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# DEBT RATIO ANALYSIS OF TAIWAN??PROPERTY DEVELOPMENT FIRMS UNDER CONTRACTION

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# DEBT RATIO ANALYSIS OF TAIWAN'S PROPERTY DEVELOPMENT FIRMS UNDER CONTRACTION

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Key words: property developer, debt ratios, principal component method, contraction cycle.


## ABSTRACT

This study analyzes the correlation between debt ratios and corporate performance of the property development firm during times of contraction in Taiwan. This study collects and examines financial data for the period 1992 to 2003 for 25 listed property development firms. A total of 16 financial ratios, collectively representing corporate performance, were statistically checked with three types of debt ratios. The comparison results reveal that profitability related ratios are inadequate representations of corporate performance. Especially, investors consider a vigorous dividends policy to indicate a crisis. Two positive directions for property development firms during a contraction include (1) product differentiation and innovation and (2) retrofitting tax structure and bankable assets to prepare for long-term financing.


## INTRODUCTION

Horrigan [6] contended that fluctuation of the business cycle could affect industrial operations. Amato and Wilder [1] observed that corporate performance varies from one industry to another. Moreover, the corporate performance of one industry also varies from one business cycle to another. Berman [4] pointed out that an industry with little profit to show for in an expanding business cycle will suffer less loss in a contracting business cycle. The said industry is affected by the factor of business cycle insignificantly. On the contrary, the industry that revitalizes rapidly in a recovery reacts faster to the factor of business cycle than other industries; therefore, the said industry is much more sensitive to the fluctuation of business cycle. To summarize, industry reacts to business cycle differently from one to another.

The Taiwanese property developer requires substantial capital for land acquisition and construction work; therefore, property development investments are rarely made with self-sufficient funds but rather use loans. Based on the Balance Sheet of the Taiwanese property development firm, industry debt comprises over sixty percent (60%) of total assets. Apparently, most property development industries fund their investments with loans. The business cycle is a key influence on the debt ratio of a property developer. Therefore, the property developer must be capable of applying capital structure flexibly in response to business cycle movements. Restated, the property developer must raise loans rapidly to meet high market demand during upswings in the business cycle by rapidly mobilizing funds to complete projects to meet market demand and achieve profits. On the other hand, the property developer requires less funds relatively, completes fewer projects, and makes reduced profits during times of weak market demand owing to an economic contraction cycle. Under the economic contraction cycle circumstances, raising debt becomes the main source of risk to a property developer. If property developers fail to control debt, the industry inevitably faces the risk of breach of contract or bankruptcy. This investigation analyzes the correlation between financial ratio and debt ratios for the property development industry during the recent decade since 1992 to 2003 in Taiwan.

## DATA PROCESSING

### 1. Business cycle of the property development industry in Taiwan

The business cycle describes the continuous phenomenon of economic expansion and contraction. Mitchell [15] has divided the business cycle into four stages of prosperity, crisis, depression, and recovery. Moreover, the Council for Economic Planning and Development (CEPD) of Taiwan has divided the business

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**Table 1. Composite index (CI) of the real estate industry in Taiwan**

| Composite Index | Investment | Production | Trade | Application |
|---|---|---|---|---|
| Leading indicators | 1. Change rate of GDP<br>2. Change rate of money supply (M2) | 1. Change rate of bank loan to the construction industry | 1. Change rate of consumer's price index | |
| Coincident indicators | 1. Number of lands after architecture trade/transfer registration index<br>2. Basic loan interest rate | 1. Areas licensed for construction<br>2. Number of construction workers | 1. Change rate of average price of pre-sold and newly constructed houses | 1. Use rate of houses |
| Lagging indicators | 1. Change rate of construction stock price index | 1. Area licensed for use<br>2. Average salaries/wages of construction workers | 1. Number of trade transactions completed<br>2. Land incremental tax amount | 2. Change rate of rent index |

Note: The above indexes of ABRI are revised slightly in 2003 and 2004.

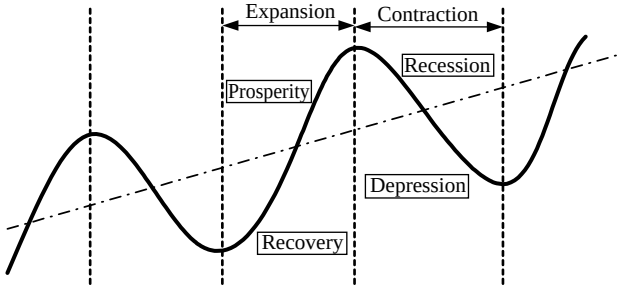


**Fig. 1. Business cycle chart.**

**Table 2. Composite index (CI) and turing point of the property development industry in Taiwan**

| Business cycle | Valley | Peak |
|---|---|---|
| 1st Stage | 1973 Q1 | 1974 Q1 |
| 2nd Stage | 1975 Q4 | 1979 Q3 |
| 3rd Stage | 1983 Q2 | 1988 Q4 |
| 4th Stage | 1991 Q1 | 1992 Q2 |

Note: Q means for "quarter."

