Exploring the Relationship between Risk-taking Behavior through Derivatives Usage and Earnings Management

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I. Introduction

Firms aim to diminish the risks they face and maximize their interests through a foundation of diversified businesses or through the design of their financial assets portfolio. However, firms frequently attempt to increase their performance by taking risky positions. In particular, they attempt to maximize their interests by reducing risk or risk-taking behavior, typically using derivative to achieve this purpose. Derivatives are required to eliminate uncertainty in the value of assets and liabilities during a normal business cycle. Stulz (1984), Smith and Stulz (1985), DeMarzo and Duffie (1992), and Froot, Scharfstein, and Stein (1993) report that if firms are associated with weak diversification of business activities and latent bankruptcy costs or are owned by shareholders who are very likely to avoid risk, these firms would attempt to eliminate their future risk. There is much evidence proposing that derivatives usage aims to reduce the firm’s financial and operational risk. However, firms frequently take a speculative position that aims to increase the volatility of their assets’ value. In particular, Black and Scholes (1973) build their option pricing model on the basis of the inference of the relationship between option value and liquidation claim. Following this, Jensen and Meckling (1976) and Myers (1977) suggest that the possibility of incentives through a leverage position might be produced among shareholders, transferred from creditors. Thus, firms are motivated to hold derivatives to create marginal risk positions. Furthermore, Geczy et al. (2004) suggest that the tendency of firms to speculate is closely related to their belief in their superior status in terms of
information access, compensation for speculation, and relatively weaker governance system. As mentioned above, firms adopt risk management policies to reduce or increase their business risk through derivatives usage. Moreover, this kind of risk management behavior affects the firm’s decision-making in areas such as earnings management. First, managers attempt to manage their performance through earnings management to fulfill their self-interest to maximize their compensation such as bonuses and salaries. They also adopt earnings management policies to avoid disadvantageous situations arising from regulations such as monopoly and fair trade directives. Fang et al. (2014) propose that the change in risk management behavior from hedging to speculation during a bank reform period\(^3\) affects the firm’s earnings quality. In particular, they infer that earnings management is ultimately used by the firm to hide their risk-taking behavior. Furthermore, Fonseca and González (2008) suggest that investor protection, regulation, and supervision of banks undermine risk-taking behavior, and thus this effect is likely to mitigate the firm’s earnings management behavior.

A variety of research proposes a relation between the firm’s risk management and earnings management among general firms as well as financial firms. Barton (2001) and Pincus and Rajgopal (2002) report that the firm’s derivatives usage and the amount of discretionary accruals are negatively correlated. Both papers argue that hedging through the usage of derivatives is a

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\(^3\) Fang et al. (2014) assume the collapse of the former Soviet Union as a rapid institutional exogenous change in the financial industry is related to the reporting system in Central and Eastern Europe (CEE). In particular, CEE faced a shift from a centralized to a market-based system, and thus was expected to change its regulatory environment. Also, Fang et al. (2014) use data from 434 commercial banks in CEE countries (Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Serbia, Slovakia, and Slovenia) to investigate the relationship between the firm’s risk management behavior and earnings management.
strategic substitute for earnings smoothing. Nan et al. (2007) also present that if
decision-making for derivatives hedging is contractible, the efficiency of hedging
enhances the bond between hedge policy and earnings management since the risk
premium and earnings management are likely to mitigate the deadweight loss
incurred through earnings management. This paper uses data from 2001 to 2012
to investigate the relation between the firm’s risk-taking behavior and earnings
management on the basis of results presented in prior literature. Our results are as
follows: First, the firm’s risk-taking behavior through derivatives usage is
positively correlated with its earnings management. This outcome supports the
argument of Fonseca and González (2008) and Nan et al. (2014) that firms are
likely to choose earnings management to hide their risk-taking activities. Second,
we attempt to separate the research period before and after 2008 to investigate
the effect of the financial crisis on the relation between the firm’s risk-taking
behavior and earnings management.

4 Barton (2001) reports that derivatives usage is negatively related to the magnitude of the
firm’s discretionary accruals as a proxy of earnings management. Pincus and Rajgopal
(2002) suggest similar results to Barton with regards to the oil and gas industry. Both
papers assert that hedging activities and earnings management can be substitutes for each
other. On the other hand, Nan et al. (2007) describe this relation as explaining the hedge
effect of the endogenous incentives and earnings management cost.

5 Nan et al. (2007) explain that hedging activities are likely to mitigate the agency cost
through a decline of the risk premium and the equilibrium of earnings management if the
decision-making of hedging activities is contractible. However, if the decision-making is
not possible, hedging activities are not likely to mitigate agency cost, since they increase
personal cost from earnings management. This in effect increases the principal’s cost, a
compensation for the manager. The ultimate motivation for compensation through hedging
activities may withstand the deterioration period of inefficient earnings management. Under
such circumstances, allowing earnings management is likely to be efficient even if it may
discourage hedging activities.

6 Kang and Lee (2011) report the qualitative change after the global financial crisis in 2008
We suggest numerous contributions and empirical results as follows. This paper investigates the relationship between risk-taking behavior through derivatives usage and earnings management and also suggests more empirical results by using the methodology detailed in Zhang’s (2007) paper. Our comprehensive results show a positive (+) relation between risk-taking activities and earnings management, suggesting that earnings management is employed to hide the firm’s risk-taking activities. Furthermore, we attempt to investigate the effect of the financial crisis in Korea on the relationship between the firm’s risk-taking behavior and earnings management. The results show a negative correlation between the firm’s risk-taking behavior and earnings management, which indicates that the firms mitigated their risk-taking activities after the 2008 financial crisis. This trend is likely to suppress earnings management activities.

The remainder of the paper proceeds as follows: Section II discusses the in terms of risk preferences (degree of risk aversion) in the won/dollar OTC (over the county) currency option market. They find a rapid change in the relationship between implied and realized volatility since February 2008. This result shows that before the global financial crisis in 2008 won/dollar OTC option, market traders may have displayed risk-neutral or risk-seeking propensity, in contrast to their extreme risk aversion after the crisis.

Zhang (2007) suggests the main factors that determine the firm’s risk management: interest rate risk exposure, foreign currency exchange rate risk exposure, and commodity price risk exposure. To derive a risk factor, they construct the risk factor model as follows:

\[ R_{it} = \alpha_0 + \alpha_{1t} R_{mt} + \alpha_{2t} Macro_{it} + \epsilon_{it} \]

\( R_{it} \) is the holding period return of the firm’s i at t, \( R_{mt} \) is weighted-market portfolio return at t, and \( Macro_{it} \) monthly-return change in interest, currency and commodity related to macro factors. Absolute value of \( \alpha_{2t} \) estimated from the model above is the measure of risk exposure related to macro-factor of the firm i in each period.
previous studies and the development of our hypotheses: Sections III and IV details the research design and empirical analyses, and Section V reports the result of sensitivity analyses. Finally, Section VI provides the conclusion.

