015**	(0.0006)
Fin t-1	-0.0015	(0.0020)				
Inv t-1			0.0003	(0.0023)		
Div t-1					0.0511***	(0.0173)
Inv.	0.0079***	(0.0017)			-0.0023***	(0.0006)
Fin.			0.4286***	(0.0032)	0.0006**	(0.0003)
Div.	2.3183***	(0.6658)	-0.2399**	(0.1092)		
Size	-0.1378**	(0.0643)			0.0224**	(0.0100)
Tang	0.7936***	(0.1954)				
MTB	0.2762***	(0.0715)	0.0911**	(0.0454)	-0.0237	(0.0372)
CF	-0.2991***	(0.0742)	0.2586**	(0.1159)	0.0215	(0.0161)
INOW					0.0000	(0.0001)
RE/TE					0.0078**	(0.0036)
Company dummy	Yes		Yes		Yes	
Year dummy	Yes		Yes		Yes	
Observations	342		342		342	
R-Square	0.995		0.993		0.611	

Notes: This table presents the results of the 3SLS. Postfraud is a dummy variable that equals 1 for the 3 years following the fraud revelation and zeroes for the 3 years before the fraud announcement. Fin t-1, Inv t-1, and Div t-1 are the lagged variables of financing, investment, and dividends. Size, Tang, MTB, CF, INOW and RE/TE show the size of the firm, asset tangibility, market to book ration, cash flow, inside ownership and retained earnings respectively. The study controls for the firm and year effects using the company and year dummies. Standard errors are reported in the parenthesis. The *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels.

Moreover, cash flow (CF) has a negative and significant effect on financing. Consistent with prior studies (Jensen, Solberg, & Zorn, 1992; Lee et al., 2016; McCabe, 1979; Meng, 2013), the results support the pecking order theory of Myers (1984) that under information asymmetry, firms follow financing hierarchy. Among the control variables, the results for size are statistically significant and negative at 1 percent. The results confirm the prediction of pecking order theory. The results for asset tangibility (*Tang*) is significant and positive which suggests that tangible assets serve as

collateral for external financing (Bae & Goyal, 2009). Growth opportunities (*MTB*) has a positive and significant effect on financing. This suggests that firms with high growth require external funds to support the investment (Yuan & Zhang, 2016).

For changes in the investment decision in Panel B of Table 10, the results find a statistically significant and negative effect of fraud on investment. Similar to financing, the results also indicate the adverse shocks of fraud on firms' investment decisions. The coefficient of financing has a significant and positive impact on investment decision. These results are consistent with the prior studies e.g., (Lee et al., 2016; McCabe, 1979; McDonald et al., 1975; Meng, 2013) and confirm the capital-rationing theory, which predicts that financing decision leads investment decision. Moreover, the coefficient of the dividend has a significant and negative impact on investment decision and is in conformity with (McCabe, 1979; McDonald et al., 1975; Meng, 2013). The result suggests that dividend and investment are competing uses of funds and fraudulent firms do the tradeoff between dividend payouts and investment outlays while allocating the scarce funds. The lagged investment variable on future investment of firm is insignificant and positive. The cash flow (*CF*) has a positive and significant effect. The results imply that the investment decisions of fraudulent firms are constrained by internal cash flows as well as external finance.

Finally, for dividend equation in Panel C of Table 10, the results indicate that the effect of fraud on dividends is statistically significant and negative. On the interaction of corporate decisions, the results for 3SLS show that financing has a positive and statistically significant effect on dividends while investment has a negative and significant effect at 1 percent. Moreover, the coefficient of investment in dividends is statistically significant and negative. The results imply that dividend payout is not a residual or independent decision, instead, it is made simultaneously with financing and investment decisions. Contrary to the findings of Pruitt and Gitman (1991) who report dividends payouts as independent decisions, this study establishes the simultaneity of dividends with financing and investment. The results for growth opportunities (*MTB*) and insider ownership (*INOW*) are insignificant in the model. The cash flow (*CF*) is also statistically insignificant. The results do not support the signaling hypothesis of dividends that firms use dividends as a signal about future firms' profitability. Consistent with Lifecycle theory, the effect of retained earnings (*RE/TE*) on dividends is significant and positive. Overall, the results from 3SLS indicate that fraud revelation has adverse consequences on the corporate financial triad. The corporate decisions become interdependent following the fraud discovery.