cycle into the two phases of expansion and contraction. Furthermore, the expansion phase is divided into the two stages of recovery and property; while, the contraction phase is divided into the two stages of recession and depression. (See Figure 1)

Barras [2] realized that the business cycle of the *United Kingdom* real estate industry was affected by the interaction among the macroeconomy, the real estate market, and financial markets. The operations of the Taiwanese property development firm are substantially affected by the influences of macro-environment (economy, politics, and society), industrial environment, financial policy, and land policy. Therefore, in the Real Estate Composite Index (CI) of the Property Development Industry that was prepared by the Architecture and Building Research Institute (ABRI) of the Ministry of the Interior of Taiwan, the classifications investment index, production index, trade index, and application index are provided as a reference; additionally, leading indicators, coincident indicators, and lagging indicators are provided to indicate the industrial development of the property developer (investment index and trade index) and the construction firm (production index) in Taiwan. Please refer to Table 1 for the illustrations of indexes and indicators.

The 6-8 year business cycle of the real estate industry based on the business cycle of 1974, 1979, and 1988 is most frequently discussed in Taiwan. According to the data of ABRI in Table 2, from 1971 to the first quarter of 2005, the development of the Taiwanese property developer can be divided into a valley-and-peak cycle comprising four stages. The length of each stage varies from 2-3 years (the first and third stages) to 10 years. This study defines the start and end of the expanding and contracting business cycles using the

approach of Kane [9]. The contraction cycle begins in the month with the highest peak and ends in the month with the lowest valley of a business cycle. The expanded business cycle begins in the month with the lowest valley and ends in the month of with the highest peak of a business cycle. Based on the investigative results obtained by ABRI, a boom signal appeared in a slow recovery from the second quarter of 2003. Therefore, this study analysis the contraction cycle between the third quarter of 1992 and the second quarter 2003.

### 2. Financial data

The Construction Industry category on the Taiwanese stock exchange (TAIEX) includes both construction and property development firms. This study selects property development firms as study subjects using the operating item disclosed in these firms yearbooks and financial statements[1]. Companies with investments in constructing buildings (including parking spaces) for sale or rent that exceed over 80%[2] of their business income are selected as the study sample. Most property development firms were not listed on the OTC until 1995 and thus the industry has a relatively short history of available study data; consequently, this study only surveys TAIEX listed property development firms. Twenty-five effective samples in the contracted business cycle were gathered after eliminating firms with ratios of property development investment below 80% and for which insufficient study data were available.

## VARIABLES

### 1. Debt variables

Generally, the financial indicators of a company, such as debt ratio and shareholder equity, are classified as being indicators of either market value or book value. Scholars generally measure capital structure using debt ratios. Titman and Wessels [17] observed a significant correlation between the market and book values of debt for identical periods; therefore, whether market value or book value is used as the indicator of debt value is unimportant. Baskin [3] believed that book value could reflect demand for accumulated financing. Moreover, Micheal and Wesley [14] believed that the book value of debt ratio could reflect actual firm reliance on debt.

It is rare for Taiwanese property development firms to use bonds for financing owing to the lack of activity on the local bond market, which makes it difficult to determine the market value of bonds. Bank loans are the major financing channel of most property developers. The difference between the market value and book value of bank debt is insignificant. Stock speculation and manipulation recently has been common; therefore, stock price is not capable of reflecting actual firm business operations. The true value of shareholder equity valued based on stock price can be distorted by unreasonable stock market falls or corrections. Consequently, total assets (the combination of total debt and shareholder equity) are valued at book value in this work, while the ratios of total debt, long-term debt, and short-term debt to total assets are variables of capital structure, where:

Total Debt Ratio (TDR) = Total debt / Total assets (book value) = TD/TA
Short-Term Debt Ratio (STDR) = Short-term debt/Total assets (book value) = STD/TA
Long-Term Debt Ratio (LTDR) = Long-term debt/Total debt (book value) = LTD/TA

### 2. Business variables

Ress [16] believed that financial ratios are used to summarize relevant information regarding multiple financial indices; additionally, financial ratios are used to eliminate the influence of operating scale when making inter-firm comparisons. Therefore, firm business performance is observed based on the analysis of financial ratios, for example, Mensah [13] examined the correlations among the business cycles of three industries (mining, manufacturing, and retailing) and 38 financial ratios; also, Kane [9] examined the impact of recession on industry financial ratios.

The emphasis in the observation of financial ratios should differ among industries owing to differences in industry characteristics. Mason *et al*. [12] studied construction companies in the U.K. using the indicators of the ratio of return on total assets, ratio of return on total assets applied, current ratio, financial leverage, number of days sales in accounts receivable, and trends in accounts receivable. Mason *et al*. [12] concluded that the indicators of ratio of return on total assets and ratio of return on total assets (applied had contributed most applied significantly to the study model. Moreover, Langford *et al*. [11] studied three construction compa-

[1] Financial data are abstracted from the financial statements of the listed firms and the reports of listed construction firms submitted to the "Taiwan Economic Newspaper Database."