II. Literature Review & Hypotheses

In general, numerous researchers support the assertion that firms use derivatives to reduce risks by taking a hedged position. A different line of inquiry, however, opposes this argument, inferring that firms frequently take speculative positions for self-interest reasons. Stulz (1984), Smith and Stulz (1985), DeMarzo and Duffie (1992), and Froot, Scharfstein, and Stein (1993) support the finding that firms use derivatives to reduce the firm’s operational and financial risk, since firms require stability in the value of their financial assets, avoiding progress taxes and mitigating substantial default risk. On the other hand, there are a few inferences that firms use derivatives to acquire additional operational and financial risks. Black and Scholes (1973), Jensen and Meckling (1976), and Myers (1977) propose that firms increase their internal risks by using derivatives, since high volatility provides marginal benefit for shareholders. The securing of a leverage position through risk-taking is likely to transfer wealth from creditors to shareholders.

Based on the theoretical evidence, there is also a good amount of empirical research evidence. For example, Tufano (1996a) attempts to investigate risk management behavior in the gold mining industry and concludes that firms that use derivatives mostly do so in order to decrease their operational and financial

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8 The results of Tufano (1996a)'s investigation of risk management behavior in the gold mining industry supports the hypothesis that gold mining firms use derivatives to decrease their financial risks. It can also suggest that the ultimate motivation for hedging behavior is the tendency of managers and owners to avert risks.
risks, since their managers and shareholders tend to be risk-averse. On the other hand, Bodnar and Marston (1996) provide survey evidence in terms of derivatives usage, and propose that while firms conventionally use derivatives, not all of them are used for hedging. Thus, Bodnar and Marston infer that firms intermittently take speculative positions.

Furthermore, Geczy et al. (2007) propose that firms have various determinants of risk management policy through their derivatives position. They describe the causes of speculative behavior in the derivatives market as follows. First, speculators are likely to enjoy an advantageous position in terms of access to information, and therefore tend to have a blind belief. Second, speculators depend on the speculative position to maximize their compensation. In particular, when the stock sensitivity of compensation (Delta) is elevated, the speculative tendency becomes stronger.\(^9\) Finally, operations without a monitoring and control system allow the manager's speculative activities, and thus a weak governance system is a main determinant of a firm's risk-taking activities.

Many researchers provide evidence that a firm's risk management behavior and its earnings management have a certain relevance to each other. In particular, Fonseca and González (2008) report that numerous constrained conditions such as investor protection and regulation and supervision of banks lead to firms' mitigating their risk-taking behavior, and that this ultimately discourages the firm's earnings management behavior. Furthermore, Fang et al. (2014) find that banks' risk-taking activities change according to the level of bank reforms, and propose that earnings quality deteriorates due to increasing risk exposure level. These empirical results support the idea that banks are likely to manage their performance in order to hide

\(^9\) Delta is the sum of the option's realizable and unrealizable delta, which is derived from Black–Scholes option pricing, modified by Merton (1973). This measures wealth sensitivity of stock value based on a 1% stock price change (Geczy et al. (2007)).
risk-taking activities.

Also, prior literature provides evidence that derivatives usage of firms is related to their earnings management behavior. Barton (2001), and Pincus and Rajgopal (2002) report that discretionary accruals as a proxy of earnings management is negatively related to derivatives usage. Both papers report that the firm’s hedge position and earnings management are related as substitutes for earnings smoothing. Nan et al. (2007) also investigate the relationship between the firm’s hedging activities and earnings management. Adopting the mean-preserving spread structure, they conclude that if the hedging decision is contractible, the hedge position enhances the firm’s efficiency since it mitigates the equilibrium amount between risk premium and earnings management, decreasing the deadweight loss by earnings management as well.

Thus, based on previous evidence, our paper suggests the main hypothesis as follows:

Hypothesis 1> A firm’s risk-taking activities are likely to reinforce its earnings management behavior.

III. Methodology

3.1 Firm’s Risk Management Behavior Variable

Guay (1999) investigates whether firms use derivatives to increase or reduce their financial risk by examining changes in diverse risk measurements. He presents that after the use of derivatives, exposure to foreign currency exchange and interest rate risks significantly diminishes, and he concludes that firms
generally use derivatives in order to achieve risk hedge rather than to speculate. In addition, Zhang (2007) claims that firms are identified as effective hedge firms (EHF) if their risk exposure decreases after derivatives usage, and they are considered ineffective or speculative firms (ISF) if their risk exposure increases, following Guay (1999)’s methodology. Both judge a firm’s risk management behavior by observing the change in risk exposure after derivatives usage. In particular, Zhang (2007) examines the change in risk management behavior for ISF and EHF before and after the adoption of SFAS no.133, which is related to the accounting treatment of derivatives. To discern risk management behavior by derivatives usage, we follow the methodology suggested by Guay (1999) and Zhang (2007): If the firm’s risk exposure increases after using derivatives, we identify it as ISF, and if its risk exposure decreases, we identify it as EHF.

To identify the firm’s risk management behavior following the previous research by Guay (1999) and Zhang (2007), we measure the systematic risk, interest rate risk exposure, and foreign currency exchange rate risk exposure. Thus, we propose models (2), (3), and (4), using the coefficient value measured in model (1) to determine the level of the individual firm's risk exposure, as follows:

1. Systematic Risk Exposure: The absolute value of the estimated coefficient from a regression of the firm’s monthly stock returns on the monthly percentage change in the KOSPI index.

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10 In this paper, we exclude the commodity price risk exposure since we have a limitation in finding an appropriate proxy for commodity price risk. Thus, we adopt foreign exchange risk and interest risk as macro-risk exposure factors in terms of derivatives usage following Zhang (2007). Also, we add the systematic risk as another macro-risk exposure factor in terms of derivatives usage.
Interest Rate Risk Exposure: The absolute value of the estimated coefficient from a regression of the firm’s monthly stock returns on the monthly percentage change in the Treasury bond yield in Korea.