4.3 Strength of interdependence among corporate financial triad

In the previous test, the study examines the effect of fraud on the corporate financial triad and established the adverse effect of fraud and interdependencies among corporate decisions. In this section, it examines the strength of interdependence of the corporate financial triad in the post-fraud period. For the purpose, it interacts each corporate decision variable with a *Postfraud* dummy in the respective equations. If the interaction effect is significant, one can interpret the coefficient as the decrease or increase in interdependencies. The 3SLS results are reported in Table 11.

Table 11: Strength of interdependence among corporate financial triad (3SLS)

	Panel A		Panel B		Panel C	
	Financing (Fin)		Investment (Inv)		Dividend (Div)	
Variables	Coefficient	S. E	Coefficient	S. E	Coefficient	S. E
Postfraud	-0.0087**	(0.0037)	-0.0518***	(0.0167)	0.0011*	(0.0006)
Postfraud*Inv	0.1704***	(0.0097)			-0.0044**	(0.0019)
Postfraud*Div	0.1808*	(0.1039)	-4.1574*	(2.2005)	0.0000	
Postfraud*Fin			0.5614**	(0.2465)	0.0371*	(0.0209)
Fin t-1	-0.0001	(0.0007)			0.0000	
Inv t-1			0.0001	(0.0027)	0.0000	
Div t-1					0.0569***	(0.0203)
Inv	0.0358**	(0.0157)			-0.0005*	(0.0002)
Fin			1.0057***	(0.2413)	0.0511**	(0.0213)
Div	0.2018*	(0.1076)	-1.4960	(1.9823)	0.0000	
Size	-0.0058*	(0.0030)			0.0287***	(0.0052)
Tang	0.5513***	(0.1076)			0.0000	
MTB	0.0294***	(0.0080)	0.0858**	(0.0366)	-0.0322	(0.0406)
CF	-0.0144**	(0.0063)	0.1244***	(0.0196)	0.0281*	(0.0158)
INOW					0.0001	(0.0002)
RE/TE					0.032	(0.0025)
Company dummy	Yes		Yes		Yes	
Year dummy	Yes		Yes		Yes	
Observations	342		342		342	
R-square	0.9992		0.9877		0.647	

Notes: This table presents the results of the 3SLS. Postfraud is a dummy variable that equals 1 for the 3 years following the fraud revelation and zeroes for the 3 years before the fraud announcement. Post*Inv, Post*Div, and Post*Fin are the interaction terms to see any increase or decrease in the interdependence of investment, finance, and dividend variables in the post-fraud period. Fin t-1, Inv t-1, and Div t-1 are the lagged variables of financing, investment, and dividends. Size, Tang, MTB, CF, INOW and RE/TE show the size of the firm, asset tangibility, market to book ratio, cash flow, inside ownership and retained earnings respectively. The study controls for the firm and year effects using the company and year dummies. Standard errors are reported in the parenthesis. Standard errors are reported in the parenthesis. The *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels.

First, the study discusses the financing equation. The interaction term *Postfraud*Inv* is statistically significant and positive which shows that strength of interdependence of financing and investment increases in post fraud period. The coefficient of investment is also statistically significant and positive. The coefficient of *Postfraud*Div* is statistically significant at 10 which imply that while

making financing decisions, management pays considerably less attention to dividend decisions compared to investment decisions.

In the investment equation, the coefficient of *Postfraud*Fin* is positive and significant. The results confirm the increase in the simultaneity of investment and financing decisions. The coefficient of *Postfraud*Div* is also statistically significant and negative. The results are in conformity with competing uses of funds for dividends and investment. Overall, the results for investment indicate that investment sensitivity to financing and dividends increases in post fraud period. The results for dividend equations show that sensitivity of dividends to both financing (*Postfraud*Fin*) and investment (*Postfraud*Inv*) increases following the fraud discovery. Both financing and investment interaction terms with Postfraud are significant. The evidence for financing, investment, and dividends analyses reinforces the assertion that the revelation of fraud imposes adverse impacts on the corporate financial triad.