[2] The data of the sampled firms demonstrates that the investment ratio in construction either exceeds 80% or is below 35%; therefore, the threshold for selection for the property developers for a firms to be classified as a property developer was a ratio of 80% of investment to business income.

nies in the U.K. in 1988-1992 based on the financial ratios of Mason. Langford *et al*. [11] concluded that the analysis of financial ratios had effectively predicted problems firm business operations. Furthermore, Fotwe *et al*. [5] used the study of Mason *et al*. to forecast contractor solvency using financial ratios. Fotwe *et al*. [5] concluded that financial ratios alone were inadequate for predicting contractor solvency, and proposed supplementing financial ratios with non-financial social, economic and management indicators). Kangari *et al*. [10] investigated the financial performance of construction firms in the United States using the indicators of current ratio, leverage ratio, total asset turnover, operating capital turnover, return on total assets, and ratio of return on net assets. Finally, Hsieh *et al*. [7] analyzed 40 construction firms in Taiwan from 1995-1999 using 14 financial ratios and multiple variables; moreover, he discovered the crucial financial factors of the construction industry to follow the order account receivable turnover, operating capital turnover, net value turnover, net value growth rate, and times interest earned ratio.

Regarding the selection of business operating variables, since this work focuses on the property developer during periods of contraction, the effects of society and economy are included in analyzing the business cycle of the property developer, and the management style of the firm cannot be analyzed easily. Therefore, this study does not consider the non-financial factors suggested by Fotwe *et al*. [5]. Based on considerations of data collection, this work selects eight types which contain 16 financial factors (See Table 3) for studying correlation between factors and debt variables.

**Table 3. Influential factors of business operating**

| Classification | Code | Influential factors |
|---|---|---|
| Growth | $X_1$ | $(TA)_{GR} = [\ (TA)_t - (TA)_{t-1}\ ]/(TA)_{t-1}$<br>Total assets growth rate =<br>Current total current – Total assets of prior period)/Total assets of prior period |
| | $X_2$ | $(EBIT)_{GR} = [(EBIT)_t - (EBIT)_{t-1}]/(EBIT)_{t-1}$<br>Sales revenue growth rate<br>= (Current sales revenue – Sales revenue of prior period)/Sales revenue of prior period |
| | $X_3$ | $(EBIT)_{GR} = [\ (EBIT)_t - (EBIT)_{t-1}\ ]/(EBIT)_{t-1}$<br>Earnings before interest and tax (EBIT) growth rate = $(EBIT_{current} - EBIT_{prior\ period})/EBIT_{prior\ period}$ |
| Profit | $X_4$ | EBIT/TA = Earnings before interest and tax/Total assets |
| | $X_5$ | $(ROA)_{before\ tax}$ = EBT/TA<br>Ratio of return on total assets (ROA) before tax = Earnings before tax/Total assets |
| Operating risk | $X_6$ | $[\ (EBIT/TA)\ ]_\sigma$ = Standard deviation of (Earnings before interest and tax/Total assets) |
| | $X_7$ | $(OE)_{vc}$ = Variable coefficient of operating earnings |
| Non-debt tax shield | $X_8$ | T/EBT = Income tax/Earnings before tax |
| | $X_9$ | DE/TA = Depreciation expense/Total assets |
| Operating scale | $X_{10}$ | $Log[\ (TA)_{bv}\ ]$ = Log (Book value of total assets) |
| Value of assets mortgaged | $X_{11}$ | Mortgaged assets/Total assets = (Fixed assets + Mortgaged inventory)/Total assets |
| | $X_{12}$ | FA/TA = Fixed assets/Total assets |
| Product characteristics | $X_{13}$ | $(R\&D)_r$ = (R&D)/NSR<br>R&D expense ratio = R&D expense/Net sales revenue |
| | $X_{14}$ | $(OP)_r$ = OP/OI<br>Operating expense ratio = Operating expense/Operating income |
| Dividend distribution ratio | $X_{15}$ | CDPS/EPS = Cash dividend per share/Earning per share |
| | $X_{16}$ | $CDPS/(SEPS)_{bv}$ = Cash dividend per share/Book value of Shareholder's equity per share |

## DESCRIPTIVE STATISTICAL ANALYSIS

### 1. Preliminary statistical analysis

Three debt ratios and 16 influential factors for a total of 19 variables are used for the analysis of an arithmetic mean value, median value, standard variance, maximum value, and minimum value in accordance with the statistical principle. Please refer to Table 4 for the analytical result and summarized conclusions:

(1) Based on the arithmetic mean and median of Total Debt Ratio (TDR), Short-Term Debt Ratio (STDR), and Long-Term Debt Ratio (LTDR) in Table 4, the ratio of total debt to total assets is approximately 60%. The debt source of the study sample for the contraction period is short-term debt rather than long-term debt; notably, the short-term debt of the sampled firms comprises 84% of the total debt.

(2) The competency of the sampled firms in achieving profits and adjusting debt in response to the business cycle varies; therefore, debt ratio fluctuates significantly under contraction. Thus from the difference and standard variance between the maximum and minimum values of the TDR, STDR, and LTDR in Table 4, the debt policies of the sampled firms vary significantly.

(3) Based on the variation between the maximum and minimum values of influential factors, factors vary among study samples.

