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국내 재벌기업들의 수익성관련 분위회귀모형 상 재무적 결정요인 분석

Investigations on the Financial Determinants of Profitability for Korean Chaebol Firms by applying Conditional Quantile Regression (CQR) Model

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요약

본 연구는 국내 자본시장에서의 최근 주요 관심이슈 중 하나인 국제금융위기 이후 재벌그룹 소속 계열사들의 수익성 분포 편향가능성과 관련된, 동 지표에 대한 재무적 결정요인의 분석이다. 연구대상으로 공정거래위원회에서 규정한 대규모기업집단과 유사한 의미인 국내 재벌그룹 중심의 소속 계열사들이며 특히, 시장가치 산정을 위하여 유가증권시장과 코스닥시장에 상장된 기업들로만 구성된다. 또한, 동 연구기간은 국제금융위기 이후의 기간인 2009년부터 2012년 사이로 선정되었다. 관련 분석을 위하여 2가지 가설들이 설정되었으며, 전자는 분위회귀모형을 이용한 각 해당 비율 구간별 재벌 계열사들의 수익성 결정요인들을 각각 판명하여 비교분석하는 것이며, 후자는 5가지의 요인들로 구성된 '확장적' 듀퐁공식을 기준으로, 프로빗 모형분석을 이용한 표본기업들의 재무적 차별요인들을 분석하는 것이다. 도출된 결과와 관련하여, 수익성에 대한 재무적 결정요인으로서 부채비율, 비유동자산회전율, 외국인지분율, 그리고 주식거래시장의 구분 등이 통계적인 유의성을 나타냈으며, 두번째 가설검정 결과는 자기자본수익률에 영향을 미치는 요인들로서, 자기자본(시장가치 기준) 대비 매출액 비율과 부채비율 등이 재벌소속 기업들의 금융위기 시점과 최근까지의 변화되는 재무적 특성으로 판명되었다. 또한, 현재 정책적인 측면에서 기업들의 사내유보금에 축소에 대한 논리와 관련하여 본 연구에서는 기업의 유보금과 수익성 증대의 상관관계에서 통계적 비유의성을 보였다.

■ 중심어 : | 국내자본시장 | 재벌 | 분위회귀분석 | 프로빗모형 | 수익성 |

Abstract

This study investigated one of the contemporary issues in the Korean capital market and two hypotheses of concern were tested on the financial determinants of profitability for the firms belonging to the Korean chaebols during the era of the post-global financial turmoil. The first hypothesis applying conditional quantile regression (CQR) estimation provided the evidence that leverage ratio, fixed asset utilization, and foreign ownership among the nine quantitative explanatory variables, had overall statistical significance relative to the book-valued profitability measure, while additional variables such as a firm's size, fixed and a proxy for the type of exchange market showed their strong impacts on the market-valued profitability indicator. Concerning the formulated 'extended' DuPont system, only two components of EBITDAEBIT and EMULTIPLIER revealed their prominent influence on ROE (Return on Equity) over the two tested periods (the years 2008 and 2012).

■ keyword : | Korean Capital Market | Chaebol | Conditional Quantile Regression | Probit Model | Profitability |

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I. Introduction

This study addresses one of the contemporary issues, which may be of considerable interest to foreign and domestic investors as well as the government policy makers in the Korean capital market. It is relevant to identify any common or disparate financial elements or characteristics among the firms belonging to the chaebols, so called as a 'chaebol firm', depending on the distributional location in terms of the profitability indicator. There seems to be relatively little empirical evidence in the previous finance literature, on the relationship between the profitability indices and their proposed financial attributes within the international and domestic context. Furthermore, as described in [1], to date, it may be noteworthy to further investigate the subject for the chaebol firms, given the ongoing trend presumed that major financial aspects inclusive of profitability may continue to be distorted or polarized in their distributions among themselves. To exemplify, the level of profitability for the sixteen Korean conglomerates among the top (largest) twenty, decreased below to their previous levels attained in the period of the pre-global financial turmoil (the year 2008), based on the market data including those from Korea Exchange[2]. Moreover, with respect to the total amount of operating profit as earnings before interest and taxes (EBIT) during the fiscal year of 2013, it was released that the largest conglomerate, Samsung Group, took its weight of 47.9% in total amount of EBIT, as followed by Hyundai Motor Group and SK Group with 21.7%, and 14.3%, respectively, suggesting that more than 92% of the total EBIT was accounted for by only these few conglomerates even among the top ten largest chaebols in total asset size during the fiscal year of 2013[3]. To make this phenomenon more concerned, it was reportedly updated that only two subsidiaries belonging to each corresponding chaebol (i.e., Samsung Electronics Co. and Hyundai Motor Co.) have accounted for about 14.7% in operating profit (e.g., 22.8 billion Korean won) out of the total (corporate-tax paying) domestic firms in the year 2012, implying the drastical increase of their proportions which was only 7.3% in the year 2009[4].

The primary motivation to perform this research may be postulated as follows: First, as a legitimate empirical study, any results obtained from the tested models may be compared with those in the previous literature such as [24] dealing with similar, but different subjects on the financial profiles of the Korean chaebol firms. Consequently, it was expected to enhance validity of the empirical findings by deriving any common factors shared by the associated studies, which subsequently tend to reinforce robustness and consistency on the results from each study. Second, given the redundancy of economic stage of cycle augmented or mitigated by external and/or internal conditions, any unanticipated financial instability incurred possibly by the aforementioned distortion of financial profitability may be, to some extent, reduced or eliminated by applying the empirical findings obtained from this study, by which any stagnant or sluggish financial aspect of profitability may well be improved, as similarly described in [1]. In other words, taking into consideration of the trend of the current distorted or polarized distribution of profitability even among the chaebol firms, this study may contribute to reducing or preventing any financially volatile situations by identifying financially significant attributes under each tested quantile. Third, due to the actively processed agreements among the associated nations such as bilateral or trilateral free trade agreement (FTA) and trans-pacific economic pact (TPP), the

domestic capital market may be anticipated to host more capital inflow into the manufacturing and the financial service sectors. From foreign investors' perspectives, it may be useful to identify any financial determinants on profitability for domestic firms inclusive of the chaebol firms, when they take into account or apply to relatively long-term direct or short-term indirect investment opportunities such as cross-border mergers & acquisitions (M&A) and rebalancing portfolio holdings.