5. Robustness tests

In the previous analysis, the study used 3SLS to examine the simultaneity of the corporate financial triad. Although 3SLS is asymptotically more efficient, yet it is subject to high specification errors than the limitation information model. Therefore, to check the robustness of the results, the study estimates the results using 2SLS. The results of the 2SLS are reported in Table 12.

The results for financing, investment, and dividend equation are quite similar despite some variations in the significance level of the few variables. The coefficients of corporate financial triad variables in the respective equations bear a similar sign of the relationship. Moreover, the control variables also show similar behavior as evidenced in the 3SLS results. In Table 13, the study reports the results for the strength of interdependence in post fraud period using 2SLS. These results are also similar to those reported in Table 11. The only difference is shown in the insignificant coefficient of dividend in financing equations which is shown to be significant in Table 11. Overall, the results provide consistent estimates using both 3SLS and 2SLS.

Table 12: Results of two-stage least square model (2SLS)

Variables	Panel A		Panel B		Panel C	
	Financing (Fin)		Investment (Inv)		Dividend (Div)	
	Coefficient	S. E	Coefficient	S. E	Coefficient	S. E
Postfraud	-0.0611**	(0.0261)	-0.0926***	(0.0191)	-0.0017*	(0.0009)
Fin _{t-1}	-0.0018	(0.0028)				
Inv _{t-1}			0.0002	(0.0038)		
Div _{t-1}					0.0874**	(0.0379)
Inv	0.0026***	(0.0008)			-0.0031***	(0.0010)
Fin			0.5768***	(0.0049)	0.0033**	(0.0014)
Div	2.6325***	(0.8554)	-0.5329**	(0.2436)		
Size	-0.1560*	(0.0825)			0.0416***	(0.0076)
Tang	0.9023*	(0.4883)				
MTB	0.3180***	(0.0923)	0.1211	(0.1714)	-0.0401	(0.0491)
CF	-0.3431***	(0.0956)	0.3506*	(0.2044)	0.0368	(0.0271)
INOW					0.0001	(0.0003)
RE/TE					0.0140**	(0.0070)
Company dummy	Yes		Yes		Yes	
Year dummy	Yes		Yes		Yes	
Observations	342		342		342	
R-square	0.999		0.972		0.595	

Notes: This table presents the results of the 2SLS. Postfraud is a dummy variable that equals 1 for the 3 years following the fraud revelation and zeroes for the 3 years before the fraud announcement. Fin_{t-1}, Inv_{t-1}, and Div_{t-1} are the lagged variables of financing, investment, and dividends. Size, Tang, MTB, CF, INOW and RE/TE show the size of the firm, asset tangibility, market to book ration, cash flow, inside ownership and retained earnings respectively. The study controls for the firm and year effects using the company and year dummies. Standard errors are reported in the parenthesis. The *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels.

Table 13: Strength of interdependence among corporate financial triad (2SLS)

Variables	Panel A		Panel B		Panel C	
	Financing (Fin)		Investment (Inv)		Dividend (Div)	
	Coefficient	S. E	Coefficient	S. E	Coefficient	S. E
Postfraud	-0.0082*	(0.0044)	-0.0311**	(0.0127)	-0.0011*	(0.0006)
Postfraud*Inv.	0.2201***	(0.0149)			-0.0060**	(0.0028)
Postfraud*Div	0.3439*	(0.1851)	-0.5003	(3.4043)	0.0000	
Postfraud*Fin			4.2750**	(1.8274)	0.0533*	(0.0297)
Fin _{t-1}	-0.0001	(0.0008)			0.0000	
Inv _{t-1}			0.0001	(0.0042)	0.0000	
Div _{t-1}					0.0810**	(0.0343)
Inv	0.0113**	(0.0047)			-0.0025**	(0.0012)
Fin			4.8488**	(2.3141)	0.0484**	(0.0240)
Div	0.3484	(0.3285)	-0.3896	(3.0795)	0.0000	
Size	-0.0034*	(0.0020)			0.0409***	()
Tang	1.7449***	(0.6600)			0.0000	
MTB	0.0314***	(0.0104)	0.0705**	(0.0320)	-0.0439	(0.0411)
CF	-0.0162**	(0.0081)	0.5566**	(0.2338)	-0.0353	(0.0413)
INOW					0.0001	(0.0003)