(4) Based on the arithmetic mean and median of the ratios of assets mortgaged ((Mortgaged assets/Total assets) and (Fixed assets/Total assets)), the mortgaged assets comprised 70% of total assets under contraction; however, fixed assets comprised just 5% of total assets. Apparently, the main assets of the sampled firms are the land for construction, building/land for sales, and construction in progress that could be mortgaged. However, the said assets were difficult to sell during a contraction, and thus a high ratio of mortgaged assets to total assets does not indicate a healthy property development firm.

(5) From the arithmetic mean of the dividend distribution ratios ((cash dividend per share/EPS) and (cash dividend per share/book value of shareholder's equity per share)), the sampled companies have low cash dividend ratios. The property developer thus likely requires substantial funds.

**Table 4. SPSS descriptive statistics of factors under contraction**

| Code | Statistics | | | | |
|---|---|---|---|---|---|
| | Arithmetic mean ($\bar{x}$) | Median ($x_m$) | Standard deviation ($\sigma$) | Maximum value ($x_{max}$) | Minimum value ($x_{min}$) |
| TDR | 0.612 | 0.589 | 0.156 | 0.795 | 0.290 |
| STDR | 0.516 | 0.498 | 0.109 | 0.692 | 0.268 |
| LTDR | 0.048 | 0.050 | 0.036 | 0.135 | 0.000 |
| $X_1$ | 29.583 | 29.896 | 12.615 | 54.455 | 5.865 |
| $X_2$ | 76.869 | 29.740 | 93.572 | 564.700 | 9.229 |
| $X_3$ | -2.115 | 1.384 | 12.786 | 5.188 | -66.910 |
| $X_4$ | 0.048 | 0.042 | 0.035 | 0.125 | -0.064 |
| $X_5$ | 0.026 | 0.024 | 0.036 | 0.121 | -0.075 |
| $X_6$ | 0.055 | 0.050 | 0.044 | 0.189 | 0.010 |
| $X_7$ | 1.427 | 0.975 | 1.042 | 7.607 | 0.055 |
| $X_8$ | 6.062 | 6.131 | 4.253 | 17.384 | 0.000 |
| $X_9$ | 0.002 | 0.001 | 0.003 | 0.012 | 0.000 |
| $X_{10}$ | 15.851 | 15.742 | 0.655 | 17.354 | 13.425 |
| $X_{11}$ | 0.756 | 0.781 | 0.104 | 0.889 | 0.535 |
| $X_{12}$ | 0.058 | 0.053 | 0.055 | 0.262 | 0.010 |
| $X_{13}$ | 0.001 | 0.000 | 0.002 | 0.012 | 0.000 |
| $X_{14}$ | 0.141 | 0.125 | 0.065 | 0.339 | -0.006 |
| $X_{15}$ | 0.081 | 0.042 | 0.128 | 0.513 | 0.000 |
| $X_{16}$ | 0.011 | 0.007 | 0.013 | 0.052 | 0.000 |

## 2. Regression statistical analysis

*(1) Correlation of variables*

The relation of factors in this study is complicated, and factor correlation cannot be used as the sole basis for opinions regarding factor correlation. Therefore, the relation and correlation of factors should be defined via a statistical correlation analysis. The 16 selected factors in this investigation are not normally distributed; thus they could not be examined using the Pearson Correlative Coefficient Method. This study examined the correlation in accordance with the Spearman Correlation Coefficient Method.

From the calculation results obtained using the Spearman Correlation Coefficient Method, the selected factors are not independent of one another, and some are closely correlated. Therefore, regression analysis could result in irrational phenomenon. Such as: (1) inconsistent negative sign of the regression and correlative coefficients; (2) insignificant regression coefficient test results; (3) excessive differences or reversal of signs between multiple regression coefficient and simple regression coefficient; or (4) multiple correlative coefficient $R^2$ not adding up. To resolve the issue of collinearity and minimize the number of variables, this study uses Factor Analysis to convert the 16 selected factors into independent factors for regression analysis. The Factor Analysis model is illustrated in Eq. (1) below:

$$X = \Lambda \times F + \delta \quad (1)$$

$X : p \times 1$ Variables matrix
$\Lambda : p \times q$ Factor loading matrix
$F : q \times 1$ Common factor matrix

In which, $\delta : p \times 1$ Specific factor matrix (variance matrix)
p : number of variables (p = 16)
q ; number of factors

In terms of factor extraction, this study uses the Principal Component Method and selects factors in accordance with the eigenvalue > 1 defined by Kaiser [8]. Therefore, five out of the 16 variables are classified and extracted for analysis. The variance can be explained with an accuracy of up to 79.20%. Apparently, the five chosen variables clearly represent the 16 variables (see Appendix A for the engenvalue, variance, and cumulative variance of each factor).