Foreign Currency Exchange Rate Risk Exposure: The absolute value of the estimated coefficient from a regression of the firm’s monthly stock returns on the monthly percentage change in the won/dollar index

\[ R_{it} = \alpha_0 + \alpha_1 R_{mt} + \alpha_2 Macro_{it} + \varepsilon_{it} \]

Model (1)

By using model (1) suggested above, we construct the systematic risk exposure to be implemented in the models, as a dependent variable.

\[
SYS_{EXP_i} = \gamma_{com,0} + \gamma_{com,1} RET\_VOL_i + \gamma_{COM,2} BM_i + \gamma_{COM,3} SIZE_i + \gamma_{COM,4} LEV_i + \gamma_{COM,5} SINVEST_i + \varepsilon_{it}
\]

Model (2)

\[
INT_{EXP_i} = \gamma_0 + \gamma_{INT,1} EXP\_IND_i + \gamma_{INT,2} RET\_VOL_i + \gamma_{INT,3} BM_i + \gamma_{INT,4} SIZE_i + \gamma_{INT,5} LEV_i + \gamma_{INT,6} SINVEST_i + \varepsilon_{it}
\]

Model (3)

\[
FX_{EXP_i} = \gamma_{fx,0} + \gamma_{fx,1} EXP\_IND_i + \gamma_{fx,2} RET\_VOL_i + \gamma_{fx,3} BM_i + \gamma_{fx,4} SIZE_i + \gamma_{fx,5} FSHARE_i + \varepsilon_{it}
\]

Model (4)

\[ MBETA_{it} \quad : \text{firm's systematic risk exposure of firm } j \text{ at year } t \]

\[ FXBETA_{it} \quad : \text{foreign currency exchange rate risk exposure of firm } j \text{ at year } t \]
As defined by Zhang (2007), we identify ISF if they are represented with a positive value (+) for residuals ($\varepsilon$) from models (2), (3), and (4). On the other hand, firms with a negative value for residuals are denoted as EHF. Thus, we classify the ISF and EHF based on the estimated results.

### 3.2 Discretionary Accruals (Modified Jones Model 1995; Kothari Model 2005)

This paper has adopted the modified Jones Model suggested in Kothari et al. (2005) to estimate the firm’s earnings management behavior as follows:

$$DisAcc_{it} = (TA_{it}/A_{it-1}) - (\beta_0 \left( \frac{1}{A_{it-1}} \right) + \beta_1 \left[ \frac{\Delta RETVol_{it} - \Delta REC_{it}}{A_{it-1}} \right] + \beta_2 \left[ \frac{PPE_{it}}{A_{it-1}} \right] + \beta_3 \text{lagged}(ROA_{it-1})$$

Model (5)

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11 Kothari et al. (2005) provide the discretionary accruals by adding the firm performance factor based on the modified Jones model. We also measure non-discretionary accruals (NDA) and then subtract NDA from the total accruals. The final measure of the discretionary accruals (DA) takes absolute value for each firm at $t$ ($DisAcc_{it}$).
\( \text{DisAcc}_{it} \): Absolute Discretionary accruals for firm \( i \) at year \( t \) by using Kothari et al.’s (2005) model

\( \text{TACC}_{it-1} \): Total accruals for firm \( i \) at year \( t-1 \)

\( \Delta \text{REV}_{it} \): Change of sales at year \( t \): \( t-(t-1) \)

\( \Delta \text{REC}_{it} \): Change of account receivable at year \( t \): \( t-(t-1) \)

\( \text{PPE}_{it} \): PPE for company \( i \) at year \( t \)

\( \text{lagged}(\text{ROA})_{it-1} \): Profitability of total assets: NI/TA

\( A_{it-1} \): Total assets at year \( t-1 \)

We produce non-discretionary accruals from firm-specific industry observation and cross-sectional analysis from 2001 to 2012, since the instability of time-series is likely to be deteriorated during the 2000s. If we estimate the non-discretionary accruals by a time-series model, the coefficient is likely to be biased. Thus, we need to protect this econometric problem by following DeFond and Jiambalvo’s (1994), and Subramanyam’s (1996) models\(^{12}\).

### 3.3 Research Model

We set models (3) and (4) to show the relation between the firm’s risk-taking behavior and earnings management as follows:\(^{13}\)

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\(^{12}\) The coefficients estimated from the regression are applied to models (1) and (2) in order to measure discretionary accruals. The estimated absolute value is then used to gauge the level of earnings management.

\(^{13}\) The panel regression for panel data is a useful method to control the heterogeneity of accounting quality for individual firm \( i \) and dynamic change for the firm’s accounting quality. The fixed-effect model assumes that the slope parameter of explanatory variables is fixed throughout the period and across the firms, and individual firm’s accounting quality level
\[
\text{DisAcc}_{i,t} = \alpha_0 + \alpha_1 MBETA_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 LEV_{i,t-1} + \alpha_4 SINVES_{i,t} + \alpha_5 MB_{i,t} + \alpha_6 CFO_{i,t} \\
+ \alpha_7 NWC_{i,t} + \alpha_8 RNDEXP_{i,t} + \alpha_9 PAYOUT_{i,t} + \epsilon_{i,t}
\]

Model (6)

\[
\text{DisAcc}_{i,t} = \alpha_0 + \alpha_1 FXBETA_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 LEV_{i,t-1} + \alpha_4 SINVES_{i,t} + \alpha_5 MB_{i,t} + \alpha_6 CFO_{i,t} \\
+ \alpha_7 NWC_{i,t} + \alpha_8 RNDEXP_{i,t} + \alpha_9 PAYOUT_{i,t} + \epsilon_{i,t}
\]

Model (7)

\[
\text{DisAcc}_{i,t} = \alpha_0 + \alpha_1 INTBETA_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 LEV_{i,t-1} + \alpha_4 SINVES_{i,t} + \alpha_5 MB_{i,t} + \alpha_6 CFO_{i,t} \\
+ \alpha_7 NWC_{i,t} + \alpha_8 RNDEXP_{i,t} + \alpha_9 PAYOUT_{i,t} + \epsilon_{i,t}
\]

Model (8)

\[
\text{DisAcc}_{i,t} : \text{Discretionary accruals for firm } i \text{ at year } t \text{ by using Kothari et al.'s (2005) model}
\]

\[
MBETA_{i,t} : \text{Firm’s systematic risk exposure of firm } j \text{ at year } t
\]

\[
FXBETA_{i,t} : \text{Foreign currency exchange rate risk exposure of firm } j \text{ at year } t
\]

\[
INTBETA_{i,t} : \text{Interest rate risk exposure of firm } j \text{ at year } t
\]

\[
SIZE_{i,t} : \text{the log value of market value of firm } j \text{ at year } t
\]

\[
LEV_{i,t} : \text{the total debts divided by total assets of firm } j \text{ at year } t
\]

\[
SINVES_{i,t} : \text{the total short-term investment of firm } j \text{ at year } t
\]

\[
MB_{i,t} : \text{the market value of the equity divided by the book value of equity of firm } j \text{ at year } t
\]

\[
CFO_{i,t} : \text{the operating cash flow of firm } j \text{ at year } t
\]

\[
NWC_{i,t} : \text{the networking capital of firm } j \text{ at year } t
\]

\[
RNDEXP_{i,t} : \text{the research and development expenses of firm } j \text{ at year } t
\]

\[
PAYOUT_{i,t} : \text{the dividend ratio of firm } j \text{ at } t
\]

\[
\epsilon_{i,t} : \text{the residual value of firm } i \text{ at } t
\]

