

# Further Investigations on the Financial Attributes of the Firms listed in the KOSDAQ Stock Market

패널 분석을 통한 국내 KOSDAQ 상장기업들의 재무적 요인 심층분석

Hanjoon Kim  
Hoseo University, Republic of Korea  
+8241-560-8369(O)  
E-mail: [khj723@hoseo.edu](mailto:khj723@hoseo.edu)

## ABSTRACTS

From the perspective of the domestic capital markets, there have been little researches on the financial characteristics of the firms belonging to the KOSDAQ(Korea Securities Dealers Automated Quotation), in comparison with those of the firms classified into the KOSPI(Korea Composite Stock Price Index). For robustness, this study has performed the following three hypotheses for further investigations: (1)To find any financial characteristics on the capital structure regarding the firms' leverage ratios listed in the KOSDAQ utilizing the 'panel data' analysis. (2)To examine any structural changes of the firms in the leverage determinants, covering the sample periods between the pre- and post-U.S. financial crisis (3)To further analyze the statistically significant variables (or components) such as profitability by utilizing the DuPont system. Given the global economic circumstances related to the bilateral or trilateral FTA pact among the associated nations, multinational corporations headquartered in either advanced or emerging capital regions, may examine the results obtained from this study, when taking into account establishing new business entities and implementing their optimal capital structures in the Korean capital markets.

**Keywords:** KOSDAQ, Panel Data Analysis, Quasi-experiment, DuPont System, Korean Capital Markets

**주제어:** 코스닥 시장, 패널자료 분석, 구조적 변이, 듀폰 시스템, 국내 자본시장

## I. Introduction

In the transition of the Korean capital market classified into an 'advanced' capital market from its contemporary status as an 'emerging' one, it may be of interest or importance to examine any possible financial attributes or characteristics of the firms listed in the KOSDAQ(Korea Securities Dealers Automated Quotation) stock market in terms of one of the financial issues including the capital structure (or leverage). Regarding the previous literature on the issues of the capital structure on a global basis, there also seems to be more researches on these issues for the firms headquartered in the advanced (or the western hemisphere) markets than those for their counterparts in the emerging ones. Therefore, there may need more active theoretical and/or empirical studies on the issues in a variety of international aspects across nations and domestic markets, as noted in Harris & Raviv(1991). From the perspective of Korean domestic capital market still belonging to the emerging one, there seem to be relatively few researches on the financial characteristics of the firms belonging to the KOSDAQ(Korea Securities Dealers Automated Quotation) stock market on the capital structure, in comparison with those of the firms classified into the KOSPI(Korea Composite Stock Price Index) stock market. even if the current domestic stock market condition shows its continuing increase in the former(KOSDAQ) market index,(i.e., from the level of 245.08 points(2008/10/31) to 563.39(2013/4/16)) Furthermore, in comparison with the results of Kim(2012), this study has implemented further (or in-depth) investigations to identify any financial attributes of the capital structure (or leverage) for the firms listed in the KOSDAQ market, which consist of three hypothesized issues with each corresponding methodology, as illustrated later.

The primary motivations to perform this study are as follows:

First, most previous academic researches on the financial determinants of the capital structure seems to pay more attention to the studies on the firms belonging to the advanced capital markets and/or Korean domestic firms listed in the KOSPI than those in the KOSDAQ. In addition, many professionals including equity analysts seem to be less motivated to analyze and value, at least, some of the firms listed in the KOSDAQ market, due to the history of their previous accounting scandals and moral hazard at management level as described in Kim(2012). The domestic government such as Financial Supervisory Committee has recently announced her revised and reinforced comprehensive measures against any illegal and immoral practices such as stock price manipulation and insider trading.

Second, from the perspective of individual investors who have traditionally played a major role

in the particular market in terms of trading volume and amount, it may be more important or essential to review the further analyzed results obtained in this study, in order to implement their effective and/or efficient investment strategies, given the favorable current market conditions as the KOSDAQ stock index reached its record high in 4 years, as described. Coupled with the relatively sluggish market conditions on the KOSPI, more institutional investors are estimated or expected to participate in the KOSDAQ market by expanding their portfolio diversification into the firms belonging to the market.

Third, this particular study has performed the following three null-hypotheses : (1)To find any financial characteristics on the capital structure regarding the firms' leverage ratios listed in the KOSDAQ utilizing the 'panel data analysis'. (2)To examine any quasi experiment (or structural change) of the firms in the capital structures, separating the whole sample periods into the pre-global financial crisis(i. e., the years of 2005 and 2006) and the post-one (i.e., the years of 2009 and 2010). (3)To further analyze a statistically significant or frequently utilized variable such as ROE(return on equity) in practice, by utilizing the contemporary methodologies in practice such as the DuPont system, once the variable shows its importance to affect the level of leverage, based upon the book-value or the market-value.

As for the primary objectives initiated by the above motivations and expected from the results of this study, the results implemented by employing further (or in-depth) analyses, may be used for comparison purposes, which may reinforce the robustness of or suggest another implications on the results obtained the previous researches such as Kim(2012). Moreover, foreign multinational and domestic corporations headquartered in either advanced or emerging capital markets, which plan to establish new businesses with middle-sized and I/T related subsidiaries in Korea, may take into account the results of this study on the capital structure and ROE of the KOSDAQ listed firms, given the contemporary global economic circumstances toward the bilateral or trilateral FTA(Free Trade Agreement) pact among the associated nations.