Since the factor loading matrix is not a simple matrix, it is difficult to identify the correlation between factors and variables. To understand the meaning of each factor, the Varimax Rotation Method is used to derive the factors from the rotation factor loading matrix (Appendix B). Moreover, the variables with an absolute factor loading value exceeding 0.5 are selected to explain the extracted factors. Table 5 lists the correlation between the factors and variables:

**Table 5. Correlation between factors and variables**

| Category | Code of variables | Classification |
|---|---|---|
| $F_1$ | $X_3$, $X_9$, $X_{11}$, $X_{13}$, $X_{14}$ | Industry characteristics |
| $F_2$ | $X_2$, $X_4$, $X_5$, $X_6$ | Profitability |
| $F_3$ | $X_{15}$, $X_{16}$ | Stock dividend policy |
| $F_4$ | $X_1$, $X_7$, $X_{10}$ | Industry operating risk |
| $F_5$ | $X_8$, $X_{12}$ | Financing policy |

Category 1:

The financial ratios of EBIT growth rate, Depreciation expenses/Total assets, Mortgaged assets/Total assets, R&D expense ratio, and Operating expense ratio under contraction can be combined into a single category and treated as an independent variable. The property development industry provides an example: if more resources are used for R&D, and if more operating expenses and advertisement expenses are invested. In general, the mortgaged asset value of the land for construction or building/land for sales will appreciate. Under the circumstances, the depreciation timing of the said assets could be extended or profit could increase; therefore, the above five variables are highly correlated with the industry characteristics of the company.

Category 2:

Sales revenue growth rate, Earnings before interest and tax/Total assets, ratio of return on total assets before tax, and standard variance of EBIT/Total assets are ratios closely related to firm operating profits without considering tax and interest expenses. These four variables could be combined into a single independent category.

Category 3:

The ratios of Cash dividend per share/EPS, and Cash dividend per share/Book value of shareholder's equity, indicate firm stock dividend policy; thus, Category 3 is correlated to the stock dividend policy.

Category 4:

Growth rate of total assets, variance coefficient of operating earnings, and natural logarithm of the book

value of total assets are relevant to firm operating risk. Generally, operating leverage represents the application of assets invested. If firm operating earnings are markedly affected by small changes in sales revenue, the firm adopts high operating leverage, and therefore faces high operating risk. The analytical results demonstrate that the change in the operating earnings of the property development industry during contraction is correlated to investment and total asset growth.

Category 5:

The ratios of Fixed assets/Total assets, and Income tax/Earnings before tax are correlated with firm financing policy. The effect of debt tax shield is conspicuous increases with firm tax rate, forcing firms to increase their debt level. In the property developer, fixed assets are frequently used as collateral for loans. Hence, firm financing policy is affected by tax and mortgaged asset value.

*(2) Multiple regression analysis and test*

To understand whether the categories selected in the previous section influence capital structure, the crucial categories in terms of the capital structure are gradually selected using the "backwards selection method" for multiple regression analysis. Through the gradual selection process, Factors 3 and 4 are chosen because they more effectively explain the total debt ratio; additionally, Factors 1, 3, and 4 are chosen for their superior ability to explain the short-term debt ratio; moreover, Factor 5 is chosen because of its superior ability to explain the long-term debt ratio.

Multiple regression analysis is conducted with certain basic assumptions; therefore, data must be tested before conducting regression deduction to yield a true result. This study performs two tests: (1) normal test, (2) variance independence test (see Appendix C). The test result demonstrates that the three debt ratios have a normal distribution and are free of autocorrelation.

To summarize, the result of compound regression analysis satisfies the above assumptions. The analysis result (Appendix D) is illustrated as follows:

(A) Multiple regression analysis of Total Debt Ratio (TDR)

The regression model has an F value of 3.606, a P value of 0.044 and an adjusted R-square of 24.8%; moreover, the test results are satisfactory. The independent variables appear sufficient to explain the change in total debt ratio. Regarding the influence of individual independent variables on total debt ratio, below the significance level of 0.1, the category of stock dividend policy and industry operating risk is characterized by a significant negative correlation between the total debt ratios.

$$TDR = 58.131 - 4.662 \times F_3 - 3.897 \times F_4$$

(B) Multiple regression analysis of Short-Term Debt Ratio (STDR)

The regression model takes F = 4.217, P = 0.019 and adjusted R-square = 37.6%. The independent variables appear sufficient to explain the change in total debt ratio. Regarding the influence of individual independent variables on short-term debt ratio, below the significance level of 0.1, a positive relation exists between industry characteristics and short-term debt ratio, while there is a negative correlation between industry operating risk and short-term debt. Additionally, below the significance level of 0.05, stock dividend policy and short-term debt ratio are negatively correlated.

$$STDR = 51.891 + 3.130 \times F_1 - 4.321 \times F_3 - 3.625 \times F_4$$

(C) Multiple regression analysis of Long-Term Debt Ratio (LTDR)

The regression model has an F value of 8.191, a P value of 0.009 and adjusted R-square of 26.3. The independent variables appear sufficient to explain the change in the total debt ratio. Below the significance level of 0.05, a positive relation exists between the financing policy and long-term debt ratio.

$$LTDR = 5.635 + 1.968 \times F_5$$

(D) Market demand declines under contraction; moreover, businesses base their investment decisions on concerns regarding profitability, but must try to control debt to avoid risk; therefore, profitability category and debt ratio are not significantly correlated.