This paper is organized as follows: Introducing an overview of the study in the first section, the review on the previous literature related to the financial aspects including profitability was presented in the second section. Criteria on data collection and statistical estimations for each corresponding hypothesis were separately described in the subsequent section. Subsequently analyses and discussions with their implications were also elucidated on the basis of the results obtained, which was followed by the concluding remarks including several contribution of this paper to the empirical finance.

II. Previous Literature

The following literature was described to chronologically review major theoretical and empirical findings contributed to the relationship between a firm's financial indicators inclusive of profitability and their proposed determinants, which had also been referred to in the previous researches such as in [5] and [6].

Krishnan & Moyer [7] employed four different performance measures such as ROE, ROIC, pre-tax operating profit margin at book-value and the market return of equity at market-value for corporate performance (i.e., profitability), while two measures such as the ratio of total debt to the market value of equity and the ratio of long-term debt to the market value of equity for leverage for the sample firms headquartered in across Hong Kong, Malaysia, Singapore, and South Korea. They provided the evidences in the regression models that the country dummy variable representing South Korea showed its negative and statistically significant effect on the performance measure (in comparison with Hong Kong) and revealed its significant positive coefficient on the employed leverage ratios compared to the other three countries during the sample period ending the year 1992. One of the issues investigated by Kim & Berger [8] is whether the Korean chaebol may possess different market-value based debt ratios than their counterparts not classified into the chaebol. Meanwhile, the Korean chaebol may share similar financial aspects to the Japanese Keiretsu at the macro-level, although there were distinct and unique disparity as presented in the study. The results suggested that the Korean chaebol firms may, on average, maintain a higher leverage than their counterparts. Moreover, by employing a logistic regression model, they found that the chaebol firms may possess different levels of the financial determinants, compared with their counterparts with larger in total sales, higher growth rate in sales, and less profitability.

Goddard et al.,[9] addressed the results obtained for the significant components on the profitability measure for European manufacturing and services industries belonging to Belgium, France, Italy, Spain and the UK during the tested period from 1993 to 2001 after the formation of the European Union. By utilizing dynamic panel data model to determine any possibility of persistence in financial profit rate, they presented positive and significant persistence across

all of the sample countries. Moreover, the independent variables in the model showed that a firm's size showed its negative and significant effect on the profit rate, while market share and leverage ratios displayed their positive and negative significant influences on the dependent variable, respectively.

During the panel between the year 1992 and 2001 including the pre- and post- Asian financial turmoil in the Korean capital market, Fattouh et al.,[10] asserted that there may be systematic association between leverage and the variable representing asymmetric information cost. However, firm size effect on the capital structure was insignificant or negatively significant at a higher quantile of leverage due to increased borrowing cost. Profitability defined by the ratio of EBITDA divided by total assets, was negatively significant across at all quantiles, which may be accounted for the pecking order theory in the context of modern finance. Gill et al.,[11] tested three different types of the regressors proxied for leverage as short-term, long-term, and total debt to find any effects on the profitability measure of ROE. Additional independent variables such as size, growth rate in sales, and industry dummy, were also employed in the regression models. While there seemed to be positive associations between short-term and total debt ratios, and ROE in the manufacturing and the service industries, the effect of the long-term debt ratio was contradicting between those industries. Overall, statistically significant linkages between profitability and the other aforementioned variables were not also found in the research.

Kim[23] tested relevant hypotheses on the financial determinants of the capital structure for the firms listed on the KOSPI during the sample period from 2006 to 2011. It was found that three explanatory variables such as profitability, a firm's size, and business risk, were revealed to be statistically significant impacts determining the level of leverage during the post-global financial period. In addition, the results obtained from the Fisher exact probability test suggested that a firm belonging to each sample industry may have a tendency of reversion toward its industry mean and median leverage levels, respectively. Morever, the study done by Kim[6] presented an empirical subject to identify any financial attributes of profitability measure for the Korean chaebol firms. Three hypothesis tests were implemented during the sample period comprehending the U.S. financial turmoil. Adopting the model specification of panel data analysis, the study showed statistically significant relationships of the control variables such as leverage, market- to book-value ratio, business risk relative to the book-valued profitability measure, while the market-valued profitability indicator was only accounted for by the book-valued debt ratio. With respect to another hypothesis to test for the profitability level at the industry level, the firms belonging to the chemical and the food sample industries, on average, maintained themselves in higher positions in rank.

III. Data and Model Specification

1. Data Collection

The following table [Table 1] provides a general guideline to finalize the sample firms belonging to the Korean chaebols over the reference time from the year 2009 to 2012 covering the post-period of the global financial turmoil.[1]

1 The criteria for data collection was also utilized in [1].

Table 1. Data Selection Criteria

1. All the data for the employed variables were available for at least five years from 2009 to 2012, which was in the post-period of the global financial turmoil. 2. The sample firms were listed on the KOSPI or KOSDAQ market during the sample period. 3. They were also included in the databases of New KisValue sourced by the NICE. 4. The criteria to categorize a firm belonging to a chaebol during the sample period, were in accordance with the guidelines by the Fair Trade Commission (FTC) in the Republic of Korea, such that it was the one classified into a 'Large Business Group', subject to the ceiling on cross-shareholding system. 5. Financial and regulated industries were not included in the final sample.

The reference period investigated in the present study was set for the post-era of the global financial turmoil originated basically in the U.S. subprime mortgage crisis. This selection for the sample period may mitigate or reduce any spill-over effects caused by the turmoil as possible. In particular, the data for the year 2008, was utilized (in the 2nd hypothesis) for a comparison purpose when performing the test to investigate any components changed intertemporally, between the two periods of the year 2008 when the global financial crisis began and the year 2012 which may also incorporate or reflect any *ex post* since the turmoil.

