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Capital Structure and Stock Returns: Evidence from Korean Stock Markets

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ABSTRACT

In this paper, a structural equation model is applied to Korean firms listed in KOSPI and KOSDAQ from 1990 to 2016 to analyze the determinants of capital structure and stock returns and discern how capital structure and stock returns affect each other. We find that stock returns have a strongly negative (-) effect on capital structure in the structural equation model. However, leverage has no significant effect on stock returns in the structural equation model, perhaps because we use data from before, during, and after recent financial crises. In addition, asset structure (+) and profitability (-) have strongly significant effects on capital structure. Uniqueness and size show unstable effects on capital structure. As for the determinants of stock returns, size (-), B/M (+), investment (+), and market premium (+) show strongly significant effects on stock returns in all the models. Profitability shows no significant influence on stock returns.

Keywords: Capital Structure, Stock Returns, Debt, Structural Equation Model (SEM), Korean Stock Markets

1. Introduction

Studies on capital structure and stock returns have been widely discussed in the finance area. Capital structure is how a corporation finances its assets through a combination of debt, equity, and some hybrid securities. Starting with MM (Modigliani-Miller) theory, scholars have continually put theories forward, the trade-off theory, the pecking order theory, market timing theory and so on. Moreover, researchers extensively conduct empirical studies and use them to verify broad applications of theories or research

methods in different markets. However, the field has not yet reached a common conclusion for some anomalies.

Some empirical analyses of the various theories have focused on the determinants of capital structure (Titman & Wessels, 1988; Graham, Leary, & Roberts, 2015). Some analyzed the dynamic process of capital structure by targeting leverage as well as adjustment speed (Son & Son, 2006; Kim & Lee, 2015). Some compared trade-off theory and pecking order theory to examine which one more greatly affects the capital structure in Korea (Kim, 2012). All that research is based on finding the appropriate determinants of capital structure.

The endeavor to investigate the risk factors of stock returns is also continual. Fama and French

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(1993) used the market premium factor, firm size, and book-to-market equity ratio to describe average stock returns and propose the Fama-French three-factor model (FF 3-factor model). Recently, Fama and French (2015) added profitability and investment to the previous FF 3-factor model to propose the FF 5-factor model.

Welch (2004) empirically showed that stock returns play an important role in explaining debt ratio dynamics. Park (2004) used the listed firms in Korea and found that debt-to-equity ratios were a premium risk factor for stock returns.

Most previous research has examined the determinants of capital structure, the factors of stock returns, or even the relationship between capital structure and stock returns. However, Yang et al. (2010) investigated the relationship between capital structure and stock returns along with their determinants using a structural equation model (SEM) and Taiwanese stock market data. Our paper is motivated by their research, and we use structural equation modeling to analyze the co-determinants of capital structure and stock returns. We choose the firms listed in KOSPI and KOSDAQ from 1990 to 2016. Then we use an SEM to explore the determinants of capital structure and stock returns, and to investigate how capital structure and stock returns affect each other. Regression model analyzes and estimates observable variables only. The SEM, on the other hand, provides more complex and diverse explanatory functions by including not only observable variables but also latent variables.

This paper is divided into six sections. Section 1 provides a general introduction, including research motivation, research purpose, and paper framework. In section 2, we review the literature about capital structure and stock returns. In section 3, we describe the hypothetical relationships and define the variables. In section 4, we introduce model specifications to test our hypotheses. In section 5, we analyze the empirical results. In the last section, we summarize the paper and discuss its limitations.

II. Literature Review

A. Capital Structure

Modigliani and Miller (1958) put forward MM theorem, which states that the valuation of a firm is irrelevant to the capital structure of the company. Put simply, MM theorem is the basis of modern capital structure theory, but it ignores many real-world factors, such as bankruptcy costs and taxes. In 1963, Modigliani and Miller added the corporate tax and suggested that firm value would increase with debt due to the tax shield effect. Miller (1977) added personal tax into this consideration.

Thereafter, trade-off theory and pecking order theory appeared. They suggested that when firms borrow too much, they become likely to experience financial distress. According to trade-off theory, gains from the tax shield on debt are offset by the financial distress costs of excessive debt. As a result, firms should borrow to the point at which the tax benefit from an extra dollar in debt was exactly equal to the cost derived from the increased probability of financial distress.

Myers and Majluf (1984) systematically proposed the pecking order theory, which postulates that financing costs increase with asymmetric information, which affected financing choices about internal and external financing and the issuance of debt and equity. A relatively reliable way to finance uses retained earnings for internal financing first, which prevents a decrease in firm value and guarantees the interest of the original shareholders. However, when internal financing cannot meet investment needs, firms consider external financing, issuing debt if necessary. When firms use debt financing and the financed projects realize a profit, the creditors get only the fixed interest income, and the majority of proceeds are still owned by shareholders. Only when debt financing cannot easily meet the need or too much debt leads to a financial crisis would firms choose equity financing as a last option because investors believe that managers know more than they do about their firm's value, risk, and prospects. Therefore, firms that issue equity

are likely signaling that their stock price is overvalued and they place a lower value on the equity, which can lead to a drop in share prices.

Jenson and Meckling (1976) proposed the agency cost hypothesis under asymmetric information, which mainly clarifies the conflict between management and shareholders. As free cash flow grows, management has an incentive to destroy firm value to meet its own needs. But high leverage imposes discipline on management.

Stein (1996) first proposed the market timing hypothesis, suggesting that rational managers could take advantage of market timing and create value for firms by selecting a financing method on the premise that the market is inefficient. When stock prices are overvalued, rational managers issue more equity and repurchase debt. On the contrary, if stock prices are undervalued, managers issue debt and retire equity because of market sentiment.