## RESULTS AND DISCUSSION

Table 6 summarizes the analytical results. Based on the analytical results, the property developer during a period of economic contraction possesses the following characteristics:

1. A significant negative correlation exists between the categories of stock dividend policy ($F_3$ ($X_{15}$, $X_{16}$)) and operating risk ($F_4$ ($X_1$, $X_7$, $X_{10}$)) to total debt ratio (TDR).

2. A positive relationship exists between the category of product characteristics ($F_1$ ($X_3$, $X_9$, $X_{11}$, $X_{13}$, $X_{14}$)) and short-term debt ratio (STDR). Moreover, a negative correlation exists between the categories of stock dividend policy ($F_3$) and operating risk ($F_4$), and short-term debt ratio (STDR).
3. A positive relationship exists between the category of the financing policy ($F_5$ ($X_8$, $X_{12}$)) and long-term debt ratio (LTDR).
4. Market demand declines during a contraction; therefore, the sampled company bases their investment decision on concerns regarding profitability, and will maintain a certain level of debt to avoid risking breach of contract or bankruptcy due to excessive interest expenses on loans. Thus no significant correlation exists between the factors of profitability and debt ratio.

The reasons for the fluctuation of variables can be discussed in accordance with the following debt ratios:

**1. Factors related to total debt ratio**

(1) The variable coefficient of operating earnings of a company with substantial assets or with significant asset growth rate during a period of contraction which with unstable profitability. If the utilization of operating leverage is compromised owing to deteriorating profitability, firm operating risk will increase. In this situation, if firm assets and funds are sufficient to maintain its basic business operations, the firm will adopt a conservative attitude towards borrowing. Therefore, a negative correlation exists between total debt ratio and industry operating risk (include the natural logarithm of the book value of total assets ( $X_{10}$), total asset growth rate ($X_4$), and variable coefficient of operating earnings ($X_7$)).

(2) Firm profitability reduces under contraction, and creditors worry that the distribution of cash dividends may impact the fortunes of the debtor company. Consequently, creditors will add clause into the agreement to protect their interests, thus increases the costs borne by the debt agent. So there is a negative correlation between stock dividend policy (including the two ratios of Cash dividend/EPS ($X_{15}$) and Cash dividend/Book value of shareholder equity

**Table 6. The correlation between influential factors to capital structure and debt ratio under contraction**

| Classification | Variables | Code | TDR | STDR | LTDR |
|---|---|---|---|---|---|
| Growth | $(TA)_{GR}$ Total assets growth rate | $X_1$ | (–)* | (–)* | — |
| | $(EBIT)_{GR}$ Sales revenue growth rate | $X_2$ | — | — | — |
| | $(EBIT)_{GR}$ Earnings before interest and tax (EBIT) growth rate | $X_3$ | — | (+)* | — |
| Profit | EBIT/TA | $X_4$ | — | — | — |
| | $(ROA)_{\text{before tax}}$ Ratio of return on total assets (ROA) before tax | $X_5$ | — | — | — |
| Operating risk | $[\ (EBIT/TA)\ ]_{\sigma}$ | $X_6$ | — | — | — |
| | $(OE)_{vc}$ Variable coefficient of operating earnings | $X_7$ | (–)* | (–)* | — |
| Non-debt tax shield | T/EBT | $X_8$ | — | — | (+)* |
| | DE/TA | $X_9$ | — | (+)* | — |
| Operating scale | $\text{Log}[\ (TA)_{bv}\ ]$ Log (Book value of total assets) | $X_{10}$ | (–)* | (–)* | — |
| Value of assets mortgaged | Mortgaged assets/Total assets | $X_{11}$ | — | (+)* | — |
| | FA/TA | $X_{12}$ | — | — | (+)* |
| Product characteristics | $(R\&D)_r$ R&D expense ratio | $X_{13}$ | — | (+)* | — |
| | $(OP)_r$ Operating expense ratio | $X_{14}$ | — | (+)* | — |
| Dividend distribution ratio | CDPS/EPS | $X_{15}$ | (–)** | (–)** | — |
| | $CDPS/(SEPS)_{bv}$ | $X_{16}$ | (–)** | (–)** | — |

Note: 1. * represents that the factor under $\alpha = 0.1$ reaches the significant level; ** represents that the factor under $\alpha = 0.05$ reaches the significant level.
2. (+) Positive correlation; (–) Negative correlation.

($X_{16}$)) and the total debt ratio during a period of contraction.

**2. Factors related to short-term debt ratio**

(1) A negative correlation exists between industry operating risk and stock dividend policy to short-term or long-term debt ratio.
(2) Regarding short-term debt ratio, most firms will take advantage of industry characteristics as collateral for short-term financing. However, good products are always easy to sell; therefore, property developers do not take advantage of construction product for long-term financing. A positive correlation exists between industry characteristics (include $X_3$, $X_9$, $X_{11}$, $X_{13}$, $X_{14}$) and short-term debt ratio.