1.1 Variables Employed

The definition of the variables in the dependent variable (DV) and the independent variable (IDV) of this study was elucidated as follows:

1.1.1 Dependent Variable (DV)

(1) PFT = EBIT / Total Assets

(2) MTB = The Ratio of Market Value to Book Value of Total Assets

(3) ROE = Return on Equity
=Net Income / Equity

1.1.2 Independent Variable (IDV)

Table 2. Definition of IDVs Employed

Definition	IDV	Measurement as a Proxy
Leverage	BVLEV	Book value of liabilities / Total assets
	MVLEV	Book value of liabilities / [Book value of liabilities plus Book value of preferred equity plus Market value of common equity]
Size	SIZE	Natural logarithm of sales amount at each fiscal year-end
Growth rate	Growth	[Sales / one-period lagged sales] - 1
Business risk	VOLATILITY	[Standard deviation of annual stock returns] x ([Square root of total number of trading days during each fiscal year)] defined by the New Kisvalue Database.
Foreign ownership	FOS	Foreign ownership of each sample firm belonging to the chaebol
Free cash flow to the firm	FCFF	Earnings after corporate taxes - [Net changes of the amount of assets during a fiscal year]
Retention ratio	RETENTION	[1 - Dividend Payout]]
Market capitalization	MVE	Market value of equity
Non-current assets turnover ratio	FTURNOVER	[Sales / non-current assets]
Fiscal year	FYEAR	f2010= 1 if the fiscal year is '2010'. 0, otherwise. f2011 = 1 if the fiscal year is '2011'. 0, otherwise. f2012 = 1 if the fiscal year is '2012'. 0, otherwise. (Base fiscal year = the year 2009)
Type of stock exchange	SMARKET	SMARKET = 1 if a firm belonging to the chaebol is listed in the KOSDAQ stock market. 0, otherwise.

Concerning the DV employed, the DV such as PFT and MTB were employed in this study to test for the first hypothesis as exposited below, while ROE was utilized for the latter hypothesis test related to the 'extended' DuPont system. In particular, along with the book-valued profitability measure (PFT), it was

of considerable interest that the market valued measure (MTB) was adopted in the present study, which seems to have rarely been tested especially for the Asian firms including Korean ones in the previous literature to data. Gentry & Shen [12] employed the market related measure to examine any associations with accounting measures for the U.S. sample firms. With respect to the IDV employed in the study, it may also be noteworthy to control any possible effect of internal savings proxied by RETENTION defined by [1 – dividend payout], which the Korean government currently urges domestic large firms including the chaebol firms to dispense more in investments or minimize the level of internal savings in the expectation of boosting the stagnant economic condition. In other words, it may be more rationally persuasive or effective to implement this unprecedented policy from a domestic policy maker′s perspective, provided that the corresponding IDV may be an insignificant or negatively significant effect on the profitability indicator as tested below. In the meantime, other IDVs adopted in the present study shared communalities with those in [1] in the majority, for enhancing validity and a comparison purpose with the previous researches, as descirbed above.

2. Model Specification

The following two hypotheses were postulated for this study to test for identifying financial determinants which may affect the level of profitability for the chaebol firms.

2.1 The first hypothesis

H_0: There may not be any differences in financial determinants across all categorized quantiles on profitability for the firms belonging to the Korean chaebols by utilizing conditional quantile regression (CQR) estimation.

As a fundamental motivation to perform the present study was initiated by identifying any financial determinants of profitability whose distribution may be contemporarily distorted or polarized, due to its disportionate concentration on only the few largest chaebol firms in the domestic capital market, as exemplified. Given the idiosyncratic phenomenon on concentration, it may be useful to utilize conditional quantile regression (CQR) estimation technique, as adopted in Kim (2014). The CQR analysis which was developed by [14], may provide a practically efficient method to estimate models by adjusting an absolute value (yielding a median) to derive an appropriate asymmetric weighting which could be utilized for the other quantiles, as presented in [14].

As frameworked in [10], the underlying rationale on the CQR estimator may be specialized as follows, which was also referred in [1]:

Let (yi, xi), i=1,. . .,n be a sample from some population where xi is a (K x1) vector of regressors. Assuming that the Θth quantile of the conditional distribution of yi is linear in xi, the CQR model can be formulated as follows:

$$y_i = x_i'\alpha\Theta + \mu\Theta i$$
$$\text{Quant}\Theta\,(y_i \mid x_i) \equiv= \{y: F_i(y \mid x)\Theta\} = x_i'\alpha$$
$$\text{Quant}\Theta\,(\mu\Theta i \mid x_i) = 0$$

,where QuantΘ (yi | xi) indicates the Θth conditional quantile of yi on the regressor vector of xi′. αΘ is the unknown vectors of parameters to be estimated for varying values of Θ in (0,1). μΘ is the error term which is assumed to have a continuously differentiable c.d.f. FμΘ (.|x) and a density function fμΘ (.|x). Fi(.|x) denotes the conditional distribution function of y. By varying the value of Θ from 0 to 1, we trace the entire distribution of y conditional on x.

The estimator for αΘ is obtained from:

$$\min \sum_{i}^{n} \rho\theta(Yi - Xi'\alpha\theta)$$

, where ρΘ(μ) is the check function as ρΘ(μ) = Θμ if μ ≥= 0, (Θ-1)μ, otherwise.

As also outlined in [1], the check function denotes that positive and negative values were asymmetrically assigned varying weights according to the positive and negative residuals, and a linear programming methodology for optimalization could be applied to estimate each corresponding coefficient which may minimize the weighted sum of absolute deviations between the dependent and the independent variables in the regression model, which was described in [15].

2.2 The second hypothesis

H_0: Firms belonging to the chaebols, may, on average, have the same level of each component comprising the 'extended' DuPont system in the intertemporal period between the year 2008 in which the global financial crisis having been originated and the year 2012 having been incorporated any ex post changes after the spillover effect of the turmoil.

