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## **CORPORATE LEVERAGE, FIRM CHARACTERISTICS AND FINANCIAL CRISIS**

### **Abstract:**

This paper investigates the leverage decision of Japanese firms in their corporate leverage choice by analyzing the multi-directional causal relationship among firm characteristics such as firm size, profitability, tangibility (ratio of fixed to total assets), and growth opportunity (as measured by market-to-book ratio) on firms' choice of leverage. Using corporate finance data for a large sample of Japanese firms (25,698 firm-years) between 1980 and 2000, this paper finds a highly significant and positive size effect. Tangibility positively affects total debt, but Profitability negatively affects total debt. Market valuation also positively affects total debt. Finally, profitability is positively affected by operating cash flow, growth in sales, and change in earnings. The model is applied to sub-samples before and after the Asian financial crisis and results remain broadly similar before and after the financial crisis. Our findings support the hypothesis that the firm leverage choice is driven by firm characteristics.

### **Keywords:**

Leverage, Profitability, Size effect, Market to book

**JEL Classification:** A10

## 1. INTRODUCTION

While there are a large number of studies on corporate capital structure of US firms, international research is not as extensive. In their international comparison of capital structure, Rajan, Zingales and Luigi (1995) find that capital structure is determined by growth, capital intensity or tangibility of assets, profitability, and size. Dewenter and Warther (1998) find differences in dividend policy between US and Japanese firms and attribute this to reduced information asymmetry and agency conflicts in Japanese firms, especially *keiretsu* firms. In a comparative investigation of Japanese and US corporate control mechanisms, Morck and Nakamura (1999) find significant differences between US and Japanese firms in the relationship between ownership structure and firm performance. In particular, major banks play a key ownership role in Japan. In contrast, Fohlin (1998) finds that, in the universal banking period in Germany (1903-1913), relationship banking did not provide consistent lessening of the sensitivity of corporate liquidity to firm cash flow. Weinstein and Yafeh (1998) examine the relationship between banks and firms in Japan and find that when “access to capital markets is limited, close bank-firm ties increase the availability of capital to borrowing firms, but do not lead to higher profitability or growth.” Kang and Stulz (1996) find evidence that the 1980s liberalization in Japanese finance and banking caused the announcement abnormal returns of Japanese firms to become closer to that of US firms. Weinstein and Yafeh (1998) find evidence that liberalization decreased the influence of Japanese banks in corporate finance.

In their comparison of Japanese and US corporate finance, Kang and Stulz (1996) summarized what was then a common view: “It is widely argued that managers in Japan pursue different objectives than managers in the United States. Some view this difference in a favorable light, arguing that Japanese managers do not have to focus on short-term results and can take a long view that allows them to produce more wealth for shareholders. Others view this difference as evidence that Japanese managers are more interested in pursuing objective such as the maximization of market share than in maximizing shareholder wealth (Kang and Stulz (1996), p. 110).” Evidence in their study supports the view that Japanese managers base their share-issuance decisions on different considerations than those of US managers.

Many studies on capital structure (see, for example, Rajan, Zingales and Luigi (1995) and Titman and Wessels (1988)) find evidence that firms try to maintain a target capital structure. Over time, debt ratios are associated with firm characteristics like size, market valuation, high levels of fixed or tangible assets, and the marginal tax rate. Fama and French (2002) find that more profitable firms are less leveraged and, as the pecking order

model predicts, short-term variation in investment and earnings is mostly absorbed by debt.

Baker and Wurgler (2002) use market-to-book ratios to investigate the impact of market timing on capital structure and find that firms with lower leverage tend to raise funds when their market-to-book ratios were high. In contrast, highly leveraged firms tend to raise funds when their valuation was low. A firm's current capital structure is therefore in part the cumulative outcome of past attempts to time the market. Elliott et al. (2002) find that firms issuing equity (debt) are most overvalued (undervalued) at the time of the issue, and publicly (privately) placed issues are most overvalued (undervalued). Pandey et al. (2000) Annuar and Shamsheer (1993), and Ariff (1998) examine corporate finance in the emerging markets of Southeast Asia.

It is clear that while there is a vast literature on capital structure, empirical evidence is mixed, and many issues are unresolved. In addition, international evidence is not as extensive. In this paper, we apply a new methodology on a sample of Japanese firms. We find significant multi-directional relationships between firm characteristics and total debt levels.

The paper is organized as follows: Section 2 describes the data and research methodology. Section 3 reports results of the statistical analyses and Section 4 examines the impact of the Asian financial crisis, and section 5 concludes.