Our main variables included in the models are as follows: first, we use the (intercept) differs, whereas the random-effect model assumes that intercept difference is stochastic relation.
DisACC_{it} as a dependent variable to show their relation to the risk-taking behavior at time t (MBETA_{it}, FXBETA_{it}, INTBETA_{it}). MBETA_{it}, FXBETA_{it}, and INTBETA_{it} represent the level of risk-taking behavior as our main interest variables. In addition, we add the control variables (SIZE_{t}, MB_{t}, LEV_{t}, SINVES_{t}, CFO_{t}, PAYOUT_{t}, NWC_{t}, and RNDEXP_{t}), which are regarded as the determinants of earnings management. SIZE_{t} represents the firm’s size at time t. Since large firms are likely to have a stronger monitoring system compared to small firms, we expect SIZE_{t} to show a negative (+) relation with earnings management. MB_{t} is the market to book ratio, in that higher MB_{t} is more likely to have higher growth. In general, growth firms are likely to manage their earnings. Therefore, we expect MB_{t} to be positively related to earnings management. LEV_{t} represents the firm’s financial stability (leverage) at time t. Since higher leverage is likely to lead to higher financial risk, we expect LEV_{t} to be positively associated with the firm’s earnings management. SINVES_{t} represents the firm’s profitability at time t. With higher profitability related to stable financial conditions, we expect a negative sign with crash risk. CFO_{t} represents operating cash flow, regarded as one of the determinants for the current earnings management. We also suggest NWC_{t}, RNDEXP_{t}, PAYOUT_{t} as the proxy for financial transparency.

IV. Sample and Results

4.1 Sample

Our research data includes listed firms on Korea's KOSPI and KOSDAQ stock markets from the year 2001 to 2012 as shown in <Table 1>. A firm is excluded from the sample if it is in the financial industry and if its fiscal year does not end on December 31. The reason for such exclusion is that firms in the
financial sector differ from those in other industries.\textsuperscript{14} In addition, since the test requires consistency in measurement time, we only include firms whose fiscal year ends on December 31. Furthermore, we only include sample firms that used derivatives during the research period. Finally, the total sample firm–year observations are (N=3,645). We also suggest the statistics in Table 1 as follows:

\begin{table}[h]
\centering
\caption{Table 1}
\end{table}

### 4.2 Empirical Results

The empirical results confirm our hypothesis that firms’ risk-taking behavior is likely to be related to earnings management behavior. Table 2 provides the results of the correlation analysis for the main variables. First, as dependent variables, $MBETA_t$, $FBETA_t$, and $INTBETA_t$ are positively (+) related with $DisAcc_t$. This indicates that the firm’s risk-taking behavior is likely to stimulate its earnings management behavior. For the control variables, the firm size ($SIZE_t$) and operating cash flow ($CFO_t$), and payout ratio ($PAYOUT_t$) are the main causes of the firm’s reduced earnings management behavior. On the other hand, the firm’s leverage ($LEV_t$) and short investment behavior ($SINES_t$) are positively (+) related to its earnings management.

\begin{table}[h]
\centering
\caption{Table 2}
\end{table}

\textsuperscript{14} Before the adoption of K–IFRS in 2011, the reporting system is used to differentiate between general manufacturing firms and financial firms. However, the adoption of K–IFRS has made it impossible to identify the gap between general manufacturing firms and financial firms since K–IFRS does not provide special accounting rules for financial firms.
<Table 3> suggests the effect of the firm’s risk-taking behavior through derivatives usage on its earnings management during the research period. First, we describe in Panel A of <Table 3> the result of adopting panel regression to control the model’s random-effect. Column (1) of Panel A in <Table 3> shows a positive coefficient value of \( MBETA_t \) (risk-taking behavior by market beta), presenting the firm’s risk-taking behavior on \( DisAcc_t \) (Discretionary Accruals) (i> Coef: 0.005, t-value: 1.620, ii> Coef: 0.004, t-value: 1.480). In addition, Column (2) reports the panel regression result with regards to controlled random-effect. It presents a significant positive coefficient of \( FXBETA_t \) (Beta of macro factor by FX) on the firm’s earnings management (i> Coef: 0.008, t-value: 2.760, ii> Coef: 0.008, t-value: 2.620). Column (3) reports the result of using \( INTBETA_t \) (Beta of macro factor by interest) as a proxy for the firm’s risk-taking behavior; it shows a positive relation with \( DisAcc_t \) (i> Coef: 0.006, t-value: 2.030, ii> Coef: 0.006, t-value: 1.870). All this evidence indicates that the firm’s risk-taking behavior stimulates its earnings management.

Second, we describe in Panel B of <Table 3> the result of adopting panel regression to solve the fixed-effect problem in the model. Column (1) of Panel B in <Table 3> shows a positive coefficient value of \( MBETA_t \) as the variable for the firm’s risk-taking behavior on \( DisAcc_t \) (Discretionary Accruals) (i> Coef: 0.006, t-value: 1.890, ii> Coef: 0.006, t-value: 1.860). Furthermore, Column (2) reports the result of the panel regression with controlled fixed-effect, with a significant positive coefficient of \( FXBETA_t \) (Beta of macro factor by FX) on the firm’s earnings management (i> Coef: 0.010, t-value: 3.110, ii> Coef: 0.009, t-value: 3.070). Column (3) reports the result of using \( INTBETA_t \) (Beta of macro factor by interest) as a proxy for the firm’s risk-taking behavior; it shows a positive relation with \( DisAcc_t \) (i> Coef: 0.007, t-value: 2.350, ii> Coef: 0.007, t-value: 2.290). This result is almost similar to that of Panel A.

The results shown in Panel A and B of <Table 3> indicate that the firm’s
risk-taking behavior through derivatives usage increases its earnings management. Thus, this supports our hypothesis that the firm’s risk-taking behavior is likely to stimulate its earnings management since firms have a significant motivation for earnings management in order to hide their risk-taking activities through derivatives usage.