Son and Son (2006) used panel data from 1981 to 2003, examined the dynamic determinations of capital structure by the two stage GMM-SYS method, and analyzed the determinants that influenced the target leverage and adjustment speed before and after the foreign currency crisis in 1997 in Korea. Kim (2012) designated the variables from trade-off theory and pecking order theory for examination. Leverage was positively related to tangible assets, size, and financial deficit ratio and negatively related to profitability, depreciation cost, R&D expenses, and sales and management expenses. Hence the variables extracted from trade-off theory had a greater effect on capital structure than the variables based on pecking order theory (Kim, 2012; Prieto and Lee, 2019).

Kim and Lee (2015) analyzed how the capital structure of listed firms in Korea changed over 33 years, found that debt ratios fluctuated seriously during the foreign currency crisis. They divided the period into two sub-periods (before crisis and after crisis). The estimated coefficients were significantly different before and after the foreign currency crisis, which proved that the crisis changed capital structure. For example, tangible assets and profitability were significantly associated with debt ratios only after

the crisis.

Graham, Leary, and Roberts (2015) found that the leverage of unregulated firms in the United States increased significantly during the past century. They suggested that firm characteristics could not account for the shift in leverage. Therefore, they considered macroeconomic factors to capture the leverage change and found that leverage increased along with corporate tax rates, growth in financial intermediation, and reduction in government borrowing. Cui (2016) applied a method similar to that of Graham et al. (2015) to KOSPI2000 data to combine firm characteristics and macroeconomic variables. Cui (2016) found that leverage decreased with tax reductions and an increasing trend of government borrowing.

On the other hand, some researchers analyzed a single controversial determinant with capital structure, such as profitability. The association between profitability and leverage should be positive according to trade-off theory. Nevertheless, empirical results always show a negative relationship in both U.S. and Korean markets. Kim (2012) explained that their results support pecking order theory rather than trade-off theory. Danis, Rettl, and Whited (2014) explained this puzzle through dynamic trade-off theory. Using U.S. manufacturing firms, Xu (2012) and Rathinasamy et al. (2013) suggested that profitability decreased with an increase in import competition and that firms would reduce their debt ratios by issuing shares and repaying debt.

Titman and Wessel (1988) initially applied structural equation modeling to corporate finance to find the latent determinants of capital structure using U.S. data. They indicated that debt levels were negatively related to uniqueness (-), size (-), and profitability (-). But the relationships showed poor significance. The other 4 variables, non-debt tax shield, growth, volatility, and collateral value, were not significantly related to debt ratios. Chang, Lee, and Lee (2009) revised the indicators (observable variables) from Titman and Wessel (1988) and applied the multiple indicators and multiple causes model to investigate the relative determinant power of firm-characteristic variables. Chang et al. (2009) ranked the determinants

of capital structure choice as follows: growth, profitability, collateral value, volatility, non-debt shields, and uniqueness. However, Chang et al. (2009) could not ensure the positive or negative effects of some latent independent variables on leverages. For example, the indicators (observable variables) of growth are market-to-debt asset ratio and market-to-debt equity ratio. However, market-to-debt asset ratio negatively affected leverage, whereas the market-to-debt equity ratio positively affected leverage. Therefore, it was difficult to judge how latent variable growth affected leverage.

Only a few papers have applied an SEM to Korean markets. Park (1990) found that fixed debt ratio was negatively related to profitability (-) and non-debt tax shields (-) and positively related to firm size (+).

B. Capital Structure and Stock Returns

Although a few papers combined two variables, they mainly examined one-way effects, how capital structure affects stock returns or how stock returns affect capital structure.

Park (2004) used the firms listed in Korea and found that debt-to-equity ratios could influence stock returns. However, before the Asian foreign currency crisis, a high debt ratio negatively affected a firm's stock returns. After the Asian foreign currency crisis, debt ratio positively affected a firm's stock returns, consistent with the research in previous papers. Moreover, different empirical results appeared in various U.S. markets. Stock returns increased with market leverage (Fama & French, 1992; Gomes & Schmid, 2010) but were insensitive to or decreased with book leverage (George & Hwang, 2010).

Welch (2004) researched the firms listed in the U.S. from 1964 to 2000 and divided the variation that affected debt ratio dynamics into stock returns and net issuing activities. Welch claimed that stock returns could explain 40% of the variation in debt ratio dynamics over 1 to 5 years. In addition, Welch found that firms with poor stock returns were more likely to issue debt, whereas firms with stock returns

that performed well preferred equity financing. In other words, issuing activities were not intended to adjust leverage but to amplify the variation caused by stock returns.

Seo and Chung (2017) investigated how capital structure decisions changed with a dramatic drop in stock price for U.S. firms between 1985 and 2011. Seo et al. (2017) stated that firms often repurchase equity to deviate the leverage level further.

Using data from Taiwanese stock markets, Yang et al. (2010) applied an SEM to investigate the co-determination of capital structure and stock returns. They found that leverage positively affected stock returns and stock returns negatively affected leverage, with the negative effects slightly exceeding the positive effects. The significant determinants of leverage were growth (-), followed by size (+), profitability (-), and asset structure (+). The significant determinants of stock returns were growth (+), followed by B/M (+), profitability (+), and liquidity (-). However, their results cannot prove that the effect on leverage was caused by volatility or that the effects on stock returns were from size and momentum.

III. Variables and Hypotheses

Following the previous literature, we choose several latent variables and indicators (observable variables) that serve as proxies for the latent variables that determine capital structure and stock returns, as explained below. Because no single theory can adequately describe all firm behavior, and different theories are useful for different situations, we discuss the complex relationships among the latent dependent and independent variables using different theories and markets.