Another hypothesis test was followed to test for investigating any components comprising the 'extended' DuPont system.[2] For example, the conventional DuPont formula seemed to considerably contribute itself to cross-sectional analysis on a firm's profitability level from a shareholder's perspective and be accepted as one of the most practical techniques in the field of finance. This study modifed the stereo-typed structure of the system (with three components) into the modified structure, so-called as 'extended' DuPont system consisting of five components for the profitability measures, ROE. Some of these factors may uniquely include market-value based components which were unprecedentedly tested to discriminate them between the two temporal spans (i.e., the year 2008 and 2012) as described earlier. The following equation is to describe the 'extended' one analyzed in this study:

ROE = Profit Margin x Sales per Market Value of Equity x Market value based Leverage Ratio x Market- to book-value of an Enterprise x Book-value based Leverage

= [Net income/Sales] x [Sales / (Total number of common shares outstanding x The closing price of a common share)] x [Market value of equity / (Total Liabilities + Book value of preferred share + Market value of Equity)] x [Market value of an enterprise / Total assets] x [Total assets / (Total assets - Total liabilities)]

To test for the hypothesis, the probit regression estimation was employed to investigate any components comprising the extended form of the system. The probit analysis was modelling the probability, by assigning a dummy variable, USCRISIS = 1 (if the data for a Korean chaebol firm belonging to the year 2008) and USCRISIS = 0, otherwise.

IV. Analysis and Discussion

1. Analysis

1.1 Descriptive Statistics

Before analyzing the results obtained from each corresponding hypothesis, legitimate descriptive statistics may suggest a general overview on the

2 The results of the 'extened' DuPont system was presented by the author in the 2014 Academic Conference hosted by the Korea Securities Association on Feb. 21, 2014, Korea with utilizing different data (for the KOSPI firms) and period.

sample over the investigated years (2009 - 2012).

Table 3. Descriptive Statistics for the Sample Firms of the Chaebols during the sample Period

IDV	No.	Mean	Median	STD	Min.	Max.
PFT	169	0.05	0.04	0.06	-0.35	0.24
MTB	169	1.18	1.02	0.56	0.31	4.38
BL	169	0.55	0.57	0.19	0.07	1.31
ML	169	0.54	0.55	0.24	0.02	0.997
SZ	169	28.26	28.36	1.88	23.56	32.93
MVE	169	4.2E12	8.1E11	1.4E13	3.0E9	2.2E14
GR	169	0.71	0.09	11.87	-1.00	291.7
RT	169	0.81	0.89	0.36	-4.05	1.0
FT	169	2.39	1.68	2.26	0.04	19.35
V	169	46.25	41.92	41.47	11.14	1012
FS	169	0.14	0.10	0.15	0	0.61
FC	169	7.3E10	9.5E9	1.2E12	-4.8E12	1.4E13

〈Note〉 No.= Number of the Sample Firms belonging to the Chaebols, STD=Standard Deviation, BL=BVLEV, ML=MVLEV, SZ=SIZE, , GR= GROWTH, R=Retention, FT=FTURNOVER, V=VOLATILITY, FS=FOS, FC=FCFF, Also refer to [Table 2] for each definition

Regarding the relative large difference between the mean and the median value of MVE for market capitalization may be derived from the higher volatility of STD (standard deviation) as 1.4E13 and the large distance between the MAX (=2.2E14) and the MIN (=3.0E9).

1.2 Analysis on the results of the 1st hypothesis

To perform *a priori* test, even if there were relatively abundant researches to examine and plausibly confirm major financial determinants of the capital structure since the seminal article presented by [16], it may be empirically equivocal to determine whether the former dependent variable (i.e., the capital structure) may have, any reverse or causal effect as explanatory variable on profitability as one of the proposed financial determinants. To assure any causality between the two variables (i.e., profitability and capital structure), this study implemented a popularly utilized the Granger's causality test (as *a priori* one) before performing the first hypothesis test[17]. The followings were the results obtained from the causality test on the book-valued and market-valued response variables as proxied by PFT and MTB, respectively.

Table 5. Results on the Granger's Causality Test

DV	PFT		MTB	
Test Result	HA0*	HB0*	HA0	HB0*

〈Note〉 * indicates that the null hypothesis that there may not be an effect of the capital structure on profitability, was not accepted at the 5% level of significance. HA0 and HB0 denote the employment of the book-valued (BVLEV1) and the market-valued (MVLEV1) debt measures, respectively.

As reported in [Table 5], in the majority of the test results, that is, three results, indicated that there were Granger causalities with the DVs, indicating that the

Table 4. Pearson's and Spearman's Correlation Coefficient Matrices between IDVs

IDV	BL	ML	SZ	MVE	GR	RT	FT	V	FS	FC
BL	1.00	N.A.	0.35 *#	-0.09 *	0.08 *	-0.03 #	0.09 *	0.11 *#	-0.09 *	-0.06
ML	N.A.	1.00	0.26 *#	-0.15 *#	0.08 *#	-0.09 *	-0.09 *#	0.03	-0.22 *#	-0.05
SZ			1.00	0.42 *#	0.05	-0.05 #	-0.02	-0.10 *#	0.53 *#	0.11 *#
MVE				1.00	-0.01#	0.03 #	-0.04 #	-0.06 #	0.37 *#	0.38 *#
GR					1.00	0.02	-0.02 #	-0.01 #	0.001	-0.003
RT						1.00	-0.05 #	0.05 #	-0.14 *#	0.03
FT							1.00	0.09 *	-0.05 #	-0.008
V								1.00	-0.14 *#	-0.01 #
FS									1.00	0.14 *#
FC										1.00

〈Note〉 The numeric number in each cell indicates the correlation coefficient by the Pearson correlation estimation. The statistically significant coefficient for each IDV at the 5% level was denoted by (*) for the Pearson' s test and (#) for the Spearman' s one. The table was structured to combine the two separately tested explanatory variables (i.e., BVLEV and MVLEV) tested in each corresponding model, respectively.

