Hedging Season: The Effect of Hedging Using Financial Derivatives on Firm Value of Publicly-Listed Non-Financial Firms in the Philippines

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Firms use financial derivatives as a way to hedge risky transactions to avoid financial risks. Studies have focused on firms' use of financial derivatives in developed countries. However, there is limited research done on emerging markets like the Philippines because these economies have only recently adapted advanced reporting standards that obligate the disclosure of the nature and extent of risks resulting from the use of financial instruments. We used Tobin's Q ratio to proxy for firm value and to determine the presence of a hedging premium. Because derivatives are used by firms to hedge against currency risks, interest rate risks, and commodity price risks, we hypothesize that the use of financial derivatives by firms has a positive and statistically significant effect on firm value.

1. INTRODUCTION

The importance of risk management has been more evident over time given imperfect markets. Based on previous years, when global economic conditions have not been favorable, the risks posed by the uncertainties of certain events, and the extent of these risks have been challenging to estimate accurately. With such uncertainty in the global market, derivative instruments as a means of hedging against risk is relevant and is used by firms, especially those operating in countries with relatively mature capital markets. The use of this risk management technique is popular among firms in developed countries, but the impact of using such a technique in emerging markets has yet to be examined comprehensively in the literature. Furthermore, there are no published studies that investigate the impact of derivative use and extent of derivative use on firm value in the Philippine context.

The objectives of this study are to (a) analyze the hedging behavior of publicly-listed non-financial firms in the Philippines; (b) determine if the use and extent of use of financial derivatives as hedging instruments affects the firm value of publicly-listed non-financial firms in the Philippines; and (c) identify the presence of a hedging premium for firms that use financial derivatives as compared to firms that do not use financial derivatives. The findings will hopefully give insight into the hedging behavior of publicly-listed non-financial firms in the Philippines, as well as the impact of hedging using derivatives on firm value.

2. LITERATURE REVIEW

Theories on risk-management suggest that hedging can be used to increase firm value. However, results from studies that focus on corporate risk-management and derivative use have been diverse and inconclusive to a certain degree.

Allayannis and Weston (2001) looked at how hedging against foreign currency risks affect firm value of non-financial firms in the United States from 1990 to 1995. They found that the link between the use of derivatives and the firm value was both positive and statistically significant. Moreover, they also noticed that firms that used currency derivatives to combat fluctuations in exchange rates, on average, had firm values higher by 4.87% as opposed to those with no derivative use. However, these findings were not robust, which questioned the validity of derivative use as a good proxy for risk-management activities as derivative use only makes up a small part of a firm's overall risk-management activities (Guay & Kothari, 2003; Aretz & Bartram, 2010). To address this issue, Panaretou (2013) and Ayturk et al. (2016) considered using the extent of hedging that a firm undertakes as a measure to better capture how a firm's hedging behavior affects firm value.

Jin and Jorion (2006) criticized Allayannis and Weston (2001) for their sample of only large firms from different industries, which would have rendered biased and inconsistent results because of varying labor productivity levels across industries that could justify higher Q ratios in more labor-productive industries. In line with this, they chose to limit their research to publicly-listed firms in the United States' oil and gas industry and found that firms that used derivatives to hedge and firms that did not use derivatives to hedge had no difference in firm value, but concluded that the hedging premium is subject to the types of risks the firm is exposed to. Furthermore, Magee (2009) argued that the models that Allayannis and Weston (2001) used did not properly address endogeneity. He re-examined the relationship between the use of foreign currency derivatives and firm value of publicly-listed non-financial firms in the United States using the appropriate models that address endogeneity and found that derivative use and firm value have no significant relationship.

Nguyen and Faff (2010) examined the relationship between the different types of derivative instruments and firm value among publicly-listed non-financial Australian firms. They found that the use of derivatives imposed a hedging discount on firms, which was strongly linked to the use of swaps. However, the effect of options and forwards were inconclusive due to the lack of statistical significance. Moreover, Phan et al. (2014) argued that hedging might not increase the value of a firm with the volatility of the underlying asset on the upside. When examining the effects of derivative use in the value of publicly-listed firms in the oil and gas industry of the United States, they found that hedging decreases firm value during the rise in oil and gas prices. This indicated that there is a negative relationship between hedging and firm value, and this relationship is dependent on the behavior of the underlying asset price.