A. Determinants of Capital Structure

1. Asset Structure (Collateral Value of Assets)

According to trade-off theory, firms with large bankruptcy costs will lower their debt ratio to avoid going into bankruptcy. Firms with large safe and tangible assets can liquidate rapidly and inexpensively, which makes it relatively easy for them to take a loan. Therefore, firms with larger collateral value of assets incline toward issuing debt and having high debt ratios.

In addition, arguments put forth by Myers and Majluf (1984) suggest that firms might find it advantageous to sell secured debt. Their model demonstrates the potential costs associated with issuing securities, about which the firm's managers have better information than outside shareholders. Issuing debt secured by property with known values avoids those costs. Therefore, firms with assets that can be used as collateral can be expected to issue more debt to take advantage of such opportunities.

However, some researchers argue the opposite relationship. Grossman and Hart (1982) argue that managers in firms with higher debt ratios tend to consume fewer perquisites due to the threat of bankruptcy and monitoring from bondholders. The monitoring cost is higher for firms with less collateral value in their assets. Therefore, firms with less asset collateral value tend to issue more debt to limit management's consumption of perquisites.

In the Korean stock markets, Kim (2012) used linear and nonlinear quantile regression models and proved a positive relationship between tangible asset and leverage. However, Son and Son (2006) found a negative result. In the Taiwanese markets, Yang et al. (2010) obtained a positive result using an SEM.

Therefore, the relationship between asset structure and capital structure is a little ambiguous. We use one indicator, "TANG," to represent the latent variable of the collateral value of assets (Kim, 2012).

$$TANG = \frac{\text{inventory and tangible assets}}{\text{total assets}}$$

2. Uniqueness

The customers of firms that produce unique products have difficulty finding substitutes in the short term, as do workers and suppliers, who find it difficult to change to other operations (Titman & Wessels, 1988; Yang et al., 2010). Therefore, such firms spend more, not only on training skilled workers and developing new specific products, but also on looking for appropriate suppliers and promoting their unique products. Therefore, firms that produce specialized products would suffer higher costs than other firms if they went into bankruptcy. To avoid bankruptcy, such firms tend to choose less debt financing. Therefore, we expect that uniqueness is negatively (-) related to debt ratios.

We choose RD/S and SE/S as the indicators of uniqueness (Titman & Wessels, 1988; Yang et al., 2010).

$$RD/S = \frac{\text{research and development expenditures}}{\text{sales}}$$

$$SE/S = \frac{\text{selling expenses}}{\text{sales}}$$

Each measures that in a different way. RD/S presumes that the variable is unique in that it is based on intellectual property only possessed by the manufacturer. R&D expenditures are a forward looking investment to ensure future uniqueness. SE/S could identify uniqueness in that i) the product must be explained well to potential consumers or ii) that the marketplace is competitive and the firm positions itself uniquely through influencing consumer perceptions for its products.

3. Profitability

The relationship between profitability and leverage remains controversial.

According to pecking order theory (Myers, 1984), firms prefer to finance in the following order: internal financing, debt, and equity last due to its high cost. More profitable firms generally have enough retained earnings to invest. Less profitable firms do not have enough internal capital and must then issue debt as their first choice, according to pecking order theory.

There should therefore be a negative relationship between profitability and debt ratios.

On the contrary, trade-off theory assumes a positive relationship between profitability and leverage because profitable firms are generally good firms with low bankruptcy costs that prefer to issue debt to gain the tax shield.

Traditional trade-off theories of capital structure predict that changes in expected profitability positively affect book leverage and ambiguously affect market leverage (Xu, 2012). If profitability (ROA) is a substitute for future profitability, profitable companies can borrow more because they are more likely to repay the principal of the loan (Son & Son, 2006). However, empirical studies have often shown a negative relationship between realized past profitability and leverage (Xu, 2012).

In the empirical literature, some researchers have analyzed the negative relationship between profitability and leverage from the perspective of dynamic trade-off theory (Fisher, Heinkel, & Zechner, 1989; Almeida & Campello, 2007), in which firms allow their debt ratios to fluctuate if the costs of adjusting them are greater than the cost of having a suboptimal capital structure. After endogenizing investment decisions, a negative relationship could exist (Almeida & Campello, 2007).

Danis, Rettl, and Whited (2014) analyzed the dynamic trade-off theory, in which infrequent capital structure rebalancing is optimal. When firms are at or close to their optimal level of leverage, the cross-sectional correlation between profitability and leverage was positive; all other times, it was negative.

Empirical research in the Korean stock markets shows that debt ratios decline with profitability (Son & Son, 2006; Kim, 2012; Kim & Lee, 2015). Son and Son (2006) found a negative relationship both before and after the Asian foreign currency crisis, and Kim (2012) used linear regression and nonlinear quantile regression models and got negative results.

Therefore, a negative (-) relationship should exist between realized past profitability and leverage in the Korean stock markets.

As indicators of profitability, we use OI/S, OI/TA

(Titman & Wessels, 1988; Yang et al., 2010), and EBITT (Kim, 2012).

$$OI/S = \frac{\text{operating income}}{\text{sales}}, \quad OI/TA = \frac{\text{operating income}}{\text{total assets}},$$

$$EBITT = \frac{EBITDA}{\text{total assets}}$$

4. Size

Titman and Wessels (1988) claimed that big firms tend to be more diversified and fail less often than small firms, as the phrase “too big to fail” implies. Also, big firms are generally credited with a high rating and have access to more debt financing. Thus, we predict a positive (+) relationship between size and debt ratio.

Indicators of size are LnS, LnTA, and LnME (Titman & Wessels, 1988; Yang, et al., 2010).

$$\begin{aligned} \text{LnS} &= \log(\text{sales}); \text{LnTA} = \log(\text{total assets}); \\ \text{LnME} &= \log(\text{market value of equity}). \end{aligned}$$

5. Stock Returns

According to market timing theory, firms with high stock prices and stock returns tend to issue equity rather than debt, which implies a negative relationship between stock returns and debt ratio.