Table 6. Results of the Estimated Coefficient of Each IDV on the DV of PFT in Ordinary Least Square (OLS) and Conditional Quantile Regression Models

IDV	OLS	Q(20%)	Q(40%)	Q(60%)	Q(80%)
Constant	−0.08** (−0.07)**	−0.13* (−0.12*	−0.07** (−0.04)	0.08* (0.06)	0.15* (0.10)*
BLVEV1 (MVLEV1)	−0.111* (−0.11)*	−0.08* (−0.08)*	−0.10* (−0.10)*	−0.09* (−0.11)*	−0.11* (−0.14)*
SIZE	0.006* (0.006)*	0.007* (0.006)*	0.005* (0.004)*	−0.0001 (0.002)	−0.001 (0.002)
GROWTH	8.3E−8 (1.4E−5)	−0.001 (−0.001)	−0.0001 (−0.001)	−0.0001 (−0.0001)	0.0001 (0.0001)
RETENTION	−0.002 (−0.006)	0.0002 (−0.002)	0.003 (−0.002)	0.005 (0.003)	0.004 (−0.004)
FTURNOVER	0.005* (0.002)*	0.003* (0.001)	0.003* (0.002)*	0.006* (0.003)*	0.006* (0.002)*
VOLATILITY	−3.5E−5 (−7.7E−5)**	−0.001 (−0.001)	−0.001 (−0.0001)	−0.0001 (−0.0001)	0.0001 (−0.0001)
MVE	1.4E−16 (8.34E17)	0.001* (−0.001)	0.001* (0.001)*	0.0001 (0.0001)	0.0001 (0.0001)
FOS	0.08* (0.05)*	0.05* (0.03)**	0.06* (0.03)*	0.12* (0.06)*	0.11* (0.02)
FCFF	2.0E−15 (2.49E−15)	0.001 (0.001)	0.001 (0.0001)	0.001 (0.0001)	0.0001 (0.0001)
SMARKET	0.02* (0.01)	−0.005 (−0.007)	0.01** (−0.008)	0.009 (0.01)*	0.02* (0.02)*
F2010	0.005 (0.003))	0.01* (0.01)*	0.009** (0.007)	0.005 (0.001)	0.004 (−0.0008)
F2011	−0.006 (−0.005)	−0.0003 (0.006)	0.001 (0.0002)	−0.003 (−0.004)	−0.008 (−0.007)
F2012	−0.014*(−0.01)*	−0.008** (−0.001)	−0.009* (−0.008)**	−0.02* (−0.02)*	−0.02* (−0.016)*
IND2	0.01 (0.007)	−0.004 (−0.004)	0.02 (0.01)	0.02 (0.007)	0.02* (−0.005)
IND3	0.03* (0.02)*	0.007 (0.001)	0.01** (0.008)	0.02** (0.02)**	0.05* (0.03)*
IND4	0.02 (−0.008)	0.005 (−0.02)	0.01 (−0.03)	0.03 (−0.006)	−0.0005 (−0.04)
IND5	−0.03* (−0.04)*	−0.04* (−0.04)*	−0.03* (−0.03)*	−0.02* (−0.03)*	−0.013 (−0.03)*
IND6	0.01 (0.006)	0.02 (0.02)	0.02* (0.01)	0.01 (−0.0002)	−0.01 (−0.01)
IND7	−0.01 (−0.01)	−0.02 (−0.02)	−0.002 (−0.007)	−0.001 (−0.004)	−0.003 (−0.006)
IND8	0.0001 (0.004)	0.008 (0.01)	0.01* (0.01)**	0.008 (0.02)*	0.002 (0.02)*
IND9	−0.01 (−0.006)	−0.01 (−0.007)	−0.002 (0.0004)	−0.004 (0.005)	−0.01 (0.008)
IND10	−0.004 (−0.003)	−0.003 (−0.005)	−0.006 (−0.005)	−0.01 (−0.009)	−0.01 (−0.003)
IND11	0.04 (0.02)	0.05 (0.03)	0.04 (0.02)	0.02 (0.004)	−0.009 (−0.02)
IND12	−0.02* (−0.02)*	−0.02 (−0.03)**	−0.01** (−0.02)*	−0.02** (−0.02)**	−0.01 (−0.003)
IND13	−0.004 (0.01)	−0.001 (0.01)	0.004 (0.02)**	0.0003 (0.009)	−0.02 (−0.002)
IND14	0.07* (0.07)*	0.09 (0.08)	0.09 (0.08)	0.06 (0.06)	0.04 (0.04)
IND15	−0.05** (−0.05)*	−0.001 (−0.007)	−0.04 (−0.03)	−0.05* (−0.07)	−0.09 (−0.11)

〈Note1〉 The numeric number in parentheses indicates the estimated coefficient of each corresponding IDV when employing the market-valued IDV of MVLEV substituting for the book-valued leverage one of BVLEV. The symbols of * and ** denote their statistically significant at 5% and 10% levels, respectively.
〈Note2〉 The results of the estimated coefficient of each IDV on the DV of MTB in OLS and CQR models, were not provided for the purpose of parsimony considering the limitations of space. However, they are available from the author upon request.

capital structure of a chaebol firm may granger-cause each corresponding profitability. For example, the book-valued leverage level (BVLEV1) showed its statistically significant influence on the profitability (PFT) at the 5% level with F-value of 9.134 and even the book-valued leverage one was barely insignificant on the MTB with its calculated F-value of 2.466.

1.3 Analysis on the results of the 2nd hypothesis

Before performing the hypothesis test on the 'extended' Dupont system, it may well be of considerable interest or importance to examine a structural change between the two compared periods (i.e., the year 2008 and 2012). Therefore, the legitimate Chow test, but being adjusted by the White heteroskedastic robust estimators, was implemented as *a priori* test. The result revealed that there was a statistically strong significant break between these periods with its calculated F-value of 59.09 (> Critical value of 2.10 at the 5% level).