The paper is organized as follows: The first section is for introduction and the next one is historically to review the previous major theoretical and empirical literature on the financial attributes of the capital structure, as they were also reviewed and presented in Kim(2012) as important literature with their noteworthy meanings. Then, a description of the data collection and major methodologies employed to test for each corresponding hypothesis, are described, which are then followed by the analyses and the interpretations of the empirical findings from each corresponding model of this study in the context of the contemporary finance theory. Finally, concluding remarks are summarized.

## II. Review of the Previous Literature

Since the pioneering article by Modigliani–Miller(M&M), described that there would be no optimal capital structure for any firms in the same risk class under the restrictive assumptions of perfect capital markets with no taxes(Modigliani & Miller, 1958), many theoretical and empirical researches have modelled or tested to identify any significant determinants which may affect a firm's value targeting its optimal capital structure, assuming the imperfect capital market conditions.

Scott(1972) first utilized the multiple comparison procedure to find any significant differences between each pair of the sample industries. Once he obtained the resulting one-way analysis of variance(ANOVA) inference against the null hypothesis of no industry influence, he performed a multiple comparison tests and concluded that the inter–industry differences seemed to be pervasive in the capital structure of U.S. companies. However, other study done by Remmers et al.(1974) indicated that industry was not a determinant of corporate leverage ratios in the manufacturing industries in the U.S. They also found that there were no industry differences for the Netherlands and Norway, but that there were statistically significant differences for France and Japan.

Myers(1977) theorized that the optimal policy for maximizing the market value of a firm with no corporate taxes is not to issue debt at all, which may result in the 'under–investment problem' incurred by the shareholders of the firm. He also presented that real options, which may engender positive investment opportunities, might have limitations as security for debt claims due to their thin and imperfect secondary markets.

Interestingly, two leverage ratios which seemed to be at opposite poles, common equity/total assets used in Scott & Martin(1975) and total debt/total assets in Remmers et al.(1974) were tested together by Bowen et al.(1982). They tested four major hypotheses and found that there were statistically significant inter–industry capital structures. Another result showed the statistically significant stability of the rankings of mean industry capital structure over time and a firm's significant tendency of conversion toward its industry mean.

Kester(1986) compared the capital structures between U.S. and Japanese corporations. He found that there were significant differences in capital structure between the two countries on a book value basis, after controlling for other factors such as profitability, risk, growth, and size, as well as industry classification. Many of the mature and heavy Japanese industries had higher leverage than their U.S. counterparts at either book or market value. Kim & Sorensen(1986) also tested and summarized their study on the relationship between the agency costs of debt and the agency costs of equity by stating that the advantage of issuing debt to reduce the agency costs of equity may be offset by the agency costs of debt resulting mainly from the risk incentive and/or

the under-investment incentive problem.

As the recent literature (since the 2000s) on the capital structure, esp. related to the Korean capital market, Deesomsak et al.(2004) studied the determinants of corporate capital structure in the Asia Pacific region, including Malaysia, Thailand, Singapore, and Australia, covering the period of 1993-2001. They found that the firm size effect on leverage was statistically significant and positive for most countries in the region, after the 1997 financial crisis. Across all sample countries for the entire period studied, non-debt tax shield, liquidity, and share price performance, among several explanatory variables tested, had a statistically significant effect on leverage. Glen & Singh (2004) also compared capital structures in developed and emerging markets considering 7968 firms from 44 countries (22 developed markets vs. 22 emerging markets) during the period of 1994-2000. The amount of leverage (as total liabilities to total assets) were found to be significantly higher than those in the developed markets. They also noted that the median leverage ratio of Korean sample firms was 72% in 1994, but declined to 52% in 2000, following the 1997 financial crisis. By employing a large panel for the years 1992-2001, a time that included the pre- and post- financial crisis in South Korea,

Fattouh et al.(2005) found that there were systematic relationships between the capital structure and the proxy variables for asymmetric information cost. The firm size effect on the capital structure was insignificant or significantly negative at the higher levels of leverage, as the companies were not able to borrow at favorable terms in the capital markets, since their leverage became too high. Non-debt tax shield asset tangibility was significantly related to leverage as expected. Profitability, as proxied by EBITDA/total assets, was statistically significant and negative across nearly all quantiles, as the pecking order hypothesis suggested.

The study performed by Kim & Berger(2009) investigates two prolonged controversial issues concerning Korean chaebols vs. non-chaebols. The Korean chaebol can be thought of, in a macro sense, as similar to the Japanese Keiretsu, although there are several differences which are noted in the paper. One of the issues investigated is whether firms belonging to the chaebol in Korea have different market-value based debt ratios(i.e., higher 'leverage') than their counterparts not belonging to the chaebol. If this is so, there are several managerial implications. Results indicate that, for the period studied, firms in the chaebol did have a higher mean leverage than their counterparts. The other issue addressed used logistic regression analysis to determine that firms belonging to the chaebol appeared to possess different levels of the following characteristics in comparison with firms not belonging to the chaebol.

Kim(2011) examined a prolonged, but interesting issue on the changes of the financial leverage of Korean chaebol in the post-period of Asian financial crisis. Based upon the results of this study, it was found that firms belonging to the chaebol in Korea maintained higher average book-value and market-value based debt ratios, relative to their counterparts not belonging to the chaebol

across all of the tested models. The dummy variables for the years of 2002 and 2003 showed their inverse relationships with the book-value based debt ratios. Among the industry dummy variables, there were positive relationship of IND3(=the chemical industry) and Ind5(=the construction industry) to the book-value leverage. Moreover, this study identified that there were no differences in the explanatory variables included, between the tested models (that is, without and with including the present value of an operating lease) related to each corresponding debt ratio.