<Table 3>

V. Additional Tests

5.1 Impact of Financial Crisis

We attempt an additional test to discern the effect of the financial crisis in 2008 on the firm’s risk-taking behavior and earnings management since we expect the crisis is likely to change the firm’s risk-taking behavior. Furthermore, <Figure 1> to <Figure 3> in section IV show a significant difference between the periods before and after the crisis. Thus, we attempt to identify the effect of the financial crisis on the relation between the firm’s risk-taking behavior and its earnings management. Accordingly, we add models (9), (10) and (11) as follows:

\[
\text{DisAcc}_{it} = \alpha_0 + \alpha_1MB_{A,t} + \alpha_2MBETA * CR\_I_{it} + \alpha_3\text{SIZE}_{it} + \alpha_4\text{LEV}_{it} + \alpha_5\text{SINVES}_{it} + \alpha_6\text{MB}_{lt} + \alpha_7\text{CFO}_{it} + \alpha_8\text{NWC}_{it} + \alpha_9\text{RNDEXP}_{it} + \alpha_{10}\text{PAYOUT}_{it} + \epsilon_{it}
\]

Model (9)

\[
\text{DisAcc}_{lt} = \alpha_0 + \alpha_1FX\_BETA_{it} + \alpha_2FX\_BETA * CR\_I_{it} + \alpha_3\text{SIZE}_{it} + \alpha_4\text{LEV}_{it} + \alpha_5\text{SINVES}_{it} + \alpha_6\text{MB}_{lt} + \alpha_7\text{CFO}_{it} + \alpha_8\text{NWC}_{it} + \alpha_9\text{RNDEXP}_{it} + \alpha_{10}\text{PAYOUT}_{it} + \epsilon_{it}
\]

Model (10)
Model (10)

\[
\text{DisAcc}_{jt} = \alpha_0 + \alpha_1 \text{INTBETA}_{jt} + \alpha_2 \text{INTBETA} \times \text{CRI}_{jt} + \alpha_3 \text{SIZE}_{jt} + \alpha_4 \text{LEV}_{jt} + \alpha_5 \text{SINVES}_{jt} + \alpha_6 \text{MB}_{jt} + \alpha_7 \text{CFO}_{jt} + \alpha_8 \text{NWC}_{jt} + \alpha_9 \text{RNDEXP}_{jt} + \alpha_{10} \text{PAYOUT}_{jt} + \epsilon_{jt}
\]

Model (11)

\[
\text{MATR}_{jt} = \beta_0 + \beta_1 \text{FXBETA} \times \text{CRI}_{jt} + \beta_2 \text{INTBETA} \times \text{CRI}_{jt} + \beta_3 \text{SIZE}_{jt} + \beta_4 \text{LEV}_{jt} + \beta_5 \text{SINVES}_{jt} + \beta_6 \text{MB}_{jt} + \beta_7 \text{CFO}_{jt} + \beta_8 \text{NWC}_{jt} + \beta_9 \text{RNDEXP}_{jt} + \beta_{10} \text{PAYOUT}_{jt} + \epsilon_{jt}
\]

Table 4 shows the sole impact of the financial crisis in 2008 on the firm’s risk-taking behavior and earnings management. First, Panel A of Table 4 provides the result of panel regression implemented to control the model’s random-effect. Column (1) of Panel A in Table 4 presents a negative coefficient value of \( \text{MBETA} \times \text{CRI}_{jt} \), an interaction term of market beta and financial crisis on \( \text{DisAcc}_{jt} \) (Discretionary Accruals) (i> Coef: \(-0.009\), t-value: \(-2.100\), ii> Coef: \(-0.004\), t-value: \(-0.890\)). In addition, Column (2) reports the panel regression result, which shows a significant negative coefficient value of \( \text{FXBETA} \times \text{CRI}_{jt} \) (interaction term of Beta of macro factor by FX and financial crisis) on the firm’s earnings management (i> Coef: \(-0.010\), t-value: \(-2.390\), ii> Coef: \(-0.005\), t-value: \(-1.119\)). Column (3) reports the result of using \( \text{INTBETA} \times \text{CRI}_{jt} \) (interaction term of Beta of macro factor by interest and financial crisis) on the firm’s earnings management behavior, which shows a negative relation with \( \text{DisAcc}_{jt} \) (i> Coef: \(-0.006\), t-value: \(-1.390\), ii> Coef: \(-0.001\), t-value: 0.200). Therefore, we can infer that the enforcement of risk aversion after the 2008 financial crisis affects the relation between the firm’s risk-taking behavior and earnings management.\(^{15}\)

\(^{15}\) Unfortunately, the aftermath of the financial crisis in 2008 is not likely to affect the relation between firm’s risk management behavior and earnings management significantly.
Panel B of <Table 4> reports the result of panel regression, implemented to control the model’s fixed-effect. Column (1) of Panel A in <Table 4> presents a negative coefficient of $MBETA * CRI_t$, an interaction term of risk-taking behavior by market beta and financial crisis on $DisAcc_t$ (Discretionary Accruals) (i> Coef: $-0.010$, t-value: $-2.340$, ii> Coef: $-0.003$, t-value: $-0.620$). In addition, Column (2) reports the result of the panel regression with a significant negative coefficient value of $FXBETA * CRI_t$ (interaction term of Beta of macro factor by FX and financial crisis) on the firm’s earnings management (i> Coef: $-0.012$, t-value: $-2.710$, ii> Coef: $-0.005$, t-value: $-1.050$). Column (3) reports the result of using $INTBETA * CRI_t$ (interaction term of Beta of macro factor by interest and financial crisis) on the firm’s earnings management behavior, which shows a negative relation with $DisAcc_t$ (i> Coef: $-0.008$, t-value: $-1.750$, ii> Coef: $0.000$, t-value: $-0.070$). Therefore, similarly with the results of Panel A, we can infer that the enforcement of risk-aversion after the 2008 financial crisis affects the relation between the firm’s risk-taking behavior and earnings management. This is as we expected from Figures (2), (3), and (4).

5.2 Accruals Quality & Risk-taking Activities

We add a test to investigate the relation between risk-taking behavior and
accruals quality as a proxy of the firm’s financial reporting quality\textsuperscript{16}. In general, discretionary accruals and accruals quality are reported to have similar qualities in the existing literature, and so we expect similar empirical results with our main regression provided in section IV.

\begin{equation}
\text{AccQ}_{it} = \alpha_0 + \alpha_1 MBETA_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 SINVES_{it} + \alpha_5 MB_{it} + \alpha_6 CFO_{it} + \alpha_7 NWC_{it} + \alpha_8 \text{RNDEXP}_{it} + \alpha_9 \text{PAYOUT}_{it} + \epsilon_{it}
\end{equation}

Model (12)

\begin{equation}
\text{AccQ}_{it} = \alpha_0 + \alpha_1 FXBETA_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 SINVES_{it} + \alpha_5 MB_{it} + \alpha_6 CFO_{it} + \alpha_7 NWC_{it} + \alpha_8 \text{RNDEXP}_{it} + \alpha_9 \text{PAYOUT}_{it} + \epsilon_{it}
\end{equation}

Model (13)

\begin{equation}
\text{AccQ}_{it} = \alpha_0 + \alpha_1 INTBETA_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 SINVES_{it} + \alpha_5 MB_{it} + \alpha_6 CFO_{it} + \alpha_7 NWC_{it} + \alpha_8 \text{RNDEXP}_{it} + \alpha_9 \text{PAYOUT}_{it} + \epsilon_{it}
\end{equation}

Model (14)

