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# Study of the Overall Impact of Financial Levearge and Other Determinants of Systematic Risk

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**Abstract:** Financial leverage levels have often been used by investors and other stakeholders as an indicator of the riskiness of firms. In support of this, previous studies have often noted significant relationships between all measures of financial leverage and systematic risk. However, results from a combination of Fixed Effects Model, Random Effects Model, and Pooled OLS Balanced Panel Data Regression on a unique dataset of 50 non-financial frequently-traded publicly-listed companies in the Philippine Stock Exchange (PSE) from years 2007 to 2013 show that most measures of financial leverage have a significant relationship with systematic risk. Furthermore, we have find empirical evidence indicating that firms in different sector classifications may have differences in beta appetites due to the differences in the nature of their business model. Therefore, a higher requirement of industry knowhow for investors, firms, and government is imperative.

**Key Words:** financial leverage, leverage, systematic risk, risk, beta

## 1. INTRODUCTION

According to the International Monetary Fund Country Report No.13/102, systematic risks in the Philippine economy were heightened in 2013. This was brought about by an increasing trend in debt accumulation by big conglomerates in the country because of more bank loans and issuance of bonds, especially because of the earlier relaxation in the single-borrowers limit. (IMF, 2013, p.11). Although the current levels of debt in the economy is still far from the cause of past financial crises, high leverage levels cause a stir and anxiety in the economic sector of the Philippines. The rapid expansion of big conglomerates seems to signal excessive use of debt. Given this, IMF has advised that a rollback in SBLs should be implemented in order to significantly reduce risk exposure. (IMF, 2013).

In line with this, our research aims to empirically investigate whether or not financial leverage is significantly related to systematic risk. According to Titman, Keown, & Martin (2012), the widely used indicator of systematic risk among firms is financial leverage, which means that the more debt the firm has, the greater risk that it has acquired. Ramadan (2012), argues that financial leverage - through the use of the four definitions of financial leverage, is attributable to systematic risk. He finds that financial leverage accounts for 21% - 24% of the variability in systematic risk among publicly listed Jordanian industrial firms using the Capital Asset Pricing Model (CAPM).

On the contrary, Omet and Al-Debi'e (2000) conclude in their own study of Jordanian industrial firms that leverage, particularly the debt-to-equity ratio is not a significant determinant factor of risk.

To be able to determine if there is a significant link between leverage and risk is important, because most financial investors are risk averse (Titman, Keown, & Martin, 2012). Given this, before making any financial decisions, investors analyze and study how risk can be minimized. Risk minimization is possible only when systematic risks can be accurately measured afterwhich investment decisions can be made with greater ease and rationality, resulting to better investments of capital. This will pave way for a sustainable economic growth brought by the long-term benefits of better investments.

Using a variety of theories and models measuring systematic risk, this paper provides an empirical study on the link between financial leverage and beta coefficient among non-financial frequently-traded publicly-listed companies in the Philippine Stock Exchange (PSE).

### *1.1 Research Objectives*

This research paper attempts:

1. To estimate betas as a measure of systematic risk for the frequently-traded non-financial firms listed in the Philippine Stock Exchange;
2. To determine if there is a significant link between the four measures of financial leverage and systematic risk;
3. To identify the different impacts of the alternative measures of financial leverage to the systematic risks of actively-traded non-financial firms listed in the PSE;
4. To provide empirical evidence on the existence of relationship between systematic risks and other determinants; and
5. Secondarily, to identify whether or not there are significant differences among the financial leverage-systematic risk relation in various sector classifications.

### *1.2 Significance of the Study*

The results of this paper can be of great help to investors in considering the impact of the four definitions of financial leverage among different industries and for having quality decisions regarding in the companies they should invest in. This paper can provide sufficient evidence to corporate leaders and managers on how to handle financial leverage levels –helping them to manage operations efficiently and to minimize risk.

### *1.3 Scope and Limitations*

This study is limited to the Philippine setting and the firms studied are only those frequently-traded, non-financial firms listed in the Philippine Stock Exchange from years 2007 to 2013. These limitations are further discussed in the methodology section of this paper.

## 2. METHODOLOGY

A panel dataset is used which includes different variables that affect systematic risk for a period of 7 years, from 2007 to 2013 of the frequently-traded non-financial companies listed in the Philippine Stock Exchange (PSE).