The study done by Kim(2012) examined empirical issues that have received little attention in the previous research in the Korean capital market. It is to find any financial determinants on the capital structure for the firms listed in the KOSDAQ(Korea Securities Dealers Automated Quotation). Moreover, the null hypothesis that the changing trend or movement of a firm's capital structure with respect to its industry mean (or median) may be random, is also tested. Size(INSIZE), growth(GROWTH), market value of equity(MVE), beta(BETA) and section dummy(SECTION) showed their statistically significant effects on the market-value based leverage ratios. This study also found an interesting result that a firm belonging to each corresponding industry has a tendency for reversion toward its mean and median leverage ratios over the five-year tested period.

### III. DATA AND METHODOLOGY

#### 3.1 Data Collection

<Table 1> Sampling Criteria<sup>1)</sup>

1. The corporations were included in the New KisValue(KIS) database in Korea.
2. The corporations were listed in the KOSDAQ at the end of December 2010.
3. The corporations should be included in either the 'Prime' or the 'Venture' section in the KOSDAQ, to be selected as the sample firms.
4. All the data for each corporation were available for, at least, 6 years (From 2005 to 2010).
5. Financial and regulated industries were not included in.

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1) The data are available upon request from the author.

To examine any structural break (or change) of the firms in the capital structure, this study has selected the specific tested period from 2005 to 2010, which can divide the whole sample period into the two periods such as the period for pre-global financial crisis (i. e., the years of 2005 and 2006) and the period for post-global one (i.e., the years of 2009 and 2010).

This study has only sampled the KOSDAQ listed firms classified into the Prime and the Venture sections in the KOSDAQ. According to the guideline of the market, it consists of four sections: Prime, Venture, Middle-Stage, and New Growth section. The primary rationale to include only the two sections in this study, may be the major consideration to obtain relatively reliable and consistent financial data with less degree of information asymmetries, as described in Kim(2012).

### **(1) Variables Employed <sup>2)</sup>**

The general criteria selected as the proposed proxies for independent variable(IDV) and dependent variable(DV) employed in this study, have followed the below guidelines, in order to enhance their robustness:

First, the variables across IDV and DV were selected based upon their commonalities tested in the previous literature, and they usually showed the conflicting results in terms of their signs and statistical significance. Therefore, it is expected that the results obtained from this study can be utilized to compare their similar or different patterns with the previous researches on either advanced capital market or emerging capital one.

Second, subsequent to the above guideline, one of the main objectives of this particular study is to perform further (in-depth) analyses to test for the hypothesis on the determinants of the capital structure which may be compared to the results obtained from Kim(2012) for robustness. Therefore, for the comparison purposes, it may be more efficient to employ the same (or similar) proposed proxies which were also utilized in Kim(2012) as the major theoretical variables. Therefore, coupled with the results obtained from the previous study, it is expected that any statistically significant proxies for both the IDVs and the DVs, may gain their weights as consistent and robust determinants on the level of leverage for the KOSDAQ listed firms. If there are any new findings on the significant IDVs and/or DVs in this study, it may also be plausible to reinterpret any unexpected or incomplete implications on the results of the previous research in the context of contemporary finance theory.

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<sup>2)</sup>Most variables (i.e., the DVs and the IDVs) tested in Kim(2012), have been re-employed in this study for the comparison purposes and in-depth analyses, as described, and their theoretical rationales and descriptions presented in Kim(2012) have also been reproduced in this section of the study for potential readers.

Third, all the data for finalizing each variable, should be available from the database as described in <Table 1>.

### **(1-1)Dependent Variable(DV):**

This study has employed a wide spectrum of dependent variables(DVs) as proxies for capital structure, which were measured at both the market-value and the book-value based levels, as also employed in Kim(2012): The first dependent variable(DV) as BVLEV1 was derived from the ratio of 'total liabilities divided by total assets', while the second DV as MVLEV1 was defined by the ratio of 'total liabilities at book value to total liabilities plus total preferred stock at book value plus common equity at market value'. The common equity at market value was, as usual, calculated by multiplying the closing market price of common stock on the last trading day by total number of common shares outstanding at the fiscal year-end of each sample firm during the period of 2005 to 2010. Given the historical development of Korean economy, the market value based debt ratio, may be more representative proxy as the DV for the Korean firms including the KOSDAQ listed ones, in which substantial differences as in Japan, may still exist between the market and book value of real assets such as real estate, as also presented in Kim & Berger(2008) and Kim(2009).

Moreover, the other two dependent variables notated as BVLEV2 and COVERAGE1 have been employed to test for the leverage, which may be more practically utilized proxies from a domestic firm's perspective, esp., after the Asian financial turmoil in 1997.(Kim, 2012) In definition, while BVLEV2 was proxied as 'times interest earned (=Earnings before Interest and Tax(EBIT) / Interest Expense), COVERAGE1 was defined as '(Free Cash Flow to the firm / Interest Expense)'. Free cash flow(FCF) was also calculated by [Earnings after corporate taxes - (Net changes of the amount of assets during a fiscal year)] denoted by the New Kisvalue Database.

### **(1-2)Independent Variable(IDV):**

First, Two separate variables proxied for 'profitability' have been employed in each corresponding model tested as below: **PFT and ROE**. PFT was measured by the ratio of earnings before interest and taxes (EBIT) to book value of assets at the fiscal year-end of each firm in each sample year. This ratio is usually referred to as 'Basic Earning Power(BEP)' in finance text as one of the proxies for profitability. To avoid any potential problems arising from a spurious correlation between the market-value based leverage ratio and profitability (as an IDV) in the model, this study has scaled the EBIT in PFT by book value of assets (instead of market value of assets), as also in Bradley et al. (1984). In particular, this IDV may also be regarded as one of the effective proxies for profitability, which may be compared to the level of the cost of debt of a firm to affect the level of the capital structure, as illustrated later. An alternative proxy for profitability was the return on equity(ROE) defined as Net income/Equity, which was tested in a separate model. If this proxy shows its significant effect on the leverage ratio on either the book-value or the market-value based leverage, further investigations would be guaranteed by applying the 'DuPont'

system as another hypothesis for this study.