Overall, the studies mentioned above examined the effect of the use of derivatives on the firm value of publicly-listed non-financial firms in developed countries, and the studies reveal mixed results. However, there is a lack of research done in emerging markets compared to developed markets, so conducting research using Philippine data could provide more conclusive evidence and some insight into how derivative use can affect firm value. Moreover, most of these studies did not take the endogeneity problem into account in their models. Therefore, there is still a need to create a study using a framework that can alleviate this endogeneity problem.

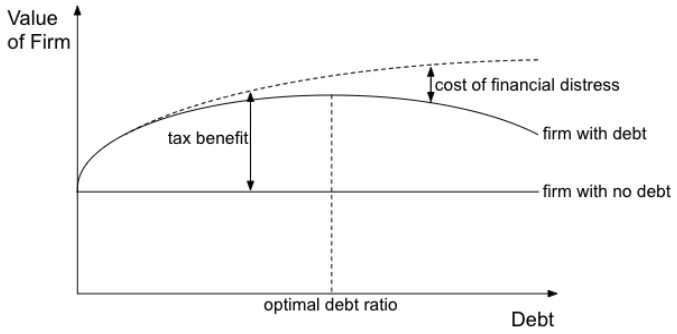
3. FRAMEWORK

The value maximization theory is the idea that firms operate to maximize their value (Jensen, 2002). Because firms seek to maximize their firm value, they also seek to minimize any degradation to firm value. Studies have shown that firms want to protect themselves by engaging in risk management strategies to reduce financial distress costs and expected taxes, increase debt capacity, and manage underinvestment issues (Smith & Stulz, 1985; Mayers & Smith, 1990; Froot et al., 1993).

Financial Distress Costs, Taxes, and Debt Capacity

Financial distress costs are incurred when firms take on debt. A firm can reduce its financial distress costs through hedging, as it makes cash flows less volatile (Smith & Stulz, 1985). Furthermore, taking on debt gives firms tax incentives from tax-deductible expenses, which increase as firms take on more debt. Hedging can increase tax incentives by improving a firm's debt capacity, which allows them to take on more debt (Smith & Stulz, 1985; Mayers & Smith, 1990).

Figure 1
The Trade-Off Theory of Capital Structure.

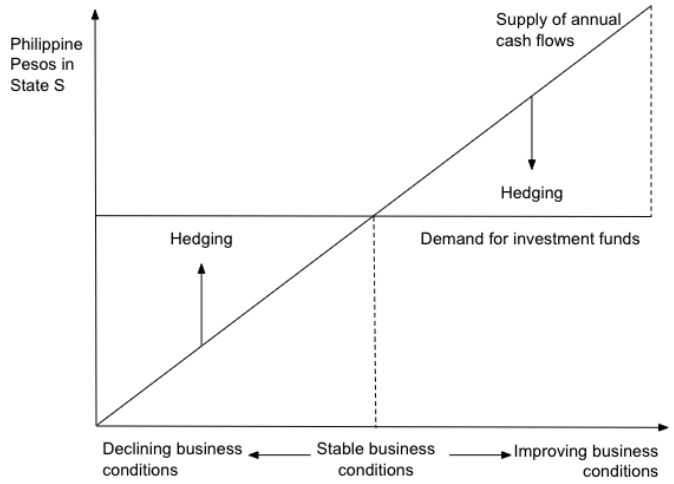


The trade-off theory of capital structure shows that tax incentives can increase firm value, but this increase can be offset by financial distress costs. If hedging increases a firm's tax incentives and reduces its financial distress costs, then its firm value should increase.

Underinvestment

Froot et al. (1993) posited that firm value could be improved by using risk-management techniques to coordinate investment and financing policies properly. The reduction of cash flow volatility can ensure sufficient internal funds for investments. This allows firms to take advantage of investment opportunities with positive net present values that can increase firm value (Velasco, 2014).

Figure 2
Coordinating Financing and Investment Policies.



Factors That Influence Hedging Behavior

A firm's decision to hedge can be influenced by a number of factors, such as transaction costs and firm size. The absence of a formal derivative exchange makes it more costly for firms to participate in the use of derivatives because over-the-counter markets for derivatives generally have higher costs of establishing derivative contracts from a requirement of additional service costs and larger principals, especially in relatively underdeveloped derivative markets (Velasco, 2014). Firms will only decide to use derivatives if the expected benefits outweigh the costs (Guay & Kothari, 2003). Furthermore, a firm's size can dictate its ability to participate in derivative use. Larger firms have more sophisticated risk-management strategies and employ specialized managers with relevant skills and information to manage derivatives for hedging purposes. Additionally, they have a better ability to engage in derivative use because they are more likely able to afford the high transaction costs of hedging compared to smaller firms.