In regard to the five elements comprising the so called as 'extended' system, only two components such as the EBITDAEBIT (defined as the ratio of sales to market-value of equity) EMULTIPLIER (as total assets divided by equity) showed their

significances by utilizing the probit regression estimation, as reported in the following [Table 7].

Table 7. Results on the Probit Regression Analysis to examine any Discriminating Components Comprising the 'extended' DuPont System between the inter-temporal Period (2008 vs. 2012)

IDV	Coefficient	Chi-square
Intercept	0.3999	0.1909
NETEBITDA	0.7719	0.2686
EBITDAEBIT	0.0271	0.0825**
EBITPM	−0.6536	0.2472
ASSETTURN	−0.0284	0.8819
EMULTIPLIER	−0.0881	0.0579**
Goodness of Fit		19.9320*

〈Note 1〉 NETEBITDA=[Net income / Sales], EBITDAEBIT= [Sales / (Total number of common shares outstanding x The closing price of a common share)], EBITPM= [Market value of equity / (Total Liabilities + Book value of preferred share + Market value of Equity)], ASSETTURN= [Market value of an enterprise / Total assets], EMULTIPLIER= [Total assets / (Total assets - Total liabilities)]
〈Note 2〉 * and ** indicate their statistical significance in the Chi-square test at the 5% and 10 % levels, respectively. Each ooefficient was estimated by the method of maximum likelihood (ML) and the overall goodness of fit was estimated by the likelihood ratio (LR) test, while the significance of each individual coefficient was tested by the Wald specification test.

2. Discussion

With respect to the results of the first hypothesis test to identify financial determinants of profitability measures for the Korean chaebol firms by utilizing the CQR analysis, there overall seemed to be the following untraversed phenomena to be reported in [Table 6]. Concerning the effect of the quantitative variable on the book-valued profitability (PFT), BVLEV, FTURNOVER, and FOS among the nine quantitative IDVs showed their statistical importances in the majority of the classified quantiles, with applying the book-valued leverage ratio of BVLEV. Moreover, on the influence of the qualitative (dummy) variable, F2012, IND3 (the chemical industry), and IND5 (the semiconductor) provided strong statistical evidences on the DV over the tested period. First, the relationship between the BVLEV and PFT was found to possess their negative and pervasive significance across all the quantiles tested in this study. This may suggest that disadvantage of higher borrowing costs due to the heavily loaded debt structure, may exceed the realized benefit resulting from the interest tax shield in terms of the trade-off theory of modern finance. Therefore, it may be plausible that the chaebol firms may still maintain higher capital structure beyond the optimal point, even if there has been persistent and continuing restructuring processes to lower the debt ratio since the 1997 Asian financial crisis. Second, it was of intriguing discovery to find the pervasive and positive effect of the explanatory variable of FTURNOVER (= sales / fixed assets) at all quantiles as one of the proposed determinants. This particular proxy measuring a level of asset utilization, seemed to receive little attention tested in the previous literature, but predominantly showed its strong effect across the DVs in terms of PFT and MTB, as explained later. While [18] presented a pervasively positive and significant relationship between profitability and asset utilization measured by total assets and inventory, there was insignificant effect of fixed asset turnover on the profitability indicator for the firms headquartered in North Chungcheong province in Korea, as found in this study. Therefore, it may be plausible to suggest that domestic large size firms including the chaebol firms were likely to operate their fixed assets more efficiently to increase or level up their profitability levels, in comparison with their counterparts with small size and local bases. Third, in line with the empirical findings of the effect of FOS on profitability as presented in [19], and [6], this study also found its positive linkage with increasing a level of profitability at the majority of the tested quantiles. This phenomenon may conclude that any efficient management skills retained possibly by foreign

(institutional) investors with any enhanced know-hows and exploiting asymmetric information were still expected to increase profitability level, even if Korean chaebols have relatively been in a long history of operations in a wide spectrum of overseas markets since the 1960s[6]. Regarding the qualitative results derived from the CQR model, time dummy variable proxied for the year 2012 showed its all negative and dominantly significant impacts across the book-valued profitability measures at the classified quantiles as reported in [Table 6], while insignificant effects of the particular time dummy were found when measured in market-valued performance of MTB. This situation may, in large part, stem from the fact that the macroeconomic factor represented by the time dummy was downturn or sluggish from the level of annual real GDP growth rate of 6.3% in the year 2010 to 3.7% and 2.3% in 2011 and 2012, respectively. The industry classification such as IND3 and IND5 also showed their statistical importance with different signs of the overall estimated coefficients as reported in [Table 6] to account for the profitability indicator of PFT. In other words, the chaebol firms belonging to the former industry (i.e., the chemical one) had their positive associations with the profitability measure over the investigated period, implying that their profitability levels may be improved as their business cycle was moving toward mature stage equippted with stable cash-inflow after the passage of the recessionary economic stage.[20] This situation may be, to some extent, attributable to the recovery of the domestic petrochemical industry with increasing demand from Asian countries after the oil price hike in the early 2000s[21]. On the other hand, the negative association between the semiconductor industry (i.e., IND5) and profitability may result from the fact that an industry categorized in the cyclical business like IND5, may encounter any decreasing operating profits more sensitively caused by the lack of demand from the overseas markets after the global financial turmoil in 2008[6]. The present results were generally congruent with the findings of [20] such that the former was located in the highest rank in profitability, while the latter was positioned itself in the lower one, which was analyzed by the multiple comparison test procedure.