By definition, this is also true when we use market leverage as the measurement because higher stock returns mean a larger market value of equity (a larger denominator), which results in a lower debt ratio (market leverage).

In addition, management is likely to issue shares when stocks are overpriced. According to pecking order theory, management would issue discount equity, which does not result in a loss of shareholder wealth. Therefore, a negative relationship can be expected between stock performance (past one year's stock returns) and leverage (Son and Son, 2006). Their results also showed that stock returns, as the dynamic determination of capital structure, had a negative (-) effect on leverage for manufacturing firms in Korea from 1981 to 2003.

Welch (2004) stated that firms with poor stock

returns were more likely than others to issue debt, whereas firms with well performing stock returns preferred equity financing. The same result was also found in the Chinese stock market, which gave support to market timing theory. The price fluctuations of stocks produced the dominant effect in the formation of capital structure, especially when considering firm-characteristic variables. Issuing activities did not counteract but amplified the effects of stock returns, (Nie, 2008).

In addition, Yang et al. (2010) used an SEM to present empirical evidence that stock returns negatively affected debt ratios in the Taiwanese stock markets.

Therefore, given those theories and empirical results, we predict that stock returns should have a negative (-) effect on leverages.

We use the yearly stock returns to measure.

B. Determinants of Stock Returns

1. Leverage

Previous studies have regarded debt ratio as a risk premium for stock returns (Park, 2004; Yang et al., 2010). An increase in leverage increases the probability of financial distress, so the stock of such firms becomes riskier, which leads to requests for more compensation. Leverage should have a positive (+) influence on stock returns.

Although those studies and theories suggest that leverage (as a risk factor) should positively (+) affect stock returns, various empirical research shows different results in U.S. markets. Stock returns:

- (1) Increase with market leverage (Bhandari, 1988; Fama & French, 1992; Gomes & Schmid, 2010);
- (2) Are essentially flat on book leverage or even decline with book leverage (Fama & French, 1992; George & Hwang, 2010; Gomes & Schmid, 2010);
- (3) Are insensitive to or decrease with market leverage and book leverage after controlling for size and book-to-market factors (Nielsen, 2006; Penman, Richardson & Tuna, 2007; Gomes

& Schmid, 2010);

- (4) Retain an increasing trend with market leverage even after controlling for firm size in the model and data (Gomes & Schmid, 2010).

Therefore, we cannot predict the relationship between stock returns and leverage in the Korean stock market despite a positive relation in theory.

Although book leverage often focuses on financing decisions, particularly as they pertain to credit, market leverage is more economically meaningful for some firms (Graham et al., 2015). Therefore, we choose book leverage and market leverage as the measurements of a firm's leverage (Kim, 2012; Graham et al., 2015).

$$\text{Book leverage (BLV)} = \frac{\text{total debt}}{\text{total assets}}$$

$$\begin{aligned} \text{Market leverage (MLV)} \\ = \frac{\text{total debt}}{\text{total debt} + \text{market value of equity}} \end{aligned}$$

2. B/M

Both the FF 3-factor model and the FF 5-factor model use B/M as a variable to analyze variations in stock returns. Yang et al. (2010) proved that the book-to-market equity ratio positively (+) affected stock returns. Therefore, we also predict that book-to-market equity ratio is positively (+) related to stock returns.

$$\text{BE/ME(Ryu et al., 2016)} = \frac{\text{book value of equity}}{\text{market value of equity}} = \frac{\text{common stock capital} + \text{capital surplus} + \text{profit surplus} + \text{own stocks} + \text{deferred tax liabilities}}{\text{market value of equity}}$$

3. Profitability

In the FF 5-factor model, Fama and French (2015) proved that profitability positively (+) influenced stock returns. The Korean data showed the same positive relation in the FF-5 factor model (Ryu et al., 2016). Thus, there should be a positive (+) relationship between profitability and stock returns.

In addition to the indicators of profitability defined above, we add one indicator here, OI/ BE, from Ryu et al. (2016).

$$OI/BE = \frac{\text{operating income}}{\text{book value of equity}}$$

4. Size

The previous literature suggests that small firms might suffer a long earning depression, which means firm size is associated with the risk factors (Fama and French, 1992). Small firms might also suffer more risks and have to compensate in their stock returns (Yang et al., 2010). A negative relationship

between size and stock returns was found in both U.S. and Korean markets (Fama & French, 2015; Ryu et al., 2016). So we expect size to be negatively (-) related to stock returns.

5. Investment

Fama and French (2015) stated that capital investment negatively (-) affected stock returns in the U.S. market, whereas Ryu et al. (2016) found a positive (+) relationship using Korean data. Because the Korean economy has been entering a maturity period, its growth potentiality is relatively larger than in the U.S. due to capital investments.

We use the same equation to calculate investment as Ryu et al. (2016).

$$INV = \frac{\text{total asset}_{t-1}}{\text{total asset}_{t-2}} - 1$$

6. Market Premium (rm-rf)

We calculate the weighted average of the index returns of KOSPI and KOSDAQ as the proxy variable for market return and use the returns of currency stabilization bonds (1 year) as the risk-free return.

