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# Co-determination of capital structure and stock returns—A LISREL approach An empirical test of Taiwan stock markets

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ABSTRACT

Titman and Wessels (1988) utilize a structural-equations model (LISREL) to find out the latent determinants of capital structure. Maddala and Nimalendran (1996) indicate that the problematic model specification causes the poor results in Titman and Wessels' research. Chang, Lee, & Lee (2009) apply a Multiple Indicators and Multiple Causes (MIMIC) model to re-examine the same issue as Titman and Wessels did but found more convincing results. We extend Titman and Wessels' research from using a single-equation approach to a multi-equations approach. In addition to the determinants of firms' capital structure, those of stock returns are determined simultaneously. Literature indicates that a firm's capital structure may affect its stock returns (Bhandari, 1988), and the reverse is true too (Baker & Wurgler, 2002; Lucas & McDonald, 1990; Welch, 2004). Hence, a firm's determinants of its capital structure and those of its stock returns should be decided simultaneously, rather than independently. By solving the simultaneous equations, we examine the empirical relationship between the two endogenous variables: capital structure and stock returns and find out their common determinants as well. Our results show that stock returns, expected growth, uniqueness, asset structure, profitability, and industry classification are the main factors of capital structure, while the primary determinants of stock returns are leverage, expected growth, profitability, value and liquidity. The level of debt ratios and stock returns are mutually determined by the aforementioned factors and themselves.


## 1. Introduction

Capital structure and stock returns are topics that have received much attention in the financial management arena. Over the past few years, there are increasing researches surrounding the issues related to the determinants of capital structure and the determining factors of expected stock returns. A few empirical studies combine these two major topics together and test whether debt/equity ratio influences stock returns or whether stock returns are factors of capital structure choices. Bhandari (1988) found that the expected common stock returns are positively related to the ratio of debt to equity and suggested that debt/equity ratio is one of the risk premia of stock returns. Hovakimian, Opler, & Titman (2001) used multiple regressions to explain companies' leverage degree and concluded that the target debt ratio may change over time as the firm's stock price and profitability change. Lucas and McDonald (1990), Baker and Wurgler (2002) and Welch (2004) empirically show that current capital structure is strongly related to historical market values and that equity issues on average are preceded by abnormal positive stock returns.

Although previous researches examined the relationship between capital structure and stock returns, few of them discussed the interaction of the two variables simultaneously. In other words, most of the researches considered only one-way causality: either capital structure affects stock returns or stock returns affect capital structure. In this paper, we try to treat the two variables (debt ratio and stock returns) both as endogenous variables, and use simultaneous linear equations to find out their inter-relationship as well as their own exogenous determinants. Our paper is motivated by Titman and Wessels (1988), who used a structural-equations model (SEM) to extract eight latent variables to explain only an endogenous variable, debt ratio level. We now extend their model to

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account for two endogenous variable, debt ratio and stock returns, and apply a LISREL system to set up and estimate our models.

Our purpose is first to find out the latent factors of firms' capital structure and stock returns respectively. Secondly, we want to know how firms' capital structure and stock returns affect each other. Does capital structure affect stock returns or the reverse is true? Or they are mutually affected? If so, which one has more dominant power and how does it work? In this paper, we use Taiwan stock market data on TEJ to examine these hypotheses.

We apply a structural-equations model (a LISREL system) to establish our models. LISREL has been widely applied in researches on marketing, organizational behavior, management, sociology, psychology, and accounting as well. Titman and Wessels (1988) first applied LISREL in finance area to deal with the determinants of capital structure. However, few financial researches have used this methodology since then. Maddala and Nimalendran (1996) indicate that the problematic model specification causes the poor results in Titman and Wessels' research. Chang et al. (2009) apply a Multiple Indicators and Multiple Causes (MIMIC) model to re-examine the same issue as Titman and Wessels did but found more convincing results.

In this paper, we try to use a LISREL model to explore more information on the relationship between and the determinants of capital structure and those of stock returns. LISREL, a factor-analytic model, consisting of two parts: a measurement model and a structural model that can be estimated simultaneously. In the measurement model, unobservable firm-specific attributes are measured by relating them to observable variables, e.g., accounting data. In the structural model, measured debt ratio and stock returns are specified as functions of the attributes defined in the measurement models.