On the other hand, regarding the discriminating determinants on the market-valued profitability index (MTB), there were primarily significant components such as BVLEV, MVLEV, SIZE, FTURNOVER, FOS, SMARKET, IND4 (the pharmaceutical industry), IND9 (the construction one), and IND15 (the digital contents one), based on the CQR analysis. (For the purpose of parsimony, the results of the CQR on the MTB were not provided in this study, as explained earlier.) Taking into account commonalities with the aforementioned discussion on the the results relative to the PFT, only the other financial determinants affecting MTB, were exposited as follows: First, a firm's size (SIZE) showed its equivocal effects on the DV of MBT by employing the differently defined leverage ratios such as BVLEV and MVLEV. That is, while there were negative and prevalently significant relationship between SIZE and MTB by employing the IDV of BVLEV, a majority of the coefficients of SIZE proxy showed the positive impacts on the same DV with adopting MVLEV. This may be caused by the inverse (-) relationship between MVLEV being scaled by the market value of assets in definition and MTB as found in the corresponding output, which could, in turn, result in the positive effect of SIZE on the MTB in the model. Therefore, it may be more reasonable to explore the results indicating the negative (-) association between SIZE and MTB (derived by employing the book-valued leverage

ratio), since it could be relatively free from any effect of the aforementioned market-valued assets incorporated in the MTB. Accordingly, the following rationale may suggest the negatively significant linkage of SIZE on the profitability measure identified in the majority of the tested quantiles: [8] suggested that the larger in size a Korean chaebol firm was, the more profitable it may be, largely attributed by a high bargaining power of their customers possessing the implied put option exercising against their counterparts as the chaebol firms. However, [22] presented that the chaebol firms as a subsidiary may not be operated close to its optimal point to take advantage of any technical economies of scale to increase a level of profitability. Based on the negative association between SIZE and MTB obtained from the study, Korean chaebol firm may not operate efficiently, given the lack of economies of scale and any dissipated market competitiveness over domestic medium size or foreign new comers entering the same industry. As for another result on the IDV obtained, it was interesting or even surprising that a subsidiary of the chaebol conglomerate listed on the KOSDAQ bourse, had consistent and positively significant impact on the increase of profitability of MTB at almost quantiles, compared with those in the KOSPI exchange market. In the contentional finance theory, a firm in mature stage realizing stable cash-flows may be more profitable than its counterparts, due to a lower borrowing cost inclusive of the agency cost of debt, as such. However, the higher profitability of the KOSDAQ listed firm with shorter history and smaller size may provide an implication that any inefficiency of a KOSPI listed firm, may well be reexamined or restructured in terms of cost savings and product development, given the current competitive market condition. Moreover, the industries proxied by both IND4 and IND15 revealed their positive importance to enhance the level of profitability relative to the market-value basis. As studied by [20], the pharmaceutical industry operating a mature business, may almost maintain the highest rank in profitability among the domestic sample industry. This phenomenon supported by higher profitability could make its market capitalization larger than those in other industries in terms of MTB over the sample period, despite the stagnant domestic economic conditions after the global financial turmoil, as discussed. In line with the higher MTB of the pharmaceutical industry, I/T based digital contents providers classified into IND15, may well retain higher market-value of equity in terms of MTB in anticipation of surging new or expanding existing markets supported by on-line service subscribers.

From a vertical point of view on the results of the CQR analysis to compare major differences between the quantile locations, it was of interest to find that only the firms at the lower quantiles (i.e., 20% and 40%) revealed positively significant relationship between SIZE and the book-valued profitability (PFT) in terms of both BVLEV and MVLEV, as reported in [Table 6]. This phenomenon may imply a new implication on the effect of SIZE of the chaebol firm, indicating that any advantages such as economies of scale and/or scope, and market competitiveness described above, were likely to be expected only for the firm whose profitability level was located in the lower quantiles. Consequently, business recovery following the global financial crisis seemed to be more expedited for the chaebol firms whose profitability measures were located in those lower quantiles as in [Table 6]. Finally, to test for one of the contemporary controversial issues among academics, practitioners, and policy makers, whether or not, internal savings or retention ratio defined by [1 - dividend payout], may increase a firm's

profitability, this study provided an evidence that at the very majority of quantiles, retention ratio may be a statistically insignificant determinant influencing the level of profitability in terms of both the market- and book-valued measures. This result may be verified by the insignificant effects of FCFF (free cash flow to the firm) at the tested quantiles. Therefore, current level of internal savings reserved by the Korean chaebol firms for either more profitable investment opportunities or parsimonious liquidity policy, may be less consequential in association with higher profitability.

To perform the second hypothesis test on the 'extended' DuPont system, the legitimate estimation technique for probit regression was applied. The extended one had its unique attributes by employing the market relevant components of EBITDAEBIT, EBITPM and ASSETTURN out of the five ones as described in [Table 7]. One of the motivations adopting these market valued components comprising ROE, was to reflect or adjust into a trend of the modern finance theory, which tends to widely apply the contemporary aspect of the market value basis inclusive of equity. Based on the results of the probit analysis, two elements of EBITDAEBIT (defined as the ratio of sales to the market value of equity) and EMULTIPLIER (the ratio of total assets to equity) showed statistically significant discernible effects for ROE. The findings may differentiate any financial characteristics of the chaebol firms between the period of the global financial crisis (i.e., the year 2008) and the *ex post* period (the year 2012) as formulated in the hypothesis. Technically, the probit regression was to model the probability by assigning the dummy variable, USCRISIS as '1', if the sample data for a chaebol firm belong to the year 2008, and otherwise, '0' was assigned for the variable. The positive and significant coefficient of EBITDAEBIT may indicate that the higher was the ratio (or element) of a chaebol firm, the larger was the probability that it may possess this unique financial attribute incorporated in the period of the global financial crisis. The higher value of this variable may be caused by either the increase of the sales amount (as a numerator) or the decrease of the market value of equity (as a denominator). Given the extremely bearish market condition begun in the global financial crisis, the higher value of the variable was prone to be resulted from the sluggish market value of equty for the chaebol firms instead of expanding their market shares to foster sales. Moreover, the negatively significant coefficient of EMULTIPLIER provided information that the level of the capital structure for the Korean chaebol firms may, on average, be higher in the post period of 2012 than the level in the year 2008. This phenomenon may be, in large part, attributed to the facts that the chaebol firms tend to gradually increase to take advantage of more benefit of interest tax shield in the post-period of the financial turmoil, given that they had been persistently reducing or lowered debt level since the 1997 Asian financial crisis[8].