Second, the proxy for size(**INSIZE**) was proxied by total sales of each firm at the fiscal year-end for each tested. Deesomsak et al.(2004) investigated the determinants of corporate capital structure in the Asia Pacific region for the sample period of 1993–2001 and found that the firm size effect on leverage was statistically significant and positive for most countries in the region after the 1997 financial crisis. However, Fattouh et al.(2005) found that the firm size effect on the capital structure was insignificant or significantly negative at the higher levels of leverage. To test for any size effect on the capital structure in this study, the size variable as IDV has been transformed, by applying a formation of a natural logarithm.

Third, a proxy for growth(**GROWTH**) was calculated by using annual geometric average in sales during the sample period for each firm. Kester(1996) found that there were significant differences in capital structure between the two countries (U.S. and Japan) on a book value basis, after controlling for profitability, risk, growth, size, and industry classification. This proxy may be related with Myers' theory that a firm having more opportunities in investments in intangible assets (as a growth one), may face higher degree of agency costs of debt, as described in Myers(1977). That is, the ratio seems to imply its importance as a possible determinants of the capital structure of a firm, esp. belonging to the KOSDAQ market, due to the fact that a firm listed in the market, may more depend on the investments in intangible assets related to the agency costs of debt such as research & development(R&D) expenses, which, may, in turn, result in the level of leverage.

Fourth, as in Kim(2012), the proxy for measuring a business risk(**VOLATILITY**) was calculated as the standard deviation of annual stock returns times the square root of total number of trading days during a year, as denoted by the New Kisvalue Database. For example, if the standard deviation of annual stock returns is equal to '1' and the total number of trading days are 252, annual 'volatility' employed in this study is calculated as  $1 \times (252)^{1/2} = 15.87$ .

Fifth, as described above, the ratio of market value to book value(**MVBV**) of each sample firm may possess its important implication as one of the proposed IDVs, taking into account the fact that substantial differences exist between the market and book value of tangible assets. Besides these five theoretical IDVs, a dummy variable(**SECTION**) was employed in each corresponding model, as a proxy for categorizing each section as either the Prime or the Venture one in the KOSDAQ stock market.

## 3.2 Methodologies

Regarding the hypotheses with utilizing the sample firms listed in the KOSDAQ market, this study has applied different corresponding methodologies such as a panel data, quasi-experiment, and

logistic regression analyses.

The followings are three hypotheses postulated to test for further investigations in this study:

*<Hypothesis 1>*

*H<sub>0</sub>: The firms listed in the KOSDAQ possess no statistically significant financial attributes to determine their capital structures in this study by utilizing a panel data analysis.*

*H<sub>1</sub>: The firms listed in the KOSDAQ shows any statistically significant financial characteristics to determine their capital structures in this study.*

The panel data analysis employed in this study is a one-way model and can be written as follows(Wooldridge, 2012):

$$Y_{it} = b_0 + b_1X_{1it} + b_2X_{2it} + \dots + b_kX_{kit} + a_i + u_{it}$$

,where  $a_i$  is the unobserved effect.  $u_{it}$  is the error term assumed to be independent and identically distributed.

$i = 1, 2, \dots, n$  (for each firm), and  $t = 2006, 2007, \dots, 2010$ .

$k =$  Total number of exogenous variables, and  $j = 1, 2, \dots, k$

If  $Cov(X_{jit}, a_i) = 0$ , a random effects model. Otherwise a fixed effects model

Panel data model examines a fixed or random effect of group or time and the major difference between the two models depend on the assumption of dummy variables. That is, if dummies are assumed to be a part of the intercept, it may be a fixed effect model. Otherwise, it may be a random effect model assumed to be a part of an error term.(Park, 2009) For reference, the followings are the major criteria to select the appropriate panel data model as suggested by Park(2011).

<i>Fixed Effect(Wald test)</i>	<i>Random Effect(BP test)</i>	<i>Hausman Test</i>	<i>Final Model Selected</i>
A null hypothesis is accepted	A null hypothesis is accepted		<b>Pooled OLS</b>
A null hypothesis is not accepted	A null hypothesis is accepted		<b>Fixed effects model</b>
A null hypothesis is accepted	A null hypothesis is not accepted		<b>Random effects model</b>
A null hypothesis is not accepted	A null hypothesis is not accepted	A null hypothesis is accepted	<b>Random effects model, otherwise fixed effects model</b>

<Hypothesis 2>

*H<sub>0</sub>: Korean firms belonging to the KOSDAQ do not show any structural changes in the mean leverage ratio between the two periods (i.e., pre- and post-global financial crises)*

*H<sub>1</sub>: Korean firms belonging to the KOSDAQ show any structural changes in the mean leverage ratio between the two periods (i.e., pre- and post-global financial crises)*

Subsequent to the first hypothesis tested, it would be interesting for academicians and practitioners to test whether or not, the level of leverage of firms belonging to the KOSDAQ may be structurally changed between the pre- and post-global financial crises, the so-called as 'quasi-experiment'. The sub-sample periods have been separately grouped and consist of the years of 2005 to 2006 and the years of 2009 to 2010. (The intervening period from 2007 to 2008, has not been included due to the possible 'spill-over' effects resulting from the global financial turmoil.)