RE/TE			0.0207***	(0.0044)
Company	Yes	Yes	Yes	
Year dummy	Yes	Yes	Yes	
Observations	342	342	342	
R-square	0.999	0.974	0.609	

Notes: This table presents the results of 2SLS. Postfraud is a dummy variable that equals 1 for the 3 years following the fraud revelation and zeroes for the 3 years before fraud announcement. Post*Inv, Post*Div, and Post* Fin are the interaction terms to see any increase or decrease in the interdependence of investment, finance, and dividend variables in the post-fraud period. Fin_{t-1} , Inv_{t-1} , and Div_{t-1} are the lagged variables of financing, investment, and dividends. Size, Tang, MTB, CF, INOW and RE/TE show the size of the firm, asset tangibility, market to book ratio, cash flow, inside ownership and retained earnings respectively. The study controls for the firm and year effects using the company and year dummies. Standard errors are reported in the parenthesis. Standard errors are reported in the parenthesis. Standard errors are reported in the parenthesis. The *, **, *** indicate significance at the 0.1, 0.05, 0.01 levels.

6. Conclusion

This study develops a model that reflects the interdependent nature of corporate financial triad while accounting for the effect of fraud allegations by short sellers. For the purpose, it conducts the simultaneous analysis of these decisions to aid our understanding of the complex relations that bind these policies together in an environment of fraud that brings higher information asymmetry and market imperfections. To investigate the interdependencies of the corporate financial triad, the study performs a full information model (3SLS) as the main estimation method as well as limited information method (2SLS) for robustness. The results seem to substantiate the claim that due to resulting information asymmetry and market imperfections of fraud discovery, corporate investment, financing, and payout decisions are indeed inextricably linked and jointly determined as implied by the flow-of-funds framework.

Consistent with the prediction of agency theory and pecking order theory, the investment decision of the firm has a positive effect on financing. Similarly, the financing decisions are also driven by the dividend decisions implying that dividend payout is not a residual policy of financing. In line with the prediction of pecking order theory, internally generated funds have a negative effect on financing suggesting that firm prefer to use internal funds over external funds under information asymmetry. As fraud revelation bring information asymmetry, these results confirm the theoretical prediction of the pecking order theory. The results of investment decision show that financing has a positive effect on corporate investment. The results are in line with the prediction of capital rationing theory that investment decisions are driven by financing decisions. Dividends, on the other hand, have a negative effect on investment suggesting that investment and dividends are two competing uses of corporate funds. The firm has to make an adjustment in funds allocation for

investment and dividends. Finally, in dividend equation, the results indicate that financing has a positive while investment has a negative effect on dividend payouts. These results again imply that dividend payout is not a residual policy of financing, and investment expenditures are competing uses of funds with dividends.

Furthermore, to estimate the strength of interdependence, the study interacts each decision with a Postfraud dummy to test whether the interdependencies of corporate decisions is increased or decreased in post fraud period. Results provide the comprehensive support of the increase in strength of the simultaneity of corporate decisions. Specifically, the results find that capital investment and dividend payout, as competing uses of limited funds, are negatively interrelated, but both are positively related to the new debt issued.

Overall, the results establish that following the fraud allegation by short sellers, corporate financial triad becomes interdependent and the strength of interdependence increases due to the resulting market imperfections of fraud. The study findings provide new insights that short sellers' allegations of fraud bring severe market imperfections for alleged firms that subsequently increase the simultaneity among corporate financing, investment, and payout decisions, and reduces managerial flexibility in adjusting those corporate decisions in response to resulting market penalties of fraud.

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