4. METHODOLOGY

Dependent Variable

Our proxy for firm value is the Tobin's Q ratio, which is widely used in the literature and empirical studies, and is widely accepted as a reliable proxy for firm value; we used the natural logarithm transformation of Tobin's Q. We calculated Tobin's Q as:

$$Tobin's\ Q = \frac{[MV\ of\ Common\ Equity + BV\ of\ Preferred\ Stock + BV\ of\ Total\ Debt]}{BV\ of\ Total\ Assets}$$

We calculated the sector-adjusted Tobin's Q on a per year basis to account for the firms that change their sector classification across time. This was calculated as:

$$Sector\text{-}adjusted\ Tobin's\ Q = lnTobin_{it} - Sector\ median\ lnTobin_{it}$$

According to Panaretou (2013), if the value for the sector-adjusted Tobin's Q ratio is positive (negative), then this suggests that other factors, such as managerial decision-making through hedging, could potentially explain the increase (decrease) in firm value.

Independent Variable of Interest

Similar to Ayturk et al. (2016), we employed two measures of financial derivative use in this study: (a) *DerivativeUse,* which equals 1 if the firm uses any kind of financial derivatives, and 0 otherwise; and (b) *Extent*, to capture the extent of hedging pursued by a firm; the notional value is a ratio between total notional value and book value of total assets, and is reported in a firm's annual report. The alternative measure *Extent* is employed because the dummy variable *DerivativeUse* cannot capture the extent or degree to which a firm hedges its risks. The kinds of derivatives that were considered in this study are currency derivatives, interest rate derivatives, and commodity derivatives because these are the most commonly used by firms included in the sample.

$$Extent = \frac{Total\ Notional\ Value\ of\ \ Derivatives}{Total\ Assets}$$

We used notional value instead of fair value because notional values were found to be more commonly used in previous studies due to their stability. Notional value is used to define the value of the underlying asset in a derivative contract; it can be thought of as the book value of the derivative contract because notional values are not subject to fluctuations.

Control Variables

We used several control variables that have been found in the literature to have an effect on firm value. Following Allayannis and Weston (2001), Jin and Jorion (2006), Panaretou (2013), and Ayturk et al. (2016), we included the following control variables:

a. Firm Size (*SIZE*): We used the natural logarithm of the book value of total assets as our measure of firm size.
b. Profitability (*ROA*): We used Return on Assets (ROA) computed as the ratio of net income before interest and taxes to the book value of total assets as our measure of profitability.
c. Access to financial markets (*ATFM*): We used a dummy variable which equals 1 if the firm paid a dividend during the year and 0 otherwise as our measure of access to financial markets.
d. Leverage (*LEV*): We used the ratio of the book value of the firm's long-term debt to the book value of total assets as our measure of leverage.
e. Investment growth (*IG*): We used the capital expenditure ratio, which is calculated as the ratio of capital expenditure to total sales as our measure of investment growth.
f. Industrial Diversification (*ID*): We used a dummy variable, which equals 1 if the firm operates in more than one industrial segment and 0 otherwise as our measure of industrial diversification. The PSE sector classification system was used to define the industrial segments, which divides Philippine publicly-listed firms into six sectors, namely: Financials, Industrials, Property, Services, Holding Firms, and Mining & Oil.
g. Global Diversification (*GD*): We used a dummy variable, which equals 1 if the firm operates internationally or has foreign revenue or sales and 0 otherwise as our measure of global diversification.
h. Time effect: In order to control for time-specific effects, we included year dummy variables in our model. We used 2007 as the base year.
i. Industry effect: In order to control for industry-specific effects, we included industry dummy variables in our model. We used Mining & Oil as the base industry.

Endogeneity

Previous studies have failed to address the endogeneity present when investigating the relationship between derivative use and firm value, which has led to unreliable conclusions due to inconsistent and biased estimates. Magee (2009) argued that there are two sources of endogeneity present in this type of study that need to be addressed: unobserved heterogeneity and reverse causality. Unobserved heterogeneity arises when unobservable time-invariant firm-specific factors (e.g., managerial quality, managerial risk preference, etc.) affect the variables in the model. On the other hand, reverse causality arises when past realizations of firm value are likely to influence the use of derivatives, which is contrary to the relationship that our paper is trying to test.