The corresponding model to test (= **Chow F test**) for any structural changes can be expressed as follows:

$$Y_i = b_0 + b_1X_{1i} + b_2X_{2i} + u_i$$

where  $i = 1, 2, \dots, n$  (for each firm) and  $u_i$  is the error term assumed to be independent and identically distributed.

$n$  = the total number of firms in the KOSDAQ,  $k$  = the total number of exogenous variables

$$\text{Chow } F \text{ statistic} = [SSR_p - (SSR_1 + SSR_2)] / (SSR_1 + SSR_2) \times [n - 2(k+1)] / (k+1)$$

Moreover, it may be of interest to test for any structural changes or breaks between the two periods, based on either the firms listed only in the Prime section or ones only in the Venture section, separately. Therefore, all of the three tests for any structural changes were performed as the parts of the second hypothesis for the KOSDAQ sample firms. The White's heteroskedasticity-robust F test has also been used for the robustness of the test results.

### <Hypothesis 3>

*H<sub>0</sub>: Korean firms classified into the 'Prime' section in the KOSDAQ, may not have any statistically significant differences in the determinants composing the 'DuPont' system in finance, in comparison with those into the 'Venture' section.*

*H<sub>0</sub>: Korean firms classified into the 'Prime' section in the KOSDAQ may have any statistically significant differences in the determinants composing the 'DuPont' system, in comparison with those into the 'Venture' section.*

As a further intriguing examination, this study would implement a logistic regression analysis between the firms in the Prime and the Venture section to find any significant components comprising the 'DuPont' system in the finance theory, once the IDV for profitability(=ROE) may be found to be a statistically significant one, based upon the results of the first hypothesis.

The basic functional form of the logistic regression model is as follows:

$$P(\text{prime}) = e^{\alpha + \beta'x} / (1 + e^{\alpha + \beta'x}),$$

,where P(prime) is the probability that a firm listed in the KOSDAQ will be classified as a member firm in the venture industry, which is bounded between 0 and 1.

It labels  $\alpha$  and  $\beta$  as the intercept and vector of slope parameters, respectively.  $x$  is a vector of independent variables at each studied year.

The logistic regression is modeling the previously mentioned probability by assigning the dummy variable SECTION=1 (if a firm in the sample was in the 'prime' section) and SECTION=0, otherwise. In particular, three factors such as profit margin(PM), asset turnover(ATURN), and equity multiplier(EM) which compose the ROE of the 'Dupont' system, were the IDVs entering into the corresponding logistic model.

## *IV. Analyses and Interpretations*

### *4.1 Analyses*

Based upon the results obtained from the models such as the panel (longitudinal) data, structural change and the logistic models, all the IDVs in the respective model was first analyzed for their implications or interpretations :

Regarding the first hypothesis, <Hypothesis 1>, as a legitimate and fundamental procedure to analyze the regression outputs from the panel data analysis as described above, this research has selected the most effective procedure among the pooled OLS, a fixed effect(FE) model, and a random effect(RE) model with utilizing the appropriate test such as F test(i.e., Wald test), Breusch-Pagan(BP) Lagrange Multiplier test, and Hausman (specification) test on the determinants of the capital structure.

**(1) For the IDV of PFT(=EBIT / Book value of Total Assets)<sup>3)</sup>**

***1) Book-value based leverage ratio as a dependent variable(DV) with the IDV of PFT:***

$$\text{BVLEV1it} = -1.91* -2.08\text{PFTit}* +0.09\text{INSIZEit}* +0.15\text{GROWTHit}* +0.004\text{MVBVit}* \\ +0.0005\text{VOLATILITYit}* -0.09\text{SECTIONit}*$$

(Note) \* indicates that the independent variable (IDV) is statistically significant at 5% level.

***2) Market-value based leverage ratio as a DV with PFT:***

$$\text{MVLEV1it} = -2.52* -0.38\text{PFTit}* +0.12\text{INSIZEit}* +0.07\text{GROWTHit}* -0.002\text{MVBVit}* \\ +0.0001\text{VOLATILITYit}* -0.117\text{SECTIONit}*$$

(Note) \* indicates that the independent variable (IDV) is statistically significant at 5%.

**(2) For the IDV of ROE(=Net Income / Equity)<sup>4)</sup>**

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3) The best model to test for the DV of BVLEV1 was selected as one-way random time effect model, as in Park(2011). While the results obtained from the model for the DV of BVLEV2 showed only one statistically significant IDV as PFT, there were no statistically significant IDVs for the DV of COVERAGE1, both of which were estimated by the pooled OLS procedures. Finally, the model to test for MVLEV1 has utilized one-way random time effect one.

4) The model selected for the DV of BVLEV1 was one-way random time effect one. The results obtained from the models for both the DVs of BVLEV2 and COVERAGE1 showed no statistically significant IDVs with utilizing the pooled OLS procedures. Finally, one-way random time effect model was chosen to test for MVLEV1 as the best one.

**1) Book-value based leverage ratio as a dependent variable (DV) with the IDV of ROE:**

$$BVLEV1it = -1.91* -0.04ROEit* +0.09INSIZEit* +0.14GROWTHit* +0.005MVBVit* \\ +0.0006VOLATILITYit* -0.09SECTIONit*$$

(Note) \* indicates that the independent variable (IDV) is statistically significant at 5% level.

**2) Market-value based leverage ratio as a DV with ROE:**

$$MVLEV1it = -2.52* -0.02ROEit +0.12INSIZEit* +0.05GROWTHit -0.0009MVBVit \\ +0.0003VOLATILITYit -0.129SECTIONit*$$

(Note) \* indicates that the independent variable (IDV) is statistically significant at 5%.