Table 1. Hypothetical relationships

	Determinants	Latent Dependent Variables	
		Capital Structure	Stock Returns
η_1	Capital Structure		+ - ?
η_2	Stock Returns	-	
ξ_1	Asset Structure	+ - ?	
ξ_2	Uniqueness	-	
ξ_3	Profitability	-	+
ξ_4	Size	+	-
ξ_5	B/M		+
ξ_6	Investment		+, - ?
ξ_7	Market Premium		+

Table 2. Definition of latent variables and observable variables

	Latent Variables	Indicators	Definition
Endoge-nous	Capital Structure	MLV	Total debt/(total debt + market value of equity)
		BLV	Total debt / total assets
	Stock Returns	sr	Yearly stock returns
Exogen-ous	Asset Structure	TANG	Inventory and tangible assets/total assets
	Uniqueness	RD/S	Research and development expenditure / sales
		SE/S	Selling expense / sales
	Profitability	OI/S	Operating income / sales
		OI/TA	Operating income / total assets
		EBIT	EBITDA / total assets
		OI/BE	Operating income / book value of equity
	Size	LnS	Log (sales)
		LnTA	Log (total assets)
		LnME	Log (market value of equity)
	B/M	BE/ME	Book value of equity / market value of equity
	Investment	INV	Growth ratio of total assets
	Market Premium	Rm-rf	Rm-rf

We summarize the hypothetical relationships between the latent variables and capital structure (leverage) and stock returns in Table 1 and list the definitions of the latent and observable variables in Table 2.

IV. Methodology and Model

A. Methodology

The method we applied is the linear structural relationship model (an SEM) developed by Joreskog and Sorbom (1981). The method was previously applied by Titman and Wessels (1988) to investigate the determinants of capital structure and by Yang et al. (2010), who extended the previous analysis to examine the relationship between and the determinants of capital structure and stock returns. The model is composed of a measurement model and a structural model. In the measurement model, unobservable firm-specific attributes are measured by relating them to observable variables. For example, we use LnS, LnTA, and LnME to measure the attribute (latent independent variable) “size.” In the structural model, leverage and stock returns are specified as a function of each other and the attributes defined in the measurement model.

The basic SEM can be specified as follows:

$$y = \Lambda_y \eta + \varepsilon \quad (1)$$

$$x = \Lambda_x \xi + \delta \quad (2)$$

$$\eta = B\eta + \Gamma\xi + \zeta \quad (3)$$

y: observable dependent variable (e.g., MLV and BLV)

x: observable independent variable (e.g., LnS)

η : latent dependent variable (e.g., capital structure)

ξ : latent independent variable (e.g., size)

ε : measurement error in y;

δ : measurement error in x;

ζ : disturbance in structural model

Λ_y , Λ_x , Γ , B: coefficient

Although the firm-characteristic attributes (e.g.,

size) cannot be observed directly, equations (1) and (2) state that several other observable variables (e.g., LnS, LnTA, LnME) are their imperfect measures. These observable variables are expressed as the linear functions of latent variables with a random measurement error.

Equation (3) represents the structural model that estimates the effects of the latent independent variables, even latent dependent variables, on the other latent dependent variables (Titman & Wessels, 1988).

After we specify the model, we need to identify the model. As long as the number of known data points is equal to or greater than the unknown coefficients, the model can be just- or over-identified. To identify the model, we always impose some additional restrictions on the parameters. For example, we can fix the factor loading (coefficient) of one indicator for each latent variable to 1 or fix the variance of each latent variable to 1.

In terms of the estimation of parameters, we use the maximum likelihood method. As Chang et al. (2009) suggested, we need to evaluate the model fit before explaining the parameter estimation results. More than 30 fit indexes are used for structural equation modeling. Recently, researchers have focused on the closeness fit indexes instead of the χ^2 test because the χ^2 value can produce inappropriate results when the sample size is large (MacCallum, Browne, & Sugawara, 1996). Therefore, we use the following fit indexes to evaluate our model: mean square of error approximation (RMSEA), standardized root mean square residual (SRMR), comparative fit index (CFI), and goodness of fit index (GFI). Those four fit indexes are widely accepted for SEMs (Chang et al., 2009; MacCallum, Browne, & Sugawara, 1996). We use the conventional criteria for each of them: $GFI \geq 0.9$ or 0.95 , $CFI \geq 0.90$ or 0.95 , $RMSEA \leq 0.08$, and $SRMR \leq 0.08$. If the model fit indexes cannot meet the criteria, we must modify the model using a modification index until it meets the fit criteria.

There are some problems such as non-normality, multicollinearity, heteroscedasticity that violate basic assumptions of a SEM (Lim & Melville, 2009). These problems lead to distortion of estimation and statistical inference. Our study does not consider these issues,

because these issues are the subject of another paper.

B. Data and Model

To investigate the relationship between capital structure and stock returns and the determinants of capital structure and stock returns, we collect the data of firms listed in KOSPI and KOSDAQ for the period 1990-2016 from FnGuide's DataGuide and the Economic Statistics System. We exclude firms in the financial industry because their financial statements vary from those of other industries, and we delete the missing observations. In the end, our sample contains 23946 firm-year observations over 27 years.

We use T (1990-2016) as the basic measuring year. The latent dependent variables - capital structure and stock returns - and the observable dependent variables are measured in year T. The measuring year for the remaining variables basically follows Yang et al. (2010). The observable variables used to measure asset structure, uniqueness, and market premium are also measured in year T. The latent independent variables used to forecast capital structure and stock returns are measured one year before (T-1), including size, profitability, and B/M. We use the value of total assets in year T-1 and T-2 to measure variable investment. We summarize the measuring year for the latent and observable variables in Table 3.

The method of this study generally follows Yang et al. (2010). We use a structural model to estimate the coefficients of the relationships and determinants and a measurement model to test how well the observable variables measure the latent variables.