## 2. Determinants of capital structure and stock returns

Before we proceed to our structural model analysis, a survey on the observable variables indicated by previous researches as determinants of capital structure or stock returns is stated as follows.

### 2.1. Determinants of capital structure

#### 2.1.1. Stock returns

Stock returns may explain firms' equity issuance. Equity market timing refers to the practice of issuing shares at high stock prices and repurchasing at low prices. Baker and Wurgler (2002) presented empirical evidences that low-leverage firms tend to raise funds when their valuations were high, and conversely high-leverage firms tend to raise funds when their valuations were low. Jegadeesh (2000) also found that equity issuers have low subsequent returns, which is consistent with the idea that firms issue equity when the cost of equity is relatively low. In this paper, we examine the relationship between debt ratio and stock return at the same testing year. If a firm performs well, its stock returns will increase and it may use more equity financing than debt. Therefore, we can expect a negative relationship between the year $t$ stock return and the year $t$ leverage level.

#### 2.1.2. Expected growth

From the capital structure's perspective, firms with higher expected growth opportunities may have more agency cost (underinvestment problem). Myers (1977) suggested that the value of a firm consists of two parts: "asset in place" and "real options" (growth opportunities), and the existence of "real options" causes shareholders to expropriate wealth from the firm's bondholders by foregoing projects that have positive net present values. Therefore, to minimize agency cost and underinvestment problem, firms with a higher portion of "real options" (expected growth) are expected to have lower debt ratio.

Similarly, as growth opportunities are highly intangible, they may provide limited collateral value or liquidation value. The inconvenience to leverage and higher bankruptcy cost also suggest a negative relationship between debt and growth opportunities.

Indicators of growth include capital expenditure over total assets (CE/TA), growth of total asset measured by percentage change of total assets (GTA) (Titman & Wessels, 1988), and market-to-book ratio of assets (MTB) (Bevan & Danbolt, 2002).

#### 2.1.3. Uniqueness

Titman and Wessels (1988) claimed that firms that produce unique or specialized products suffer relatively high costs in the event that they liquidate. Because their workers and suppliers probably have job-specific skills and capital, it is difficult for them to cash out or change to other operations. Thus, the uniqueness is negatively related to debt ratio.

Indicators of uniqueness are research and development over sales (RD/S) and selling expenses over sales (SE/S) (Titman & Wessels, 1988). The rationale to use RD and SE as proxies of uniqueness is that firms selling more unique products are likely to spend more on research and development and on advertisement, which increase the RD/S and SE/S ratios.

#### 2.1.4. Collateral value of assets (asset structure)

Based on the trade-off theory of capital structure, firms with lower bankruptcy cost would have higher target debt ratios. Companies with larger tangible and safe assets may find it easier and less costly to liquidate assets when going bankruptcy than firms with high level of intangible assets. Moreover, issuing secured debt can reduce costs arising from information asymmetry between managers and outside investors, therefore firms with assets that can be used as collateral may be expected to issue more debt to take advantage of this opportunity. In addition, if a large portion of a firm's assets are tangible and can be used as collaterals, it will reduce the risk of the lender while facing the agency cost of debt. Therefore, the greater the proportion of tangible assets on the firms' balance sheet, the more willing lenders will be to supply loans, leading to these firms' higher leverage.

Indicators of collateral value of assets include the ratio of inventory plus gross plant and equipment to total assets (IGP/TA) (Titman & Wessels, 1988), and the ratio of depreciated fixed assets to total assets (FA/TA) (Bevan et al., 2002).

#### 2.1.5. Size

Larger firms tend to be more diversified and fail less often, and should be more highly leveraged due to lower probability of bankruptcy. In addition, larger companies are likely to have a better credit rating and thus have access to non-bank debt financing, which is usually unavailable to smaller companies (Bevan et al., 2002). This also indicates a positive relation between size and debt level.

Indicators of size are logarithm of sales (LnS), logarithm of total assets (LnTA) (Titman & Wessels, 1988), and logarithm of market value of equity (LnME).

#### 2.1.6. Profitability

According to pecking order theory (Myers, 1984), firms prefer internal finance. If external finance is required, firms issue the safest security first. That is, they start with debts, then possibly hybrid securities such as convertible bonds, and lastly common equity as a last resort. The pecking order explains that the most profitable firms generally borrow less, not because they have low target debt ratios but because they do not need external funds. Less