Second, to examine any structural changes (or quasi-experiment) between the pre- and post-global financial crises. (i.e., the years of 2005 - 2006 and 2009-2010) as the second hypothesis, <Hypothesis 2>, Chow F test has been applied, coupled with the White's heteroskedasticity-robust F test for its robustness. The followings are the results obtained from each corresponding statistic:

**(1) For the Chow F test results**

	PFT*	H <sub>0</sub> ***	ROE**	H <sub>0</sub>	Prime	H <sub>0</sub>	Venture	H <sub>0</sub>
BVLEV1	1.660	Accept	1.718	Accept	1.287	Accept	1.439	Accept
MVLEV1	16,635	Reject	21.456	Reject	21.724	Reject	13.118	Reject

(Note) \*: The F statistic obtained from the total observations with including the PFT for profitability

\*\* : The F statistic obtained from the total observations with including the ROE for profitability

\*\*\*: Statistically significant at the level of 5%

Accept = Accept a null hypothesis (i.e., There may be no structural change.),

Reject = Do not accept a null hypothesis (i.e., There may be a structural change.)

**(2) For the White's heteroskedasticity-robust F test results**

	PFT*	H <sub>0</sub> ***	ROE**	H <sub>0</sub>	Prime	H <sub>0</sub>	Venture	H <sub>0</sub>
BVLEV1	1.660	Accept	1.718	Accept	1.287	Accept	1.439	Accept
MVLEV1	16,635	Reject	21.456	Reject	21.724	Reject	13.118	Reject

(Note) \*: The F statistic obtained from the total observations with including the PFT for profitability

\*\*:The F statistic obtained from the total observations with including the ROE for profitability

\*\*\*: Statistically significant at the level of 5%

Regarding the third hypothesis <**Hypothesis 3**>, this study has hypothesized a logistic regression analysis between the firms in the Prime section and the Venture one to test for any significant components comprising the 'DuPont' system in the finance, such as profit margin(PM), asset turnover(ATURN), and equity multiplier(EM). The results from the regression are as follows:

<i>IDVs</i>	<i>Coefficient</i>	<i>Chi-square</i>
<b>Intercept</b>	-0.8810	16.4445*
<b>PM</b>	2.8115	27.6648*
<b>AURN</b>	0.5197	17.2729*
<b>EM</b>	0.0134	0.1356
<b>F2006</b>	0.00422	0.0004
<b>F2007</b>	0.0584	0.0771
<b>F2008</b>	0.1224	0.3370
<b>F2009</b>	0.0178	0.0072
<b>Goodness of Fit</b>		<b>71.8905*</b>

(Note 1) \* : Significant at 5% level with respect to the chi-square test.

(Note 2) The coefficients were estimated by the method of maximum likelihood (ML). The test for overall goodness of fit was performed by the likelihood ratio (LR) test, while the Wald test was used to test for the significance of each individual coefficient.

## 4.2 Interpretations

Regarding the results for the panel data analyses, <Hypothesis 1>, the best models to find any possible determinants of the capital structures for the sample firms, were chosen as the random effect(RE) models, across the book-value based leverage(BVLEV1) and the market-value based leverage(MVLEV1). For the book-value based leverage, all of the six proposed IDVs have been found to be statistically significant at the 5% level as the financial determinants of capital structure

across the measurement for profitability such as PFT and ROE. On the other hand, all of the IDVs except VOLATILITY were found to be significant as the determinants to explain the market-value based dependent variable(MVLEV1) in the model with the IDV of PFT. It may be worthwhile to note that these results obtained by applying the panel data analysis in this study, were mostly or pervasively consistent with the previous outcomes in Kim(2012). Therefore, the results on these statistically significant IDVs across the two studies (on the first hypothesis), may be reinforced with robustness due to their commonalities.

The followings are major implications of the several statistically significant IDVs on the results obtained from the model:

First, PFT, the so-called as 'Basic Earnings Power(BEP)' showed its statistically significant and 'negative' effect on the capital structure for the listed firms in the KOSDAQ market across all the models with BVLEV1 and MVLEV1 as described. This explanatory variable showed its consistent effect on the level of the leverage for the firms in Korea, as upmost and/or only significant element, as in Kim & Berger(2008) and Kim(2012). As one of the primary implications on the negative relationship with the leverage, it may still be theoretically reasonable to interpret this phenomenon which supports the well-known Myers' Pecking Order theory.(Myers, 1984): There may be a preference for internally generated funds (as internal financing) over the external financing, and then, debt may be preferred over equity if external financing is needed. Accordingly, Korean domestic firms including the KOSDAQ listed ones, seem to follow the rationale of the theory in practice when implementing their capital structure strategies.

Second, utilizing the panel data analysis, it was found the negatively significant relationship of SECTION with the capital structure, indicating the firms in the Prime section of the KOSDAQ market may maintain, on average, lower debt ratios than those of their counterparts in the Venture section. To interpret this results, the theory of 'Range of Earnings Chart'(Higgins, 2009) may be applied to a firm, especially belonging to the Venture one, taking into a higher possibility of the bankruptcy, due to more volatile earning streams, as also presented in Kim(2012)

However, only two proposed IDVs such as INSIZE and SECTION among the six IDVs (including ROE), showed their statistical significances, based on the market-value based leverage with the IDV of ROE. Therefore, it may be of interest to examine any interpretations on the statistical difference between PFT(i.e., significant) and ROE(i.e., insignificant) affecting the MVLEV1 in the context of modern finance theory as follows:

First, as PFT and ROE were defined as EBIT/Total Assets and Net Income/Equity in this study, respectively, many firms listed in the KOSDAQ, may weigh more importance on the level of their EBIT(earnings before interest and tax) rather than that of net income, when establishing their

(market-value based) capital structures. As one of the recent financial trends, most market participants or managers seem to be more sensitive to the change of EBIT of the firms they invested in or are concerned about, than the change of net income. Therefore, most firms seem to focus on the increase of their EBIT which can be generated from their own businesses activities as operating income, which, in turn, may increase the market capitalization and lower the MVLEV1. In accordance with maximizing the market value of equity, the 'negatively' significant relationship between PFT and MVLEV1 was found in the corresponding model

Second, concerning the insignificant outcome of ROE relative to the market-value based capital structure, it may imply that the financing policies or practices of the firms belonging to the KOSDAQ, may not be consistent with the traditional theory of the capital structure toward maximizing their market value, indicating that, from the shareholders' perspectives, ROE referred to usually as 'reinvestment rate', may not be effectively controlled by the financing cost (i.e., interest expense) arising from the level of debt. ( $ROE = (EBIT - \text{interest expense} - \text{corporate tax}) / \text{equity}$ )

More importantly, another interpretation on the significant PFT, may be derived from the relationship between the PFT defined as  $EBIT / \text{Total Assets}$ , and the cost of debt, as presented in Kim(2010). At the financial break-even point(FBEP), the former(PFT) is equal to the latter(the cost of debt) which incurred by the debt burden of a company. If the EBIT is less than FBEP, the company may prefer to use less debt (that is, less leverage), due to the negative net of [PFT - the cost of debt], which may, in turn, result in a decrease of EPS(earnings per share) from a shareholder's standpoint, and vice versa. Therefore, the findings of this paper on the significant PFT and the insignificant ROE to affect the level of market-value based capital structure, may also be attributed to the incumbent management's policy, which depends upon the level of the difference between EBIT and FBEP toward maximizing EPS for the shareholders' interests.

The results obtained from the models for both the DVs of BVLEV2 and COVERAGE1 showed only one (i.e., PFT) and no statistically significant IDVs by utilizing the pooled OLS regression procedures.

Given the test results concerning the second hypothesis to examine any structural change between the pre- and post-financial periods, this study found the following consistent outcomes in terms of the Chow F test: First, there were no structural break between the two separated periods, based upon the book-value based leverage (BVLEV1) across all four tested models, such as each pooled sample model with PFT and that of ROE, and the model for the firms listed only in the Prime section and only in the Venture section, respectively. This results were confirmed by the White's heteroskedasticity-robust test for its robustness.. On the other hand, this study showed that there were statistically significant (structural) changes around the U.S. financial crisis (i.e., the years of 2007 and 2008), when measured the leverage with the market-value basis. This result may result from the fact that the stock market conditions related to the MVLEV1, increase their

volatilities to more extreme level after the U.S. financial crisis. Another plausible implication on this statistically significant change after the crisis, may, in part, result from the policy-related issue which was suggested by Fattouh et al.(2005), as industrial and financial restructuring policies adopted after the 1997 financial crisis by the Korea government led to a widespread shift in the relationship between a firm's financing and the costs resulting from asymmetric information.

Finally, this study analyzed the following formula, which is frequently utilized in practice, the so called as 'DuPont system' with three components such as profit margin(PM), asset turnover(ATURN), and equity multiplier(EM) and the time dummy variable from the period of 2006 to 2010 (e.g., the year of 2010 is a base):  $ROE = ROA \times EM = PM \times ATURN \times EM = (\text{Net Income} / \text{Sales}) \times (\text{Sales} / \text{Assets}) \times (\text{Assets} / \text{Equity})$ .

As for the results from the logistic regression model on this hypothesis, the overall goodness of fit measured by the likelihood test(LR) showed its statistical significance at 5% level with two positive and significant IDVs such as PM and ATURN. Therefore, the probability for a firm to be classified into the category of the Prime section of the KOSDAQ market, may be higher, if its profit margin and asset turnover increase. However, the equity multiplier relating to a firm's leverage, showed its statistical insignificance between the two sections, implying that the firms belonging to the Prime section may maintain higher ROE than their counterparts in the Venture section, mainly due to their improved profitability and activity, not by the level of leverage measured by the equity multiplier(EM).

## V. Concluding Remarks

This study has analyzed financial attributes or characteristics to determine the capital structure or the level of leverage for the firms listed the KOSDAQ stock market. It may be of importance or valuable for market participants to examine the results obtained from this research for robustness by comparing with the previous studies (e.g., Kim(2012)).

For the book-value based leverage, all of the six proposed IDVs have been found to be statistically significant as possible financial determinants of leverage, across the proxies employed for measuring profitability (i.e., PFT and ROE). All of the IDVs except VOLATILITY may also be the attributes to explain the market based dependent variable(MVLEV1) in the model with the IDV of PFT, as described. Interestingly, the results on the significant PFT and the insignificant ROE concerning the market-value based capital structure of KOSDAQ listed firms, may be attributed to the management's policy, which depends upon the level of the difference between EBIT and FBEP to maximize EPS for their shareholders' interests. This study also found that the results based

upon the dependent variables such as BVLEV2 and COVERAGE1 showed only one (i.e., PFT) and no statistically significant IDVs, respectively.