The equations for the structural model are specified as follows:

$$\eta_1 = \beta_{12}\eta_2 + \gamma_{11}\xi_1 + \gamma_{12}\xi_2 + \gamma_{13}\xi_3 + \gamma_{14}\xi_4 + \zeta_1 \quad (4)$$

$$\eta_2 = \beta_{21}\eta_1 + \gamma_{23}\xi_3 + \gamma_{24}\xi_4 + \gamma_{25}\xi_5 + \gamma_{26}\xi_6 + \gamma_{27}\xi_7 + \zeta_2 \quad (5)$$

Equation (4) is a linear structural equation about the determinants of capital structure (η_1): stock returns (η_2), asset structure (ξ_1), uniqueness (ξ_2), profitability (ξ_3), size (ξ_4), and an error term (ζ_1).

Equation (5) indicates the determinants of stock returns (η_2): leverage (η_1), profitability (ξ_3), size (ξ_4), B/M (ξ_5), investment (ξ_6), market premium (ξ_7), and an error term (ζ_2).

To illustrate equations (4) and (5) intuitively, we represent the path diagram of the structural model in Figure 1.

The measurement model is specified as follows:

$$y_1 = \lambda_{y11}\eta_1 + \varepsilon_1 \quad y_2 = \lambda_{y21}\eta_1 + \varepsilon_2 \quad y_3 = \lambda_{y32}\eta_2 + \varepsilon_3$$

where y_1 (MLV) is market leverage, y_2 (BLV) is book leverage, and y_3 denotes stock returns.

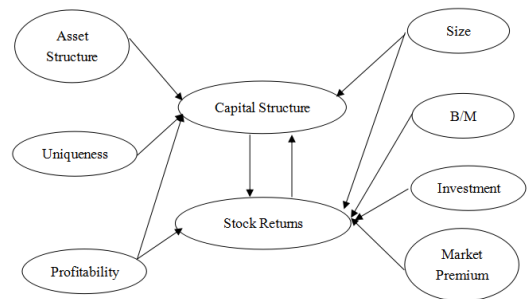


Figure 1. Path diagram of the structural model

Table 3. The measuring year for latent and observable variables

Latent Variables	η_1		η_2		ξ_1		ξ_2			
	Capital	Structure	Stock	Returns	Asset	Structure	Uniqueness			
Year	T		T		T		T			
Latent Variables	ξ_3		ξ_4		ξ_5		ξ_6		ξ_7	
	Profitability		Size		B/M		Investment		Market Premium	
Year	$T-1$		$T-1$		$T-1$		$T-1, T-2$		T	

Note: T refers to 1990-2016

$$\begin{aligned}
x_1 &= \lambda_{x11} \xi_1 + \delta_1 & x_2 &= \lambda_{x22} \xi_2 + \delta_2 \\
x_3 &= \lambda_{x32} \xi_2 + \delta_3 & x_4 &= \lambda_{x43} \xi_3 + \delta_4 \\
x_5 &= \lambda_{x53} \xi_3 + \delta_5 & x_6 &= \lambda_{x63} \xi_3 + \delta_6 \\
x_7 &= \lambda_{x73} \xi_3 + \delta_7 & x_8 &= \lambda_{x84} \xi_4 + \delta_8 \\
x_9 &= \lambda_{x94} \xi_4 + \delta_9 & x_{10} &= \lambda_{x10,4} \xi_4 + \delta_{10} \\
x_{11} &= \lambda_{x12,5} \xi_5 + \delta_{11} & x_{12} &= \lambda_{x12,6} \xi_6 + \delta_{12} \\
x_{13} &= \lambda_{x13,7} \xi_7 + \delta_{13}
\end{aligned}$$

x_1 (TANG): inventory and tangible assets over total assets; x_2 (RD/S): research and development expenditure over sales; x_3 (SE/S): sales expense over sales; x_4 (OI/S): operating income over sales; x_5 (OI/TA): operating income over total assets; x_6 (EBITT): EBITDA to total assets; x_7 (OI/BE): operating income over book value of equity; x_8 (LnS): logarithm of sales; x_9 (LnTA): logarithm of total assets; x_{10} (LnME): logarithm of market value of equity; x_{11} (BE/ME): book-to-market equity ratio; x_{12} (INV): change in total assets from T-2 to T-1; x_{13} : rm-rf

V. Empirical Analysis

A. Descriptive Statistics and Correlations

Table 4 shows the descriptive statistics for the pooled sample during 1990 to 2016. All the variables are expressed as ratios, except sr (%), rm-rf (%), LnS (logarithm), LnTA (logarithm), and LnME (logarithm). The mean of the observable variable BLV is 0.49, and the mean of MLV is 0.5; the standard variation of BLV is 0.34, and the standard variation of MLV is 0.25. The mean of stock returns is 0.44%, and the standard deviation of stock returns is 3.8%.

Table 5 presents the correlations among the observable variables. The correlation between book leverage and market leverage is significantly positive, 0.54 at the 1% level. As the observable variables of capital structure, market leverage and book leverage are likely to measure the same latent variable using the Korean data. Thus, we expect that using MLV and

Table 4. Descriptive statistics of observable variables

Variable	N	Mean	Std. Deviation	Minimum	Maximum
BLV	23946	0.49	0.34	0.01	26.48
MLV	23946	0.50	0.25	0	1
sr(%)	23946	0.44	3.80	-18.48	29.99
TANG	23946	0.45	0.20	0	0.98
RD/S	23946	0.02	0.23	0	24.59
SE/S	23946	0.03	0.12	-2.10	15.15
OI/S	23946	0.02	0.54	-48.04	0.94
OI/TA	23946	0.04	0.10	-4.53	0.56
EBITT	23946	0.08	0.10	-4.01	0.89
OI/BE	23946	0.11	4.86	-320.03	604.09
LnS	23946	18.62	1.60	10.35	26.16
LnTA	23946	18.80	1.50	13.10	26.21
LnME	23946	11.03	1.51	5.36	19.23
BE/ME	23946	1.34	7.02	-375.01	420.82
INV	23946	0.17	1.13	-0.99	137.41
rm-rf (%)	23946	-4.69	4.03	-17.63	-1.26

Note: The sample covers the period 1990-2016 and includes the firms listed in KOSPI and KOSDAQ. Financial firms and missing observations are excluded. BLV is book leverage; MLV is market leverage; sr refers to yearly stock returns; TANG is the ratio of inventory and tangible assets to total assets; RD/S is the ratio of research and development expenditure to sales; SE/S is the ratio of sales expense to sales; OI/S is the ratio of operating income to sales; OI/TA is the ratio of operating income to total assets; EBITT is the ratio of EBITDA to total assets; OI/BE is the ratio of operating income to book value of equity; LnS is the logarithm of sales; LnTA is the logarithm of total assets; LnME is the logarithm of market value of equity; BE/ME is book-to-market equity ratio; INV is the change ratio of total assets from T-2 to T-1.