\textsuperscript{16} We adopt the model employed in Dechow and Dichev (2002) in order to estimate accruals quality. We use the standard deviation of discretionary accruals over the period of 5 years. Dechow and Dichev (2002) argue that accruals quality is determined by the variation and uncertainty of accruals for a multi-period. The accruals value for working capital is used for the regression on the prior, current, and posterior period's cash flow. The unexplained portion in the equation is in a negative relation with accruals quality. Francis et al. (2005) argue that accruals quality fundamentally includes comprehensive uncertainty of accruals. They also suggest that Dechow and Dichev’s model may not precisely provide the total accruals because there can be effects from the past in the relation between non-current and realized cash flow. Therefore, we adopt the modified Dechow and Dichev model (McNichols 2002; Francis et al. 2005).

\begin{equation}
\frac{TCA_{it}}{\text{Assets}_{it}} = \varphi_{0,i} + \varphi_{1,i} \frac{CFO_{it-1}}{\text{Assets}_{it}} + \varphi_{2,i} \frac{CFO_{it}}{\text{Assets}_{it}} + \varphi_{3,i} \frac{CFO_{it+1}}{\text{Assets}_{it}} + \varphi_{4,i} \Delta REV_{it} + \varphi_{5,i} PPE_{it} + v_{it}
\end{equation}
<Table 5> suggests the effect of the firm’s risk-taking behavior through derivatives usage on its accruals quality instead of discretionary accruals. First, Panel A of <Table 5> provides the result of adopting the panel regression to control the model’s random-effect. Column (1) of Panel A in <Table 5> shows a positive coefficient of $MBE_{t}$ (risk-taking behavior by market beta), representing the firm’s risk-taking behavior on $Acc_{t}$ (Accruals quality) (i> Coef: 0.002, t-value: 0.500). In addition, Column (2) reports the result of the panel regression with a positive coefficient of $FXB_{t}$ (Beta of macro factor by FX) on the firm’s earnings management (i> Coef: 0.002, t-value: 0.570). Column (3) reports the result of using $INTB_{t}$ (Beta of macro factor by interest) as a proxy for the firm’s risk-taking behavior; it shows a positive relation with $DisAcc_{t}$ (i> Coef: 0.000, t-value: 0.000). Contrary to the results in section IV, however, these results from Column (1) to (3) do not strongly support the relation between risk-taking behavior and firm’s accruals quality.

Second, Panel B of <Table 5> shows the result of adopting the panel regression to solve the fixed-effect problem in the model. Column (1) of Panel B in <Table 5> shows a positive coefficient of $MBE_{t}$ as the variable for firm’s risk-taking behavior on $Acc_{t}$ (Accruals Quality) (i> Coef: 0.007, t-value: 1.610). Furthermore, Column (2) reports the result of the panel regression to control fixed-effect, which shows a positive coefficient of $FXB_{t}$ (Beta of macro factor by FX) on the firm’s accruals quality (i> Coef: 0.006, t-value: 1.410). Column (3) reports the result of using $INTB_{t}$ (Beta of macro factor by interest) as a proxy for the firm’s risk-taking behavior; it shows a positive relation with $Acc_{t}$ (i> Coef: 0.004, t-value: 1.000). These results from Column (1) to (3) in Panel B also do not strongly identify the relation between risk-taking behavior and the firm’s accruals quality.
In this paper, we select only firms that use derivatives to classify the firm’s risk management behavior. Thus, we adopt the inverse Mill’s ratio\textsuperscript{17} to control the sampling bias problems from our research data.

\begin{table}[h]
\centering
\caption{Table 6}
\end{table}

\textit{Table 6} suggests the result, derived by controlling sampling bias problems through the inverse Mills ratio on the effect of the firm’s risk-taking behavior through derivatives usage on its earnings management behavior. First, we provide in Panel A of \textit{Table 6} the result of adopting the panel regression to control the model’s random-effect, including the inverse Mills ratio in the model. Column (1) of Panel A in \textit{Table 6} presents a positive coefficient of $MBETA_t$ (risk-taking behavior by market beta), representing the firm’s risk-taking behavior on $DisAcc_t$ (Discretionary Accruals) ($\hat{\text{Coef}}: 0.004, t$-value: 1.500). In addition, Column (2) reports the result of the panel regression with a positive coefficient of $FXBETA_t$ (Beta of macro factor by FX) on the firm’s earnings

\textsuperscript{17}Inverse Mills ratio represents the ratio of the probability density function to the cumulative distribution function of a distribution. The inverse Mills ratio is to solve a possible selection bias in regression analysis. Heckman (1979) provides a two-stage estimation through the inverse Mills ratio to control the selection bias. First, a dependent variable for the first regression is supposed to be modeled with a probit model. Also, the probit model requires that the error-term generates a standard normal distribution. Second, the estimated parameters are applied to measure the inverse Mills ratio. Finally, the measure is supposed to be included in the main regression model as an additional explanatory variable.
management (i> Coef: 0.008, t-value: 2.630). Column (3) reports the result of using $INTBETA_t$ (Beta of macro factor by interest) as a proxy for the firm’s risk-taking behavior; it shows a positive relation with $DisAcc_t$ (i> Coef: 0.006, t-value: 1.880). Fortunately, our results as suggested in <Table 6> are consistent with the main analysis in <Table 3>, even with controlling the sampling bias problems by using the inverse Mills ratio.

Second, we describe in Panel B of <Table 5> the result of adopting the panel regression to solve the fixed-effect problem in the model. Column (1) of Panel B in <Table 5> shows a positive coefficient of $MBETA_t$ as the variable for firm’s risk-taking behavior on $DisAcc_t$ (Discretionary Accruals) (i> Coef: 0.006, t-value: 1.880). Furthermore, Column (2) reports the result of the panel regression to control fixed-effect, which shows a positive coefficient of $FXBETA_t$ (Beta of macro factor by FX) on the firm’s accruals quality (i> Coef: 0.010, t-value: 3.080). Column (3) reports the result of using $INTBETA_t$ (Beta of macro factor by interest) as a proxy for the firm’s risk-taking behavior; it shows a positive relation with $AccQ_t$ (i> Coef: 0.007, t-value: 2.310). These results from Column (1) to (3) in Panel B also identify the relation between the firm’s risk-taking and earnings management behavior.

VI. Conclusion

We attempt to identify a possible relation between the firm’s risk-taking behavior through derivatives usage and earnings management during the research period. Fonseca and González (2008), and Fang et al. (2014) report that constrained conditions such as investor protection, regulation, and supervision on banks lead to mitigation of risk-taking behavior. This effect ultimately reduces the firm’s earnings management behavior. In addition, investigating the relation between firms’ hedging activities and earnings management, Nan et al. (2007) infer
that if the decision to hedge is contractible, the hedge position enhances the firm’s efficiency since it mitigates the equilibrium amount between risk premium and earnings management, decreasing the deadweight loss by earnings management as well. Thus, following this evidence, we investigated the relation between risk-taking activities by derivatives usage and earnings management.