For weekly closing prices, Wednesday closing prices are used in accordance to Lo and MacKinlay (1988). This is to avoid the weekend effect phenomenon which is evident in financial markets wherein stock returns on Mondays are often significantly lower than those of the immediately preceding Friday. If the Wednesday data is unavailable, the Thursday data is substituted. If the Thursday observation is also missing, then the observation for Tuesday serves as the substitute. If Tuesday, Wednesday, and Thursday data are missing, then the observation for that week is considered unavailable altogether.

For the sample selection process, we exclude all the financial firms in the PSE because according to DeAngelo & Stulz (2013), the commonly used systematic risk estimator, financial leverage, does not account for the variability in systematic risk among financial intermediaries. It has been found that financial intermediaries favor higher levels of leverage because financial institutions operating in a regulated environment become less competitive compared to financial institutions with fewer constraints.

Moreover, only non-financial firms with at least 182 trading days (or 26 weeks) for every year from 2007 to 2013 are included in the sample. According to Kim, Li, and Zhang (2011), this is done in order to avoid the lag effect on stock prices for those firms that are not frequently traded since they do not adjust quickly to new information. In addition, here are the other criteria that are used to select our sample:

- Non-financial firms with initial public offerings (IPOs) not later than the start of 2007.
- Non-financial firms that were not de-listed or suspended from the PSE anytime between 2007-2013
- Non-financial firms without missing data to ensure a balanced panel
- Non-financial firms with positive leverage ratios

In this paper, we make use of $\beta$ as the measure for systematic risk. $\beta$ is obtained using the Market Model method following the approach done by Al-Qaisi (2011) and by Faff, Brooks, and Kee (2002). It establishes the linear relationship between the returns of securities and the returns of the whole market.

To obtain Beta using the Market Model, we first acquire values for returns for the specific companies as well as market returns. They are computed using the following formulas: To compute for specific returns:

$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}}$$

where $R_{it}$ is the daily or weekly returns for company i at time and $P_{it}$ is the daily or weekly price levels of stocks of company i at time t. To compute for market returns:

$$R_{mt} = \frac{I_t - I_{t-1}}{I_{t-1}}$$

where $R_{mt}$ is daily or weekly market returns at time t and $I_t$ is the daily or weekly PSE index at time t.

Based on the calculated daily or weekly returns on the specific companies and for the market, we then estimate $\beta_i$ using the Market Model as given:

$$R_{it} = \alpha_i + \beta_{it} R_{mt} + \varepsilon_{it}$$

The estimated $\beta_{it}$ coefficients that are obtained by the market model regression will serve as the independent variable for the overall final model. $\beta_{it}$ is estimated following the market model regression. We use OLS estimation and the computed $R_{it}$values for specific firms as well as the market returns for each firm $i$, wherein year $t = 2007, \ldots\ldots, 2013$.

***Measures of Financial Leverage***

| Variable | Description |
|---|---|
| Total Debt to Total Assets= $\frac{\text{Total Debt}}{\text{Total Assets}}$ | This ratio includes short and long term debts as well as tangible and intangible assets. |
| Long Term Debt to Total Assets= $\frac{\text{Total Long Term Debt}}{\text{Total Assets}}$ | This is the ratio that indicates the extent to which the company uses its long-term debt in financing all of its assets. |
| Total Debt to Equity= $\frac{\text{Total Debt}}{\text{Total Shareholder's Equity}}$ | This ratio indicates the relation between the outsider and shareholders' funds. |
| Long Term Debt to Equity= $\frac{\text{Total Long Term Debt}}{\text{Total Shareholder's Equity}}$ | This ratio indicates the degree to which the company finances its assets through owners' funds as compared to creditors' funds. |

***Control Variables***

***Profitability***

$$\text{Operating Return on Assets} = \frac{\text{Earnings Before Income and Taxes (EBIT)}}{\text{Total Assets}}$$

Profitability is expected to have a negative relationship with systematic risk since it indicates that there is a stable cash flow that supports a firm's operations.

***FirmSize***

$$\text{Firm Size} = \ln(\text{Market Capitalization})$$

Firm size is expected to have an ambiguous relationship with systematic risk since it can be associated with a firm's ability to withstand economic, social, and political shocks. However, firm size can also measure the extent of effect should a firm defaults.

***Operational Efficiency***

$$\text{Total Asset Turnover} = \frac{\text{Sales}}{\text{Total Assets}}$$

Operational efficiency is expected to have a negative relationship with systematic risk since it indicates the efficient allocation and use of a firm's resources as well as cost minimization, which increases a firm's profitability.