Model Selection

We argue that it is necessary to estimate the effect of derivative use and extent of derivative use on firm value using a dynamic panel data model because firm values in the current time period are closely linked to firm values in previous time periods. Conducting specification searches in a dynamic environment is difficult when using traditional panel data models, such as pooled OLS and fixed and random effects models. Abdallah et al. (2015) argued that using a pooled OLS model is inappropriate because it is based on the assumption that there are no omitted variables and endogeneity is not present in the data. Furthermore, fixed effects and random effects will lead to spurious results due to their assumption of strict exogeneity, which cannot be met because it is likely that the firm's past and current firm values have an effect on future firm value and derivative use (Barros et al., 2020). Moreover, Abdallah et al. (2015) advised against the use of 2SLS and 3SLS estimation techniques to correct for endogeneity as they rely on external exogenous variables, which are difficult to identify in practice. It is almost impossible to find instruments that are strictly exogenous in corporate research, so errors in instrument selection can lead to biased and inconsistent estimates. The strict exogeneity assumption that these models have makes them difficult to apply in a dynamic environment. Instead of these models, Abdallah et al. (2015) suggested using a dynamic System GMM estimation technique to produce consistent and efficient parameters that are robust to the biases and inconsistencies of endogenous variables.

Model Specification

Following Ayturk et al. (2016), we used regression analysis to examine the effects of the use of derivatives on firm value and how the extent of derivatives use affects firm value.

We estimated Equations [1] and [2] using the two-step Blundell-Bond system GMM procedure to test these relationships:

$$Tobin_{it} = \alpha + \beta_1 DerivativeUse + \sum_k \beta_k Control_{it}^k + \sum_j \beta_j Sector_{it}^j + \sum_t \beta_t Year_t + u_{it} \quad [1]$$

$$Tobin_{it} = \alpha + \beta_1 Extent + \sum_k \beta_k Control_{it}^k + \sum_j \beta_j Sector_{it}^j + \sum_t \beta_t Year_t + u_{it} \quad [2]$$

where $Tobin_{it}$ is firm i's Tobin's Q ratio or sector-adjusted Tobin's Q ratio in year t, α is the constant or intercept of the model, $DerivativeUse_{it}$ is a dummy variable that indicates

whether or not firm i used derivatives in year t, $Extent_{it}$ is a continuous variable that measures the extent of hedging employed by a firm, $\sum_k \beta_k Control_{it}^k$ is the vector of all control variables used, $\sum_j \beta_j Sector_{it}^j$ is the vector of industry dummy variables, $\sum_t \beta_t Year_t$ is the vector of year dummy variables, and u_{it} is the error term. We considered all variables as endogenous except the industry and time dummies, which we considered as exogenous. Because unobserved heterogeneity is considered a cause of endogeneity, there could be variables not included in the model that may affect the variables SIZE, ROA, and LEV, along with the lagged measures of firm value, *DerivativeUse*, and *Extent* (Ayturk et al., 2016). Additionally, ATFM, IG, ID, and GD may also be susceptible to unobserved heterogeneity because these variables are influenced by prevailing market conditions and decision-making processes made by management within a firm, both of which (economic performance and managerial characteristics) are not accounted for in the model. We instrumented the endogenous variables by 2 or more of their past values following Roodman (2009) and we winsorized the variables ROA, LEV, and IG at the 1st and 99th percentiles to mitigate the effects of outliers.

Two-step system GMM can control the sources of endogeneity in our data using two steps: internally transforming the data and introducing lags of the dependent variable. The first step of the model is to internally transform the model by using orthogonal deviations, which is ideal for unbalanced panel data because it preserves sample size regardless of the number of gaps within the data. Using orthogonal deviations controls for unobserved heterogeneity by eliminating the firm-specific time-invariant components as it subtracts the average of all future observations of a variable (Roodman, 2009; Ullah et al., 2018). The second step of the model is the introduction of lagged values as explanatory variables and instruments to control for reverse causality because it may sufficiently capture the effect of the firm's past on the present (Wintoki et al., 2012).