**3. Factors related to Long-term debt ratio**

While the effect of a non-debt tax shield is significant, firms tend to raise more loans, thus increasing their debt ratio. Business operations tend to reduce during periods of contraction; moreover, the profitability of property developers may deteriorate and access to credit may become tighter. Therefore, firms with substantial fixed assets will gain relatively easy access to long-term loans from the bank. A positive correlation exists between financing policy and long-term debt ratio. Moreover, the two financial ratios of financing policy are Fixed assets/Total assets ($X_{12}$) and Income tax/Earnings before tax ($X_8$).

## CONCLUSIONS AND SUGGESTIONS

The operations of property developers in Taiwan are strongly affected by the business cycle. Market demand declines and stabilizes during periods of contraction. Therefore, the property developers must try to maintain a certain level of debt to avoid risking breach of contract or bankruptcy because of excessive debt interest expenses. Under the circumstances, the property developers must determine an adequate debt ratio in response to business cycle variations. The financial data of Taiwanese property development firms under contraction are analyzed with the factor of debt ratio examined in this paper.

(1) Property developers generally receive loans for the funds needed; moreover, the ratio of total debt to total assets is 60% and short-term debt is the main source of funds (the ratio of short-term debt to total debt is around 85%, compared to around 5% for the ratio to total assets).
(2) Industry profits decline during periods of contraction; therefore, debt ratio is not affected mainly by the category of operating profitability.
(3) The long-term debt ratio of the property developers is influenced by the financing policy of non-debt tax shield and fixed assets; moreover, a positive correlation exists.
(4) A significant positive correlation exists between industry characteristics and short-term debt ratio. Property developers owing to its sufficient planning and R&D capability can use excellent construction products as collateral for short-term financing to acquire necessary funds.
(5) High stock dividend policy and high operating risk jeopardize the confidence of creditors in investing funds in industry. Therefore, a negative correlation exists between stock dividend policy and operating risk in terms of total debt ratio and short-term debt ratio.

In an economic contraction, the profitability of the property development industry generally suffers. If the property developer adopts a high dividend policy during this period, investors or short-term lenders may think consider this high dividend policy is a tactic for appeasing shareholders or a scalping tactic. It is not the real phenomenon that expresses the future value of the firm. Thus the property developer should pay particular attention to the phenomenon of high dividend policy signaling a crisis of confidence to investors. Therefore, the Taiwanese property industry must overcome the dilemma of economic contraction through product differentiation in marketing and an innovative operating strategy for developing new business opportunities. Additionally, the long-term debt ratio of the property developer is affected by the financing policy that relies on non-debt tax shield and fixed assets. Thus the tax structure laws and the bankable assets policy must be reformed to gain long-term financing.

To summarize, if the Taiwanese property developer wants to resolve the problem of insufficient financing during periods of economic contraction, it could consider reinforcing planning and R&D relating to product characteristics; additionally, it could consider minimizing stock dividends and operating risk to increase short-term financing and reinforce investor confidence. Also the property developer may retrofit tax structure and bankable assets to gain access to long-term financing.

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## Appendix A. Factor analysis eigenvalue and variance

| Component | Initial eigenvalues | | | Extraction sums of squared loading | | | Rotation sums of squared loading | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Variance (%) | Cumulative (%) | Total | Variance (%) | Cumulative (%) | Total | Variance (%) | Cumulative (%) |
| $X_1$ | 5.188 | 32.419 | 32.419 | 5.188 | 32.419 | 32.419 | 3.645 | 22.778 | 22.778 |
| $X_2$ | 2.714 | 16.955 | 49.374 | 2.714 | 16.955 | 49.374 | 3.137 | 19.596 | 42.374 |
| $X_3$ | 2.027 | 12.664 | 62.038 | 2.027 | 12.664 | 62.038 | 2.622 | 16.381 | 58.755 |
| $X_4$ | 1.442 | 9.015 | 71.053 | 1.442 | 9.015 | 71.053 | 1.911 | 11.930 | 70.685 |
| $X_5$ | 1.305 | 8.141 | 79.194 | 1.305 | 8.141 | 79.194 | 1.360 | 8.509 | 79.194 |
| $X_6$ | 0.937 | 5.850 | 85.044 | | | | | | |
| $X_7$ | 0.809 | 5.050 | 90.094 | | | | | | |
| $X_8$ | 0.589 | 3.684 | 93.778 | | | | | | |
| $X_9$ | 0.440 | 2.752 | 96.530 | | | | | | |
| $X_{10}$ | 0.229 | 1.422 | 97.952 | | | | | | |
| $X_{11}$ | 0.169 | 1.056 | 99.008 | | | | | | |
| $X_{12}$ | 0.083 | 0.524 | 99.532 | | | | | | |
| $X_{13}$ | 0.053 | 0.329 | 99.861 | | | | | | |
| $X_{14}$ | 0.018 | 0.110 | 99.971 | | | | | | |
| $X_{15}$ | 0.003 | 0.016 | 99.987 | | | | | | |
| $X_{16}$ | 0.002 | 0.013 | 100.000 | | | | | | |

Note: Extraction method: principal component analysis.