We have used three econometric models: Ordinary Least Squares (OLS), Fixed Effects Models (FEM), and the Random Effects Models (REM).

Before model selection is conducted, the White's Test and the Wooldridge Test are used to see if heteroscedasticity and serial correlation is present in the panel dataset.

If only heteroscedasticity is present, we use the Generalized Least Squares (GLS) model. Alternatively, if heteroscedasticity and serial correlation are both present, then the Driscoll-Kraay method of estimation will be used. However, if there is no heteroscedasticity and serial correlation, then we proceed with the model selection. The best FEM is determined using the Wald's Test. This best FEM is compared to the Naïve Model by using the Wald's Test. The Breusch-Pagan Test is then conducted to determine whether or not the REM is valid. If the p-value obtained in the Breusch-Pagan Test is less than the critical value of 0.05, then it means that the REM is valid. Because of this, the Hausman Test is used to decipher which is the better model to utilize between FEM and REM. We test the REM model against the pooled OLS with industry dummy variables to estimate $\beta_{it}$ using the overall sample given:

$$\widehat{\beta_{it}} \quad \alpha_i + \gamma_1 LEV_{it} + \gamma_2 PROF_{it} + \gamma_3 SIZE_{it} + \gamma_4 EFF_{it}$$

$$+ \gamma_5 ID_1 + \gamma_6 ID_2 + \gamma_7 ID_3 + \cdots + \gamma_8 ID_4 + \varepsilon_{it} \qquad (1)$$

We test the FEM models against the pooled OLS and the REM to estimate $\beta_{it}$ for each industry given:

$$\widehat{\beta_{it}} = \alpha_i + \gamma_1 LEV_{it} + \gamma_2 PROF_{it} + \gamma_3 SIZE_{it} + \gamma_4 EFF_{it} + \varepsilon_{it} \qquad (2)$$

Where $\beta$ is the estimated systematic risk, *LEV* is the four different definitions of financial leverage, *PROF* is profitability, *SIZE,* is firm size, *EFF* is operational efficiency, which are all firm-specific variables.

The model selection process was done for each model per sector and for the pooled regression. Among the different fixed effects models, the Least Squares Dummy Variable 2 (LSDV2) and Least Squares Dummy Variable 3 (LSDV3) were the most appropriate after performing the Wald's and Hausman Tests to compare each of the models with one another.

After checking for the presence of heteroscedasticity and serial correlation, we first regress using the beta from daily returns as the dependent variable and then we regress again using the beta from weekly returns to check for robustness.

We first perform an overall regression including all companies, regardless of the sector. Here, dummy variables for the service, property, holding, and mining and oil sectors are included. The industrial sector dummy variable was omitted to serve as the base category and to avoid falling into the dummy variable trap. If these dummy variables turn out to be significant, then a regression on a per-sector basis will also be conducted.

## 3. RESULTS AND DISCUSSION

The model selection process deem a combination of FEM and REM as the appropriate models to be used in the per sector regression for all models using the beta from daily returns. On the contrary, the model selection process for all models using beta from weekly returns show results ranging from Pooled OLS, FEM, and REM.

### *Service Sector*

In the regression using beta from daily returns, measures of financial leverage yields significant results with respect to its TDTA and TDTE. This may mean that the service sector's systematic risk is induced by its short-term liabilities, which is consistent with the maturity matching principle (McMenamin, 1999). The principle states that the term of a firm's loan should be matched accordingly to the liquidity of the asset acquired. Therefore, if the initial classification of a purchased asset is current, liabilities should be made on a short-term basis as well.

However, proving the existence of the maturity matching principle poses a challenge since data are not readily available. We believe that we cannot compare the proportion of a single industry's short-term liabilities against its long-term liabilities to verify trends or patterns. It is because account classifications of liabilities may vary after initially being incurred. Since as per IAS1 par. 69 claims that liabilities expected to be settled within 12 months should be classified as short-term liabilities. Hence, should long-term liabilities be paid on a yearly basis, the amount due within 12 months will be reclassified as a short-term liability, which would inflate short-term liabilities and decrease long-term liabilities. Therefore, knowing the purpose and the original term of the liability is untraceable since disclosures of its purpose and the original term are not required. Also, we believe that comparing the proportion of an industry's short-term assets against its long-term assets is much more unreliable due to various depreciation methods, fully depreciated assets, amortization of intangible assets, receivable write-offs and the like. Hence, we emphasize that the maturity matching principle focuses at the point of acquisition of assets and at the point when liabilities were incurred. When TDTA, TDTE, and LTDTE are used as a measure of financial leverage, efficiency becomes significantly and positively correlated with systematic risk though in contrast with our a-priori expectations.