From our research, we offer numerous contributions and empirical results as follows: First, we attempt to identify the relation between the firm’s risk-taking activities, defined by Zhang (2007)’s methodology, and earnings management. Our comprehensive results show a positive (+) relation between the firm’s risk-taking activities and earnings management, suggesting that the firms engage in earnings management to hide their risk-taking activities. Second, we investigate the effect of the financial crisis in 2008 on the relation between firm’s risk-taking activities and earnings management. The result shows a negative relationship between them, indicating that the firms have mitigated their risk-taking activities after the 2008 financial crisis. Thus, this trend is likely to discourage earnings management activities.

[References]


Kang, B. and H. Lee, 2011, The Global Financial Crisis and Qualitative Change in


We divide the research period as the first period and the second period to indentify the effect of financial crisis on the firm’s risk management based on market beta. The red broken line trend represents the pattern of DisAcc’s mean from 2001 to 2007. And, the green broken line trend indicates the pattern of DisAcc from 2008 to 2012. The second period is slightly lower than the first period, since firms try to change their risk management behavior after the financial crisis. Thus, we can assume that financial crisis in 2008 is likely to affect the relation of firm’s risk management and earning’s management.
We divide the research period as the first period and the second period to indentify the effect of financial crisis on the firm’s risk management based on FX beta. The red broken line trend represents the pattern of DisAcc’s mean from 2001 to 2007. And, the green broken line trend indicates the pattern of DisAcc from 2008 to 2012. The second period is slightly lower than the first period, since firms try to change their risk management behavior after the financial crisis. Thus, we can assume that financial crisis in 2008 is likely to affect the relation of firm’s risk management and earning’s management.
We divide the research period as first period and second period to identify the effect of financial crisis on the firm’s risk management based on Interest beta. The solid line trend represents the pattern of DisAcc’s mean from 2001 to 2007. And, the long broken line trend indicates the pattern of DisAcc from 2008 to 2012. The second period is slightly lower than first period, since firms try to change their risk management behavior after financial crisis. Thus, we can assume that financial crisis in 2008 is likely to affect the relation of firm’s risk management and earning’s management.
<Table 1: Descriptive of Main Variables>

<table>
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<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
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<th>Max</th>
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<td>DisAcc_{it}</td>
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<td>0.082</td>
<td>0.104</td>
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<td>SIZE_{it}</td>
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<td>1.826</td>
<td>5.361</td>
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<tr>
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<td>MB_{it}</td>
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<td>11.361</td>
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</tr>
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<td>CFORATIO_{it}</td>
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<td>0.000</td>
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<td>DIVRATIO_{it}</td>
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<td>0.007</td>
<td>0.010</td>
<td>0.000</td>
<td>0.132</td>
</tr>
</tbody>
</table>

This table shows descriptive statistics for the variables used in the main regression analyses. The number of the sample based on research data for the main dependent variables (DisAcc) is 4,038 firm-year observations from 2001 to 2012. Also, we exclude the value of non-useful information such as the main independent variable DisAcc.

<Table 5: Additional Table (AQ)>
<Panel A: Random-Effect Panel Regression>

<table>
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<tr>
<th>Xtreg</th>
<th>Market Beta</th>
<th>FX Beta</th>
<th>INT Beta</th>
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<tr>
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<td>Tvalue</td>
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<td>-0.007</td>
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<tr>
<td>LEV_{it}</td>
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<td>0.057</td>
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<tr>
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<td>-0.099</td>
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<td>0.000</td>
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<td>DIVRATIO_{it}</td>
<td>0.225</td>
<td>0.840</td>
<td>0.226</td>
</tr>
</tbody>
</table>

Wald Chi | 44.930 | 44.910 | 44.640 |
Rsqure | 0.009 | 0.009 | 0.008 |
NofObs | 3274 | 3274 | 3274 |
This table presents results from the regression analyses (H1) of the effect of risk management behavior on firm’s earnings management. Our main independent variables are classified as MBETA_M, MBETA_FX and MBETA_INT for the dependable variable AQ. Across all of the regressions, we take N=3,274 for model (12), (13) and (14) using firm-year observations from 2001 to 2012. We suggest coefficient estimates with t-value, only significant if t-value>12. Column 1 in Panel A shows the coefficient value of random-effect panel regression, wherein the independent variable is MBETA_M as the proxy of firm’s risk management behavior, with the main independent variable AQ, representing firm’s accruals quality instead of earnings management behavior. Column 2 and 3 in panel A present the results from similar regression analyses as Column 1 with firm’s risk management behavior estimated with FX and INT. Column 1 in Panel B shows the coefficient value of fixed-effect panel regression, wherein the independent variable is MBETA_M as the proxy of firm’s risk management behavior, with the main independent variable AQ, representing firm’s accruals quality instead of earnings management behavior. Column 2 and 3 in panel B present the results from similar regression analyses as Column 1 with firm’s risk management behavior estimated with FX and INT.
This table presents results from the regression analyses (H1) of the effect of risk management behavior on firm’s earnings management. In fact, our sample takes into
account only the firms that use the derivative instrument to classify the firm’s risk management behavior. Thus, it is likely to create sampling problems. In this table, we show the results that include the Inverse–Mill’s ratio to fix our sampling problems. Also, our main independent variables are classified as MBETA_M, MBETA_FX and MBETA_INT for the dependable variable DisAcc. Across all of the regressions, we take N=3,274 for model (6), (7) and (8) added Inverse–Mill’s ratio by using firm–year observations from 2001 to 2012. We suggest coefficient estimates with t–value, only significant if t–value>|2|. Column 1 in Panel A shows the coefficient value of random–effect panel regression, wherein the independent variable is MBETA_M as the proxy of firm’s risk management behavior, with the main independent variable AQ, representing firm’s accruals quality instead of earnings management behavior. Column 2 and 3 in panel A present the results from similar regression analyses as Column 1 with firm’s risk management behavior estimated with FX and INT. Column 1 in Panel B shows the coefficient value of fixed–effect panel regression, wherein the independent variable is MBETA_M as the proxy of firm’s risk management behavior, with the main independent variable DisAcc, representing firm’s earnings management behavior. Column 2 and 3 in panel B present the results from similar regression analyses as Column 1 with firm’s risk management behavior estimated with FX and INT.
**Table 3: Main Table**

**Panel A: Random Effect Panel Regression**

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<th>Tvalue</th>
<th>Coef</th>
<th>Tvalue</th>
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<tr>
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<td>0.0347</td>
<td>0.0532</td>
<td>0.0333</td>
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<tr>
<td>NofObs</td>
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</table>
### <Panel B: Random Effect Panel Regression>