Diagnostic Tests

The diagnostic tests employed in this study were the Arellano-Bond AR(1) test and the Arellano-Bond AR (2) test, both of which test for the presence of autocorrelation in the models used. We also employed the Hansen test to check for overidentifying restrictions and to test whether our models were correctly specified. These testing procedures were in line with the use of the Blundell-Bond system GMM estimator that addresses possible endogeneity issues (Roodman, 2009).

Optimal Lag Length Selection

The optimal model to report was chosen by selecting the one that gives the most parsimonious result. The most parsimonious result comes from the model that is able to satisfy all of the conditions of each test while employing the least amount of lags. However, Andrews and Lu (2001) proposed a systematic procedure to determine the optimal lag length in GMM estimation with an application to a dynamic panel data framework by introducing the model and moment selection criteria—Bayesian information criterion (MMSC-BIC), which they found to work well in different contexts. The MMSC-BIC is computed as in Equation [3]:

$$MMSC - BIC = J_i - ln(N)(l_i - k_i) \quad [3]$$

where J_i is the Hansen test statistic used to test the validity of the specifications of model i, N is the sample size, l_i is the number of moment conditions of model i, and k_i is the number of parameters to be estimated in model i; the MMSC-BIC rewards fewer parameters for a given number of moment conditions and also rewards more moment conditions for a given number of parameters (Kummer-Noormamode, 2015). The most optimal result would be the model with a lag length that minimizes the value of the MMSC-BIC.

5. RESULTS AND DISCUSSION

From the results of using Ln Tobin's Q and sector-adjusted Tobin's Q with *DerivativeUse* as the independent variable, all coefficients of *DerivativeUse* were positive, but only the most parsimonious result using the sector-adjusted Tobin's Q gave a statistically significant coefficient at the 10% level. Consistent with the theoretical framework, it could be said that hedging possibly increases tax benefits and decreases financial distress costs while preventing underinvestment and decreasing variability of cash flows, which can explain why, in the Philippine setting, firms that hedge have a marginally higher firm value than firms that do not hedge. However, because of the lack of statistically significant results, there is weak evidence of a hedging premium in firms that hedge than firms that do not hedge, considering publicly-listed non-financial firms in the Philippines.

From the results of using Ln Tobin's Q and sector-adjusted Tobin's Q with *Extent* as the independent variable, all coefficients of *Extent* were positive and statistically insignificant at all significance levels, suggesting that the greater proportion of its assets the firm hedges, the higher its firm value will be. However, because of the lack of statistically significant results, there is weak evidence of the extent of hedging premiums because there is not enough statistical evidence to support this extent of hedging premium for publicly-listed non-financial firms in the Philippines.

Both results are consistent in showing that there is weak evidence that derivative use and extent of derivative use have a positive effect on firm value. This statistical insignificance can possibly be attributed to the small number of derivative users in the Philippines, the fact that the use of derivatives is only a small portion of a firm's overall risk-management strategy, as well as the incomplete and improper disclosure of derivative information in the annual reports of some firms.

Table 1
Two-Step Blundell-Bond System GMM Regression Results With DerivativeUse as the Independent Variable

Dependent Variable	Ln Tobin's Q		Sector-adjusted Tobin's Q	
	Most Parsimonious	MMSC-BIC	Most Parsimonious	MMSC-BIC
Lag of lnTobin	0.6960***	0.7035***	0.6842***	0.7618***
	(7.10)	(8.14)	(6.80)	(9.39)
Derivative	0.1369	0.1449	0.1997*	0.1422

Use	(1.10)	(1.06)	(1.79)	(1.10)
SIZE	-0.2280** (-2.49)	-0.2260** (-2.27)	-0.2617*** (-2.64)	-0.1949** (-2.31)
ROA	1.3095* (1.89)	1.2377* (1.80)	1.5167** (2.19)	1.3123** (2.20)
ATFM	0.1232 (0.79)	0.1132 (0.74)	0.2460 (1.61)	0.1709 (1.24)
LEV	0.5676 (1.11)	0.4985 (0.92)	0.7305 (1.39)	0.6295 (1.19)
IG	0.0084 (0.48)	0.0267 (1.06)	0.0048 (0.25)	0.0168 (0.75)
ID	0.1930 (1.05)	0.0750 (0.46)	0.2749 (1.46)	0.1494 (0.83)
GD	0.6119* (1.94)	0.4344 (1.49)	0.7576** (2.59)	0.4012 (1.61)
Industry Dummies	Yes	Yes	No	No
Year Dummies	Yes	Yes	Yes	Yes
Intercept	4.6779** (2.40)	4.618** (2.19)	5.2156** (2.47)	3.9218** (2.12)
Diagnostic Test Results				
# of groups	239	239	239	239
# of instruments	52	115	48	93
AR(1)	-5.08***	-5.26***	-5.02***	-5.35***
AR(2)	-0.28	-0.23	-0.70	-0.54
Hansen	35.21	103.33	34.21	85.14

***, **, and * indicates statistical significance of 1%, 5%, and 10%, respectively. We used clustered robust standard errors for heteroskedasticity and serial correlation. Standard errors are reported in parenthesis.