Table 5. Correlation coefficients

	BLV	MLV	sr	TANG	RD/S	SE/S	OI/S	
MLV	0.54***	1						
sr	-0.06***	-0.12***	1					
TANG	0.15***	0.36***	-0.04***	1				
RD/S	-0.03***	-0.07***	0.01**	-0.06***	1			
SE/S	0.32***	0.03***	-0.02***	0.01**	-0.003	1		
OI/S	-0.24***	0	-0.01**	0.05***	-0.59***	-0.13***	1	
OI/TA	-0.16***	-0.10***	-0.02***	0.04***	-0.08***	-0.08***	0.37***	
EBITT	-0.15***	-0.10***	-0.01**	0.09***	-0.09***	-0.08***	0.35***	
OI/BE	0.01	0.02***	-0.01*	0	-0.01	0	0.01*	
LnS	0.16***	0.35***	-0.01**	0.19***	-0.09***	-0.04***	0.16***	
LnTA	0.16***	0.34***	-0.01*	0.18***	-0.04***	-0.02***	0.08***	
LnME	-0.07***	-0.17***	0.04***	-0.04***	0.01*	-0.04***	0.07***	
BE/ME	-0.09***	0.06***	0.04***	0.05***	0	-0.02***	0.05***	
INV	-0.01	-0.03***	0.02***	-0.05***	0.02**	-0.02**	0	
rm-rf	-0.22***	-0.32***	0.20***	-0.10***	0.03***	0	-0.03***	
	OI/TA	EBITT	OI/BE	LnS	LnTA	LnME	BE/ME	INV
EBITT	0.94***	1						
OI/BE	0.04***	0.04***	1					
LnS	0.22***	0.21***	0.02***	1				
LnTA	0.13***	0.12***	0.02**	0.93***	1			
LnME	0.19***	0.19***	0.01	0.71***	0.78***	1		
BE/ME	0.02***	0.02***	0	0.03***	0.02***	-0.06***	1	
INV	0.07***	0.05***	0	-0.03***	0	0.03***	0	1
rm-rf	-0.09***	-0.10***	-0.01**	0.05***	0.06***	0.17***	0.02***	-0.02***

Note: Statistical significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

BLV together and using either one of them alone will produce similar estimation results.

As the observable variable of asset structure, TANG shows a positive relationship with both book leverage (0.15) and market leverage (0.36) that is significant at the 1% level.

The correlation coefficients between book leverage and market leverage and RD/S are -0.03 and -0.07, respectively, which is significant at the 1% level, which means there is a negative relationship between book leverage and both RD/S and market leverage. Even so, SE/S shows a positive relationship with book leverage and market leverage that is significant at the 1% level, which is opposite to our hypothetical sign. Hence, it is difficult to obtain the predicted

result if we use both RD/S and SE/S to measure firm uniqueness in the Korean data.

As the observable variables of profitability, OI/S, OI/TA, EBITT are significantly negative (at the 1% level) with book leverage, with correlation coefficients of -0.24, -0.16, and -0.15, respectively. Moreover, OI/TA and EBITT also show a negative relationship with market leverage that is significant at the 1% level. However, those observable variables of profitability show a negative relationship with stock returns, which is opposite to the predicted sign. OI/BE has very low correlation coefficient with other indicators of profitability. And EBITT and OI/TA have very high level of correlation (0.94).

The observable variables of size, LnS, and LnTA,

are significantly positive (at the 1% level) with book leverage and market leverage, which is in accordance with our prediction. LnS and LnTA show a negative relationship with stock returns that is significant at the 5% level and 10% level, respectively, which also matches our prediction.

The other observable variables associated with stock returns present correlation signs that match our hypotheses: BE/ME (+), INV (+), and rm-rf (+).

B. Results

As explained above, the estimated coefficients are based on the overall model fit evaluation. Our model produced index values for GFI, CFI, RMSRA, and SRMR of 0.957, 0.953, 0.065, and 0.0647, respectively, all within the standard criteria.

The coefficient estimates for the measurement model are presented in Table 6. The estimates are generally in accordance with our previous idea about how well the observable variables measure the latent variables, with the exception of RD/S and SE/S. When we fix the coefficient of RD/S (uniqueness) as 1, the estimated lambda coefficient of SE/S on uniqueness

becomes an insignificant negative value. Thus, we infer that SE/S and RD/S cannot measure uniqueness well together.

The estimates of the structural coefficients are shown in Table 7. These coefficients specify the estimated effects of the latent variables on capital structure and stock returns.