<table>
<thead>
<tr>
<th></th>
<th>Market Beta</th>
<th>FX Beta</th>
<th>INT Beta</th>
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<tbody>
<tr>
<td></td>
<td>Coef</td>
<td>Tvalue</td>
<td>Coef</td>
</tr>
<tr>
<td><strong>DisAcc</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MRISK_{it}</strong></td>
<td>0.006</td>
<td>1.890</td>
<td>0.010</td>
</tr>
<tr>
<td><strong>SIZE_{it}</strong></td>
<td>0.003</td>
<td>1.100</td>
<td>0.003</td>
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<tr>
<td><strong>LEV_{it}</strong></td>
<td>0.143</td>
<td>9.160</td>
<td>0.144</td>
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<tr>
<td><strong>SINvEs_{it}</strong></td>
<td>0.197</td>
<td>4.110</td>
<td>0.196</td>
</tr>
<tr>
<td><strong>MB_{it}</strong></td>
<td>0.000</td>
<td>-0.330</td>
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<tr>
<td><strong>CFORATIo_{it}</strong></td>
<td>-0.052</td>
<td>-2.790</td>
<td>-0.051</td>
</tr>
<tr>
<td><strong>NWCRATIo_{it}</strong></td>
<td>0.076</td>
<td>4.370</td>
<td>0.076</td>
</tr>
<tr>
<td><strong>RNDRATIo_{it}</strong></td>
<td>-0.235</td>
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<td>-0.233</td>
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<tr>
<td><strong>DIVRATIo_{it}</strong></td>
<td>0.966</td>
<td>4.140</td>
<td>0.973</td>
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<tr>
<td>Fvalue</td>
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<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Rsquare</td>
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<tr>
<td>NofObs</td>
<td>3645</td>
<td>3645</td>
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</tbody>
</table>

This table presents results from the regression analyses (H1) of the effect of risk management behavior on firm’s earnings management. Our main independent variables are classified as MBETA_M, MBETA_FX and MBETA_INT for the dependable variable DisAcc. Across all of the regressions, we take N=3,274 for model (6), (7) and (8) using firm–year observations from 2001 to 2012. We suggest coefficient estimates with t-value, only significant if t-value>|2|. Column 1 in Panel A shows the coefficient value of random–effect panel regression, wherein the independent variable is MBETA_M as the proxy of firm’s risk management behavior, with the main independent variable DisAcc, representing firm’s earnings management behavior. Column 2 and 3 in panel A present the results from similar regression analyses as Column 1 with firm’s risk management behavior estimated with FX and INT. Column 1 in Panel B shows the coefficient value of fixed–effect panel regression, wherein the independent variable is MBETA_M as the proxy of firm’s risk management behavior, with the main independent variable DisAcc, representing firm’s earnings management behavior. Column 2 and 3 in panel B present the results from similar regression analyses as Column 1 with firm’s risk management behavior estimated with FX and INT.
### Table 4: Additional Table (The Effect of financial crisis in Korea)

### Panel A: Random Effect Panel Regression

<table>
<thead>
<tr>
<th>Xtregr</th>
<th>Market Beta</th>
<th>FX Beta</th>
<th>INT Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef</td>
<td>Tvalue</td>
<td>Coef</td>
</tr>
<tr>
<td>DisAcc</td>
<td></td>
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</tr>
<tr>
<td>MRISK(_{it})</td>
<td>0.010</td>
<td>2.580</td>
<td>0.007</td>
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<tr>
<td>MRISK (* FR(_{it})</td>
<td>-0.009</td>
<td>-2.100</td>
<td>-0.004</td>
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<tr>
<td>SIZE(_{it})</td>
<td>-0.003</td>
<td>-1.670</td>
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<tr>
<td>LEV(_{it})</td>
<td>0.104</td>
<td>8.540</td>
<td>0.171</td>
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<tr>
<td>SINVES(_{it})</td>
<td>0.192</td>
<td>4.770</td>
<td>0.154</td>
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<tr>
<td>MB(_{it})</td>
<td>0.000</td>
<td>-1.380</td>
<td>0.000</td>
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<tr>
<td>CFORATIO(_{it})</td>
<td>-0.076</td>
<td>-4.310</td>
<td>-0.075</td>
</tr>
<tr>
<td>NWCRATIO(_{it})</td>
<td>0.087</td>
<td>6.200</td>
<td>0.086</td>
</tr>
<tr>
<td>RNDRATIO(_{it})</td>
<td>-0.134</td>
<td>-2.250</td>
<td>-0.131</td>
</tr>
<tr>
<td>DIVRATIO(_{it})</td>
<td>0.571</td>
<td>2.770</td>
<td>0.570</td>
</tr>
</tbody>
</table>

| Chi2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |      |        |      |        |      |        |
| Rsquare | 0.034 | 0.051 | 0.037 | 0.053 | 0.034 | 0.052 |      |        |      |        |      |        |
| NofObs | 3645 | 3645 | 3645 | 3645 | 3645 | 3645 |      |        |      |        |      |        |
This table presents results from the regression analyses (H1) of the effect of the financial crisis on the relation of risk management behavior and firm’s earnings management. Our main independent variables are classified as MBETA_M*FR, MBETA_FX*FR and MBETA_INT*FR for the dependable variable DisAcc. Across all of the regressions, we take N=3,274 for model (9), (10) and (11) using firm-year observations from 2001 to 2012. We suggest coefficient estimates with t-value, only significant if t-value>|2|. Column 1 in Panel A shows the coefficient value of random-effect panel regression, wherein the independent variable is MBETA_M*FR as the proxy of firm’s risk management behavior, with the main independent variable DisAcc, representing firm’s earnings management behavior. Column 2 and 3 in panel A present the results from similar regression analyses as Column 1 with firm’s risk management behavior.
estimated with MBETA_FX*FR and MBETA_INT*FR. Column 1 in Panel B shows the coefficient value of fixed-effect panel regression, wherein the independent variable is MBETA_M*FR as the proxy of firm’s risk management behavior, with the main independent variable DisAcc, representing firm’s earnings management behavior. Column 2 and 3 in panel B present the results from similar regression analyses as Column 1 with firm’s risk management behavior estimated with MBETA_FX*FR and MBETA_INT*FR.

<table>
<thead>
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<tbody>
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<td>DisAcc&lt;sub&gt;it&lt;/sub&gt;</td>
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<td>MRISK&lt;sub&gt;M&lt;/sub&gt;&lt;sub&gt;it&lt;/sub&gt;</td>
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<tr>
<td>MRISK&lt;sub&gt;INT&lt;/sub&gt;&lt;sub&gt;it&lt;/sub&gt;</td>
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<td>0.038</td>
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<tr>
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<td>-0.020</td>
<td>-0.015</td>
<td>-0.002</td>
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<td>0.028</td>
<td>0.021</td>
<td>0.030</td>
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<td>0.013</td>
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<td>-0.704</td>
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<td>0.103</td>
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<td>-0.097</td>
<td>-0.095</td>
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<td>0.252</td>
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This table presents results from the Pearson Correlation analysis among the main variables used in the research models. We suggest coefficient estimates, among which the numbers in bold indicate at least 5% level of significance.