Consistently, not all measures of financial leverage is significantly correlated with systematic risk in the service sector when weekly betas are used, thus indicating the maturity-matching principle. However, and as opposed to results when beta was calculated using daily stock prices, TDTE is the only measure of financial leverage that is significantly correlated with systematic risk. Moreover, when TDTA is used as a measure of financial leverage, efficiency is shown to be negatively correlated systematic risk. However, contrary to a-priori expectations, profitability in the service sector, when LTDTA and TDTE are

used as a measure of financial leverage, is positively correlated with systematic risk.

*Property Sector*

The property sector, concerning its measure of financial leverages, shows significant results concerning its LTDTA and LTDTE using daily betas. This again may prove that the maturity matching principle applies. Cash collections in the property sector are normally made on a long-term installment basis. To be competitive, firms in the property sector would most likely incur and pay its liabilities on a long-term basis as well.

However, when TDTE, LTDTA and LTDTE are used as a measure of financial leverage, firm size in the property sector exhibits a positive correlation with systematic risk. We believe that the reason for this is because real properties, like other financial assets, are more susceptible to asset bubbles (Lustig, 2014). When TDTA and TDTE were used as a measure of financial leverage, efficiency shows a significant and negative correlation with systematic risk.

Conversely, all measures of financial leverage are not significantly correlated with systematic risk in the property sector when weekly betas are used. Also, when TDTA is used as a measure of financial leverage, efficiency is shown to be negatively correlated with systematic risk, which is in accordance with our a-priori expectation.

*Holding Sector*

As for the holding sector, TDTA, LTDTA and TDTE are the only measures of financial leverage that demonstrates a significant and positive correlation with systematic risk using daily betas. Indeed, this phenomenon is again consistent with the maturity matching principle. Note that the source of income for most Philippine holding companies is from trading securities and investments in associates, which is a mix of short-term and long-term assets.

Also, when TDTA, LTDTA and LTDTE are used as a measure of financial leverage, firm size in the holding sector, as opposed to the service sector, demonstrates a positive correlation with systematic risk. It is because firm size in the holding sector increases systematic risks due to the danger of default in conglomerates as feared by the IMF. On the contrary, none among all the regressors are significantly correlated with systematic risk when beta obtained from weekly returns are used to estimate systematic risk.

*Mining & Oil*

In this sector, none among our regressors is significantly correlated with systematic risk when daily betas are used. This may be because the activities of the firms in this sector are almost entirely nature-based rather than market-based (Lovins, 2002). The volatility of stock prices of nature-based firms is based on the success of research and technology –making it a sector of chances. When weekly betas are used as the dependent variable, the same results are obtained.

*Industrial Sector*

Contrary to Ramadan's (2012) claim in his research paper, TDTA, LTDTA, and TDTE are the only measures of financial leverages that have a positive correlation with systematic risk when daily beta is used. More so, when LTDTA is used as a measure of financial leverage, efficiency, similar to the case of the service sector, exhibits a significant and positive relationship with systematic risk. On the other hand, TDTE is seen as significantly correlated with systematic risk when beta obtained from weekly returns is used.

This may be brought about by the higher diversity of firms belonging to the industrial sector – which is composed of firms selling food, chemical, electricity, water and others. This high level of diversity may further cause financial leverage measures and other determinants to be insignificant.

## 4. CONCLUSIONS

Primarily, the aim of this research paper is to obtain empirical evidence to prove that there is an existing link between all financial leverage ratios and systematic risk. Despite the intuitive presumption that all measures of financial leverage levels should have a significant correlation with systematic risk, empirical results suggest that this is not always valid in actively traded non-financial firms in the Philippines on an overall and per sector analysis. Secondarily, we aim to verify whether or not differences in industry classification pose significant effects to the relationship of financial leverage and systematic risk. We have obtained empirical evidence to claim that interpretations cannot be generalized across all actively-traded companies since these

companies possess unique characteristics depending on their respective sector classification. This was proven by the significance of the dummy variables when all companies were regressed regardless of sector classification. However, the results on a per-sector basis are just a preliminary analysis and is not comprehensive because there are very few and limited studies that have been conducted using a per-sector analysis. Past research have focused on a generalized scope or only on the industrial sector. Hence, further studies on the relationship of financial leverage and systematic risk in per-sector basis is highly recommended to verify the results obtained in this research paper.

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