For the most part, the estimates of the coefficients

Table 7. Estimates of structural coefficients

Determinants	Latent Dependent Variables	
	Capital Structure	Stock Returns
η_1 Capital Structure		-0.13
η_2 Stock Returns	-0.004***	
ξ_1 Asset Structure	1.08***	
ξ_2 Uniqueness	-0.06	
ξ_3 Profitability	-0.17***	0.23
ξ_4 Size	0.05***	-0.05***
ξ_5 B/M		0.02 ***
ξ_6 Investment		0.07***
ξ_7 Market Premium		0.19***

GFI: 0.957, CFI: 0.953, RMSEA: 0.065, SRMR: 0.0647

Note: Statistical significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Table 6. Measurement model

Indicators	Latent Variables	Indicators	Latent Variables	Indicators	Latent Variables
	Asset Structure		Uniqueness		Profitability
TANG (x_1)	1	RD/S (x_2)	1	OI/S (x_4)	1
		SE/S (x_3)	-0.24	OI/TA (x_5)	0.63***
				EBITT (x_6)	0.65***
				OI/BE (x_7)	1.23***
Indicators	Latent Variables	Indicators	Latent Variables	Indicators	Latent Variables
	Size		B/M		Investment
LnS (x_8)	1	BE/ME (x_{11})	1	INV (x_{12})	1
LnTA (x_9)	1.01***				
LnME (x_{10})	0.83***				
Indicators	Latent Variables	Indicators	Latent Variables	Indicators	Latent Variables
	Market Premium		Capital Structure		Stock Returns
rm-rf (x_{13})	1	MLV (y_1)	1	sr (y_3)	1
		BLV (y_2)	0.79***		

Note: Statistical significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

for capital structure and stock returns are consistent with the predicted signs. However, some estimated coefficients are statistically insignificant.

Consistent with previous research, stock returns have a significantly negative (-) effect on capital structure. In other words, the higher a firm's stock returns, the less it uses debts for financing, in concordance with market timing theory. The estimated coefficient is -0.004, which means that debt ratios change by -40 basis points when stock returns change by 1%. However, leverage has an insignificant negative effect on stock returns. According to Park (2004), debt ratios had a negative effect on stock returns before the Asian foreign currency crisis and a positive influence on stock returns after the crisis. Kim et al. (2015) noticed that debt ratios fluctuated seriously during the Asian foreign currency crisis. Therefore, we guess that the crisis might have affected the relationship between debt ratios and stock returns. We examined the entire period together, including the Asian foreign currency crisis and the global crisis, which could explain the insignificant effect on stock returns in our results.

Asset structure has a significantly positive (+) effect on capital structure at the 1% level. The greater a firm's fixed assets, the more easily it can borrow money, which leads to higher leverage ratios. Among the determinant variables of capital structure, asset structure has the largest determining power, i.e., it has the largest significant coefficient (1.082).

As a common determinant of capital structure and stock returns, size has a significantly positive (+) effect on capital structure and a significantly negative (-) influence on stock returns (0.053 and -0.052, respectively), which is consistent with our expectations.

Profitability is the other common determinant of both capital structure and stock returns. Its coefficient on capital structure is -0.17, which indicates that it has a significantly negative (-) effect, as most empirical results have found. In other words, as profitability increases, the amount of debt decreases. In addition, profitability takes up the second explanatory power for variation in capital structure. However, the effect of profitability on stock returns is insignificant even though the coefficient is 0.231.

As for the other determinants of stock returns, investment, B/M, and market premium all show significantly positive (+) effects on stock returns, with coefficients of 0.067, 0.02, and 0.188 respectively. Moreover, market premium has the strongest determining power on stock returns.

Table 7 does not support the idea that uniqueness affects capital structure. The observable variables of uniqueness (RD/S and SE/S) cannot measure it well according to our measurement model, which might explain the poor relationship between uniqueness and capital structure. This means that there are not enough RD/S and SE/S to explain uniqueness, and that new variables need to be found. Because they only measure specific, narrowly defined facets, of uniqueness.

VI. Conclusion

In this paper, we investigate the interaction between capital structure and stock returns, along with the determinants of capital structure and stock returns. Based on the papers of Yang et al. (2010) and Titman and Wessels (1988), we apply an SEM to the Korean stock markets. We take the firms listed in KOSPI and KOSDAQ from 1990 to 2016 as research objects and use book leverage and market leverage as the observable variables of capital structure. In terms of the determinants of capital structure, we select stock returns, asset structure (collateral value of assets), uniqueness, profitability, and size. In addition to leverage, we choose profitability, size, B/M, investment, and market premium from the FF 5-factor model as the determinants of stock returns.

First, we find that stock returns have a negative (-) effect on capital structure in the SEM, consistent with our hypothesis. However, capital structure has no significant effect on stock returns as a risk factor in the SEM. We speculate that the capital structure of Korean firms changed during the Asian foreign currency crisis in 1997, which might have led to this result. We use both book leverage and market

leverage to measure capital structure in the SEM. Market leverage fluctuates more seriously than book leverage, which means that market leverage changes with the economic environment, especially in the crisis period.

As for the other determinants of capital structure, asset structure (+) and profitability (-) retain robust relationships with leverage (market leverage, book leverage). Size shows an unstable relationship with stock returns: it has a significantly positive (+) effect on leverage in the SEM.

As for the other determinants of stock returns, size (-), B/M (+), investment (+), and market premium (+) show strongly significant effects on stock returns, consistent with the hypothetical relationships. Profitability has no significant effect on stock returns in the SEM.

Because the results of the SEM are generally consistent with our prior hypotheses, it is feasible to use the SEM to analyze the determinants and relationships of capital structure and stock returns logically.

In view of the limitations found in the process of conducting our research, we propose the following improvements and future research directions. It is better to do a confirmatory factor analysis first to determine which observable variables best measure the latent variables. Since the Asian foreign currency crisis in 1997 and the global financial crisis in 2008 have had a fundamental impact on the economy, it may be helpful to analyze the periods separately. In addition, according to previous research, growth, liquidity, and volatility are representative determinants. Therefore, we could add those variables, including macroeconomic variables, for analysis in a future study.

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