Regarding the second hypothesis, there were no structural changes between the two periods (i.e., pre- and post-financial crises), based upon the BVLEV1 across all tested models such as each pooled model with PFT and that of ROE, and the model with the firms listed only in the Prime section and only in the Venture section, respectively. However, there seemed to be statistically significant (structural) changes (or quasi- experiment) around the financial instable period (i.e., the years of 2007 and 2008), when measured the leverage with the market-value basis. This result may be, in part, attributed to the increased volatility of the domestic stock market returns after the crisis. Finally, based upon the logistic regression results, this study found that the probability for a firm to be classified into the category of the Prime section in the KOSDAQ market, may be higher, if its profit margin(PM) and asset turnover(ATURN) increase, while the equity multiplier(EM) showed its statistically insignificant difference between the firms belonging the Prime section and the Venture one.

This study has several weaknesses as an empirical study, such as the possibility of obtaining different or inconsistent results under the same (or similar) subject, mainly due to utilizing different measures of the proxy variable(s), different time periods and methodologies applied.

However, the pervasive outcomes obtained from this study were mostly consistent with the previous results obtained in Kim(2012), which may also reinforce the robustness of each statistically significant IDV found in each corresponding model. Multinational corporations headquartered in either advanced or emerging capital markets, may take into account the results when establishing or controlling their subsidiaries in Korea, given the contemporary global economic environments toward the bilateral or trilateral FTA(Free Trade Agreement) pact among the nations, as described earlier. Moreover, domestic authority in charge or corporate manager may also take into account of the results of this study, when implementing their policies or strategies to determine the optimal capital structure of the KOSDAQ listed corporations at the industry and/or the firm level.

## References

- Bowen, Robert M., Lane A. Daley, and Charles C. Huber, Jr. "Evidence on the Existence and Determinants on Inter-industry Differences in Leverage." *Financial Management* (Winter1982):10-20.
- Bradley, Michael, Gregg A. Jarrell, and E. Han Kim. "On the Existence of an Optimal Capital Structure: Theory and Evidence." *Journal of Finance* 39:3 (July1984): 857-878.
- Deesomsak, Rataporn, Krishna Paudyal, and Gioia Pescetto. "The Determinants of Capital Structure: Evidence from the Asia Pacific region." *Journal of Multinational Financial Management*.14 (2004) :387-405.
- Fattouh, Bassam, Pasquale Scaramozzino, Laurence Harris. " Capital structure in South Korea: a quantile regression approach." *Journal of Development Economics* 76 (2005):231-250.
- Glen, Jack and Ajit Singh. "Comparing Capital Structures and Rates of Return in Developed and Emerging markets." *Emerging Markets Review* 5 (2004): 161-192.
- Harris, Milton and Artur Raviv. "The Theory of Capital Structure." *Journal of Finance* 46:1 (March1991): 297-355.
- Higgins, C. Robert. *Analysis of Financial Management* (9th ed.), McGraw-Hill Co., 2009.
- Kester, W. Carl. "Capital and Ownership Structure: A Comparison of United States and Japanese Manufacturing Corporations." *Financial Management* (Spring1986):5-16.
- Kim, Chuljoong, *Enterprise Value Based Business Analysis* (3rd ed.), Myoungkyung-sa, Seoul, 2010.
- Kim, Hanjoon. "Inter- and Intra-leverage Analyses for Large Firms in the United States and Korea." *Journal of Asia-Pacific Business* 10:1 (March 2009): 34-64.
- Kim, Hanjoon. "Financial Leverage of Korean Business Conglomerates "Chaebol" in the Post-Asian Financial Crisis." *Journal of the Korea Academia-Industrial Cooperation Society* 12:2 (February 2011): 4359-4368.
- Kim, Hanjoon. "Determinants of Leverage for Manufacturing Firms Listed in the KODAQ Stock Market." *Journal of the Korea Academia-Industrial Cooperation Society* 13:5 (May 2012): 2096-2109.
- Kim, Hanjoon and Paul D. Berger. "A Comparison of Capital Structure Determinants: The United States and The Republic of Korea." *Multinational Business Review* 16:1 (2008): 70-100.

Kim, Hanjoon and Paul D. Berger. "The Management Characteristics of Korean Chaebols vs. non-Chaebols: Differences in Leverage and Its Ramifications: Myth or Reality?" *Advanced In Management*, 2 (2009): 26-35.

Kim, Wi Saeng and Eric H. Sorensen. "Evidence on the Impact of the Agency Costs of Debt on Corporate Debt Policy." *Journal of Financial and Quantitative Analysis* 21:2 (June 1986): 131-144.

Modigliani, Franco and Merton H. Miller. "The Cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* 48:3 (June 1958):261-297.

Myers, Stewart C. "Determinants of Corporate Borrowing." *Journal of Financial Economics* 5 (1977):147-175.

Myers, S. C. and N. S. Majluf. "Corporate Financing and Investment Decisions When Firms have Information that Investors do not have." *Journal of Financial Economics* (February 1984): 187-221.

Park, Hun Myoung. "Linear Regression Models for Panel Data Using SAS, Stata, LIMDEP, and SPSS." Working Paper. The University Information Technology Services (UITS), Center for Statistical and Mathematical Computing, Indiana University, 2009. <<http://www.indiana.edu/~statmath/stat/all/panel>>

Park, Hun Myoung. *Practical Guides To Panel Data Analysis*, 2011. <<http://www.iuj.ac.jp/faculty>>

Remmers, Lee, Arthur Stronehill, Richard Wright, and Theo Beekuisen. "Industry and Size as Debt Ratio Determinants in Manufacturing Internationally." *Financial Management* (Summer 1974): 24-32.

Scott, David F., Jr. "Evidence on the Importance of Financial Structure." *Financial Management* (Summer 1972): 45-50.

Wooldridge, Jeffrey M. *Introductory Econometrics: A Modern Approach* (5th ed.), South-Western (Cengage Learning), 2012.