Table 2
Two-Step Blundell-Bond System GMM Regression Results With Extent as the Independent Variable

Dependent Variable	Ln Tobin's Q		Sector-adjusted Tobin's Q	
	Most Parsimonious	MMSC-BIC	Most Parsimonious	MMSC-BIC
Lag of lnTobin	0.6835*** (6.43)	0.7243*** (7.45)	0.6547*** (6.04)	0.6991*** (6.17)
Extent	0.5760 (0.59)	0.1317 (0.11)	1.3917 (1.35)	1.0456 (1.01)
SIZE	-0.2768** (-2.59)	-0.2090* (-1.96)	-0.3004*** (-2.69)	-0.2283** (-2.07)
ROA	1.6223* (1.78)	1.0794* (1.75)	1.8690* (1.92)	1.2082* (1.78)
ATFM	0.2437 (1.25)	0.0462 (0.29)	0.2903 (1.49)	0.0898 (0.51)
LEV	0.8998 (1.56)	0.6679 (1.16)	1.0849* (1.83)	0.8181 (1.56)
IG	0.0004 (0.01)	0.0243 (1.11)	0.0008 (0.02)	0.0126 (0.51)
ID	0.1336 (0.63)	0.0028 (0.02)	0.2231 (1.04)	0.0764 (0.44)
GD	0.7514** (2.21)	0.3578 (1.22)	0.8732*** (2.80)	0.3924 (1.55)
Industry Dummies	Yes	Yes	No	No
Year Dummies	Yes	Yes	Yes	Yes
Intercept	5.7052** (2.58)	4.3232* (1.92)	6.0364** (2.58)	4.7163** (1.99)
Diagnostic Test Results				
# of groups	234	234	234	234
# of instruments	43	115	39	111
AR(1)	-4.71***	-4.96***	-4.51***	-4.62***
AR(2)	-0.46	-0.35	-0.93	-0.69
Hansen	22.26	97.94	20.98	101.52

***, **, and * indicates statistical significance of 1%, 5%, and 10%, respectively. We used clustered robust standard errors for heteroskedasticity and serial correlation. Standard errors are reported in parenthesis.

6. CONCLUSION

Overall, we found a positive but statistically insignificant relationship between derivative use and firm value and the extent of derivative use and firm value, which corroborates previous findings that have taken endogeneity into account. This can mainly be attributed to the significantly small number of derivative users in the sample, because this number (9.88%) is also relatively small compared to previous studies done using publicly-listed non-financial firms from other countries that examined the effect of derivative use on firm value.

Therefore, a possible policy implication could be to establish a formal derivative exchange in the Philippines, as this would allow derivatives to be more accessible to firms. There would be a more efficient system for trading derivatives that would also allow firms to incur less costs from the use of derivatives. This is relevant because the presence of a formal derivative exchange facilitates the transfer of risk between economic agents by

opening up opportunities for liquidity and price discovery, which improves market efficiency (Tsetsekos & Varangis, 1997). Furthermore, we found that there were a number of firms that did not adhere to the reporting standards of the PFRS7, which requires the disclosure of financial instruments that a firm uses. In line with this, another possible policy implication is for authorities to improve reporting standards by having a stricter implementation of PFRS7, specifically the disclosures on the types of risks firms face and especially the extent of these risks.

It is also important to note that the use of derivatives is only a part of a firm's overall risk-management strategy. Therefore, we recommend that more research be conducted examining the effect of derivatives use and the extent of derivatives use on firm value using publicly-listed non-financial firms in emerging markets. We also recommend that more research be conducted examining the factors that influence the use of derivatives of publicly-listed non-financial firms in emerging markets. Although our results are insignificant, our research is still an important stepping stone for more conclusive evidence of whether derivatives are beneficial or harmful to firm value in the context of an emerging market.

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