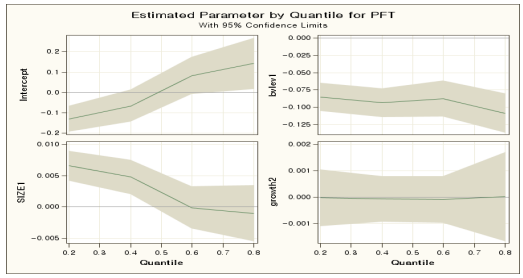
V. Concluding Remarks

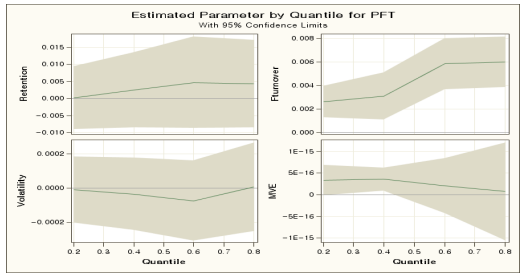
Contemporarily intriguing subjects may be examined in the study concerning the financial attributes of determining profitability for the firms belonging to the chaebols in the Korean capital market over the time reference covering the post-global financial turmoil. Fundamentally, two major hypotheses were postulated and subsequently tested such as employing conditional quantile regression and the 'extended' DuPond system. For example, major motivation to perform the former

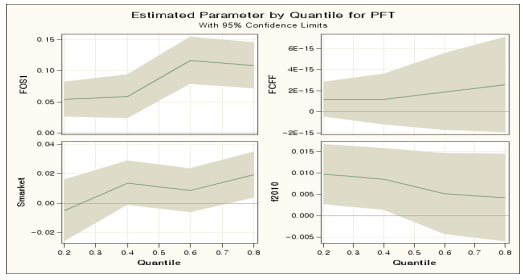
hypothesis test was to look into any internal discriminating financial components for the chaebol firms by employing the separate locations of quantile. Regarding the results of the two hypothesis tests, the former provided the evidence that BVLEV, FTURNOVER, and FOS among all quantitative IDVs, overall had statistical significance relative to the book-valued profitability, while the IDVs such as BVLEV, MVLEV, SIZE, FTURNOVER, FOS, and SMARKET showed their strong importance on the market-valued profitability index. On the outcome of the latter test using the 'extended' DuPont system, only two components of EBITDAEBIT and EMULTIPLIER of the five elements, showed their statistically significant impacts on the ROE.

This particular study may suffer from any legitimate and redundant weaknesses in performing empirical procedure. For example, any possibility of financial indicatiors such as sales and growth rate distorted or perverted by the intra-trading activities within the subsidiaries belonging to the same chaebol group may be accounted for if the data for the intra-trading are widelyl available in the future. Despite the vulnerability by performing an empirical research with utilizing different panel data and methodologies, this study may shed untraversed light on identifying financial determinants of profitability for the chaebol firms covering the era of the post-global financial crisis. As outlined earlier, current situation of the domestic capital market may be characterized by the unprecedented distortion or polarization of the (cororate performance) distribution, even among the chaebol firms. From a domestic policy maker's perspective, the approach of this study may contribute to establishing effective preventive measure by applying unique financial characteristics obtained from each quantile level of profitability. Furthermore, as one of the current controversial policy issues, this study found that in the majority of separate quantiles, the level of inernal savings proxied by retention ratio, may overall be a statistically insignificant factor to influence a firm's profitability measured by both the market- and book-valued criteria. Applying the predominantly significant results obtained from the study may be expected to forestall or mitigate any unanticipated occurrence of future external or internal financial instability as inn Kim[25], which, may, as a virtuous cycle, stabilize or enhance the level of a firm's profitability for the benefits of foreign and domestic investors.

[Appendix]







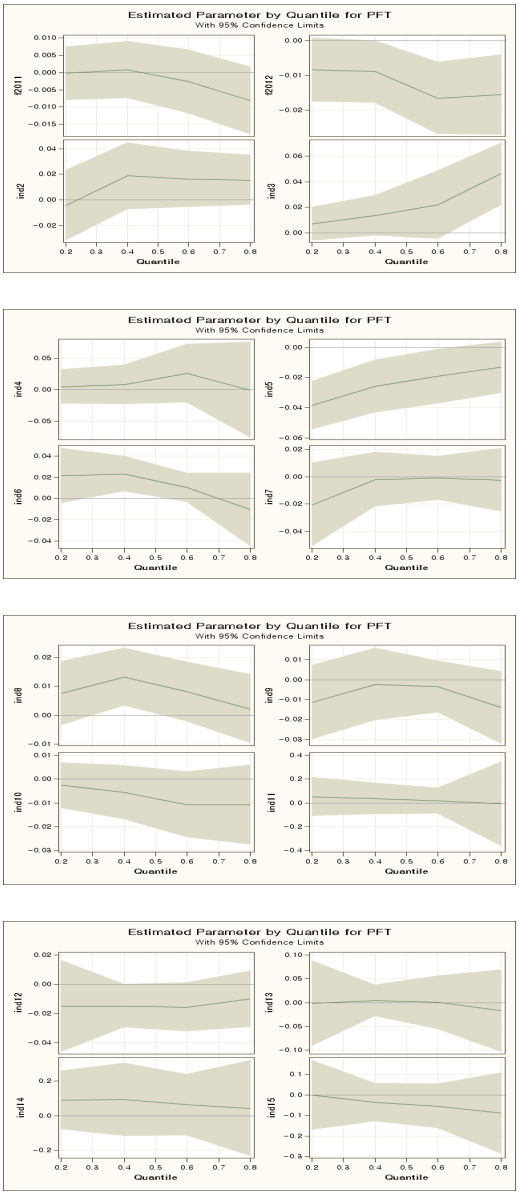


Figure 1. Estimated Parameter by Conditional Quantile Regression Analysis on the DV of PFT Inclusive of BVLEV With 95% Confidence Limits

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