## 2. DATA AND METHODOLOGY

Financial data for Japanese firms traded in Tokyo Stock Exchange between 1980 and 2000 are collected. This provides an opportunity for examination of the effect of the Asian financial crisis as the data set incorporates periods before and after the crisis. Financial and utilities firms are excluded. For each firm in the sample, accounting information is collected to compute key firm characteristic variables on leverage, profitability, asset composition, size, and market valuation. Our final sample includes 25,698 firm-years. We use the total debt ratio (based on book value of debt) as the dependent variable to measure firm leverage. Independent variables on firm characteristics are constructed as follows:

**TD-B:** Total debt ratio based on book value of debt.

**Size:** Natural log of sales, used as a control variable for size.

**OP-CF:** Earnings before interest and tax normalized by capital employed.

**Tangibility:** Fixed assets normalized by capital employed.

**GrowthS:** Growth in sales.

**$\Delta$ Earnings:** Change in earnings.

**M/B:** Market capitalization/book value of equity.

To investigate in depth the simultaneous causal impact of several firm characteristics, such as profitability, firm size, operating cash flow, and market valuation, on firm choice of debts, we employ a structural equation model (SEM).

Structural equation modeling (SEM) refers to a general approach to multivariate data analysis and is a method for studying complex dependencies among variables, where some of the variables can be unobserved and hypothetical. There are several benefits to using SEM for model testing of non-experimental correlational data. SEM permits the use of multiple measures per construct and has the capability of estimating both measurement error and prediction error. SEM allows researchers to examine both direct and indirect effects and investigate complex, well specified theoretical models with relatively unbiased regressions when each construct is measured by two or more variables. For a more detailed discussion of SEM see Harlow (1996).

The SEM methodology allows us to trace out separate but simultaneous causal relationships when one or more factors affect the dependent variables: here, long-term and short-term debt ratios. Figure 1 depicts the linkage between the variables in our model. Profitability (a construct) is affected jointly by change in earnings ( $\Delta$ Earnings), operating cash flow (OP-CF), and growth in sales (GrowthS). We expect profitability to have a negative effect on total debt. Size is hypothesized to have a direct effect on leverage (as measured by TD-B), while also having an impact on the tangibility variable, as larger firms are likely to carry more tangible assets. We also test whether tangibility directly impacts leverage. Market valuation (as measured by the market-to-book ratio) is the final independent variable that is hypothesized to directly affect total debt ratio. These direct and indirect effects have been documented in earlier empirical studies, as reviewed earlier.

### 3. **EMPIRICAL RESULTS**

Table 1 reports the regression coefficient estimates and p-value from the SEM analysis for the complete sample. The model is highly significant (GFI = 0.983). Consistent with findings by Rajan, Zingales and Luigi (1995), Lasfer, Barclay and Smith (1995), and Berger et al. (1997), there is a highly significant and positive size effect on total debt. There is, however, a highly significant but negative effect of firm size on tangibility, evidence that smaller Japanese firms tend to carry more tangible assets (as a percentage of total assets) than larger firms.

Tangibility has a significant positive effect on total debt, supporting the view that tangible assets are used as collateral and lead to higher debt capacity. Earlier findings by Van der Wijst and Thurik (1993), Chittenden et al. (1996), and Stohs and Mauer (1996) support the view that tangible assets increase debt capacity only for long-term debt but not for short-term debt. As long-term debt is in general larger than short-term debt, our results on total debt broadly agree with these studies.

Confirming previous studies, change in earnings, growth in sales, and operating cash flows all have positive and significant impacts on Profitability, which in turn positively affects leverage. This supports Modigliani and Miller (1963) who suggest that more profitable firms utilize higher debt to take advantage of interest tax shields. Market valuation (as measured by the market-to-book ratio) also positively affects total debt ratio. This confirms evidence found by Michaelas et al. (1999).

To summarize, our SEM analysis identified statistically significant relationships among several firm characteristics and leverage. Our results not only support many earlier findings but also put several key relationships together while tracing the multi-directional relationship among factors. This is strong evidence that firms act strategically, based on firm characteristics, in making leverage decisions.

### 4. **EFFECT OF THE ASIAN FINANCIAL CRISIS**

Earlier we reviewed evidence that financial liberalization in the 1980s led to significant changes in Japanese corporate finance (see Kang and Stulz (1996), and Weinstein and Yafeh (1998)). The Asian financial crisis in the late 1990s provides another natural experiment for investigating whether this crisis also led to significant changes in Japanese corporate finance. To investigate if there is a significant difference in corporate finance for Japanese firms before and after the Asian financial crisis, we test the same model using two sub-samples. The pre-crisis sample includes data from 1994 and 1995, one year before the crisis in late 1996. The post-crisis sample includes data from 1997 and 1998, the two years immediately after the Asian financial crisis.

Table 2 reports the empirical results for the pre-crisis sample and Table 3 the post-crisis sample. While the model estimates remain broadly similar between the two sub-samples, there are interesting differences. For the post-crisis period, the effects of all four key determinants of leverage (size, profitability, market-to-book, and tangibility) are all somewhat muted: the coefficients are all smaller in absolute value. Cross-sectionally, in the more difficult environment after the Asian financial crisis, firm leverage does not vary as much when key characteristics differ among firms. In contrast, the effects of the three factors driving profitability are larger in magnitude in the post-crisis period. Both of these observations may reflect the change in the operating environment before and after the Asian financial crisis. In the post-crisis period, profitability is more strongly affected by change in earnings, cash flow, and change in sales than in the easier years before the crisis. In a similar manner, total debt is cross-sectionally more strongly affected by the four key determinants in the years before the crisis.

## 5. CONCLUSION

This paper investigates the effects of firm characteristics, such as size, tangibility, profitability, operating cash flow, and market valuation on firm choice of leverage (as measured by total debt ratio). In particular, we provide international evidence by using a sample of Japanese firms over the period from 1980 to 2000.

Our results corroborate many earlier empirical findings. Specifically, we find a significant and positive size effect. There is a significant and positive valuation (M/B) effect, a significant negative profitability effect, and a significant positive tangibility effect. At the same time, our path analysis also traces significant positive effects of change in earnings, operating cash flow, and growth in sales on Profitability.

We also compare sub-samples before and after the Asian financial crisis. We find that the model estimates remain broadly similar, but with interesting differences. These differences are consistent with the changed operating environments before and after the crisis. They also provide indication that market discipline might be restored after the financial crisis and the burst of the bubble.

This paper contributes to the literature by providing international evidence from the Japanese markets as well as by using a multi-directional analysis methodology using Structural Equation Modeling. Future research can apply a similar methodology to other complex financial market research questions. The evidence strongly support the idea that firm leverage decisions are strategic choices contingent on firm specific characteristics.

**Table 1 - Structural Equation Model of Firm Characteristics and Corporate Debt**

Path	Estimates	p-value
Size → TD-B	0.6306	0.000***
P → TD-B	-0.1724	0.000***
M/B → TD-B	0.0768	0.000***
Tangibility → TD-B	0.0252	0.085*
ΔEarnings → P	0.3356	0.000***
GrowthS → P	0.5518	0.000***
OP-CF → P	0.7274	0.000***
Size → Tangibility	-0.1432	0.000***

Model significance: GFI = 0.983

\*\*\*Significant at 0.01 level.

\*\*Significant at 0.05 level.

\*Significant at 0.10 level.

**Table 2 - Structural Equation Model of Firm Characteristics and Corporate Debt (before crisis)**

Year = 1994 and 1995

Path	Estimates	p-value
Size → TD-B	0.6298	0.000***
P → TD-B	-0.1918	0.000***
M/B → TD-B	0.0626	0.000***
Tangibility → TD-B	0.0534	0.000***
ΔEarnings → P	0.2850	0.000***
GrowthS → P	0.3914	0.000***
OP-CF → P	0.5677	0.000***
Size → Tangibility	-0.1444	0.000***

Model significance: GFI = 0.981

\*\*\*Significant at 0.01 level.

\*\*Significant at 0.05 level.

\*Significant at 0.10 level.



**Table 3 - Structural Equation Model of Firm Characteristics and Corporate Debt (after crisis)**

Year = 1997 and 1998

Path	Estimates	p-value
Size → TD-B	0.6093	0.000***
P → TD-B	-0.1235	0.000***
M/B → TD-B	0.0409	0.000***
Tangibility → TD-B	0.0115	0.015**
ΔEarnings → P	0.3400	0.000***
GrowthS → P	0.5088	0.000***
OP-CF → P	0.6051	0.000***
Size → Tangibility	-0.1420	0.000***

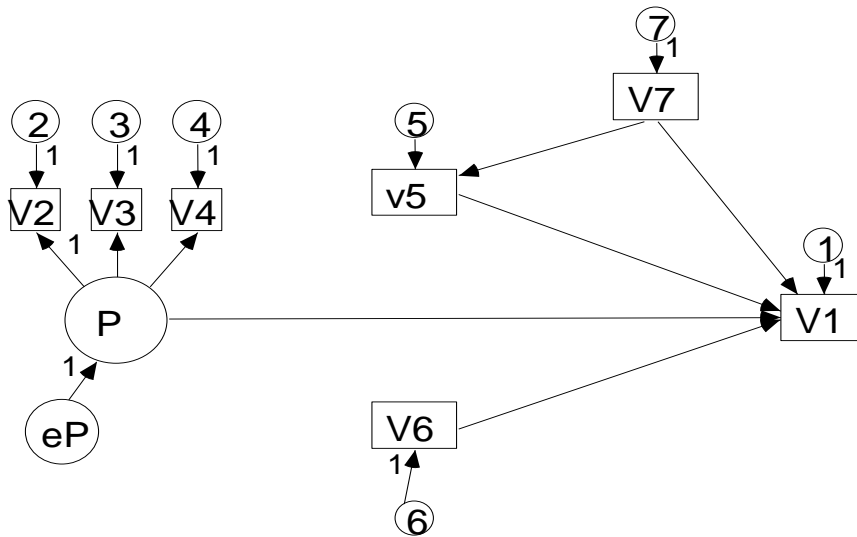
Model significance: GFI = 0.990

\*\*\*Significant at 0.01 level.

\*\*Significant at 0.05 level.

\*Significant at 0.10 level.

Figure 1



Where:  
 V1: TD-B  
 V2: OP-CF  
 V3: Growth in Sales  
 V4: Change in Earnings  
 V5: Tangibility  
 V6: M/B  
 V7: Firm Size  
 P: Profitability  
 1-7, eP: error terms

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