**Appendix B. Factor analysis rotation loading matrix and correlations**

| Code | Rotated factor loading matrix | | | | |
|---|---|---|---|---|---|
| | Category 1 | Category 2 | Category 3 | Category 4 | Category 5 |
| $X_{13}$ | -0.954 | -0.109 | 0.010 | -0.126 | 0.024 |
| $X_3$ | 0.920 | 0.132 | -0.033 | 0.071 | -0.012 |
| $X_9$ | -0.811 | 0.072 | -0.170 | -0.133 | 0.029 |
| $X_{14}$ | -0.686 | -0.168 | -0.446 | 0.111 | 0.128 |
| $X_{11}$ | 0.570 | 0.019 | 0.416 | -0.322 | 0.181 |
| $X_6$ | 0.041 | -0.928 | 0.037 | 0.016 | -0.109 |
| $X_4$ | 0.265 | 0.833 | 0.304 | 0.215 | -0.063 |
| $X_5$ | 0.304 | 0.809 | 0.380 | 0.120 | -0.057 |
| $X_2$ | 0.240 | -0.608 | -0.188 | 0.210 | 0.493 |
| $X_{16}$ | 0.131 | 0.200 | 0.933 | 0.158 | 0.005 |
| $X_{15}$ | 0.107 | 0.182 | 0.920 | 0.240 | -0.099 |
| $X_{10}$ | 0.193 | 0.113 | 0.235 | 0.759 | 0.063 |
| $X_7$ | 0.113 | -0.303 | 0.400 | 0.745 | 0.169 |
| $X_1$ | 0.164 | -0.303 | 0.118 | -0.639 | 0.277 |
| $X_{12}$ | -0.282 | -0.151 | 0.005 | -0.129 | 0.738 |
| $X_8$ | 0.178 | 0.452 | -0.055 | 0.114 | 0.621 |

Note: 1. The reading of 0.5 and higher represents a high correlation.
2. Extraction method: principal component method.
3. Rotation method: varimax rotation method with kaiser normalization.

**Appendix C-1. Normal test of debt ratios**

| Debt ratios | Kolmogorov-smirnov | | |
|---|---|---|---|
| | Statistic | df | Sig |
| Total debt ratio | 0.110 | 25 | 0.200* |
| Short-term debt ratio | 0.086 | 25 | 0.200* |
| Long-term debt ratio | 0.124 | 25 | 0.200* |

Note: * represents a lower bound of the true significance.

The limit probability of standard value in normal test is 0.2. When probability value < 0.2, indicate the test result refuse to the original assume. This mean the variable not fit the normal distribution.

The analysis result shows that three debt ratio all present normal distribution from Table Appendix C-1.

**Appendix C-2. Variance independence test**

| Item | Tolerance | VIF |
|---|---|---|
| Category 1 | 1.000 | 1.000 |
| Category 2 | 1.000 | 1.000 |
| Category 3 | 1.000 | 1.000 |
| Category 4 | 1.000 | 1.000 |
| Category 5 | 1.000 | 1.000 |

Highly multiple collinear will expand the regression standard deviation of forecast variable value. In order to avoid the collinear phenomenon, this study would employ component method to eliminate correlate between categories before regression analysis.

Tolerance is a reciprocal of VIF, so tolerate between 0 and 1. The variable collinear problem will more serious if tolerance approach 0.

Tolerances that analyze in this research are all 1.0. It will show the variable collinear problem is not existence.

**Appendix D. Multiple regression analysis of debt ratios**

| Bebt ratio | Independent variables | Estimated value of parameters | Value T | Value P | Relation with capital structure |
|---|---|---|---|---|---|
| Total debt ratio | Tangent | 58.131 | 26.219 | 0.000 | |
| | Category 3 ($F_3$) | -4.662 | -2.060 | 0.052 | Negative correlation* |
| | Category 4 ($F_4$) | -3.897 | -1.722 | 0.099 | Negative correlation* |
| | Value F | | 3.605 | | |
| | Value P | | 0.044 | | |
| | Regression coefficient value $R^2$ | | 0.248 | | |
| | Adjusted coefficient value Adj $R^2$ | | 0.178 | | |
| Short-term debt ratio | Tangent | 51.891 | 29.195 | 0.000 | |
| | Category 1 ($F_1$) | 3.130 | 1.726 | 0.099 | Positive correlation* |
| | Category 3 ($F_3$) | -4.321 | -2.383 | 0.028 | Negative correlation** |
| | Category 4 ($F_4$) | -3.625 | -1.999 | 0.059 | Negative correlation* |
| | Value F | | 4.217 | | |
| | Value P | | 0.019 | | |
| | Regression coefficient value $R^2$ | | 0.376 | | |
| | Adjusted coefficient value Adj $R^2$ | | 0.287 | | |
| Long-term debt ratio | Tangent | 5.635 | 8.360 | 0.000 | |
| | Category 5 ($F_5$) | 1.968 | 2.862 | 0.009 | Positive correlation** |
| | Value F | | 8.191 | | |
| | Value P | | 0.009 | | |
| | Regression coefficient value $R^2$ | | 0.263 | | |
| | Adjusted coefficient value Adj $R^2$ | | 0.231 | | |

Note: 1. * represents that the factor at $\alpha = 0.1$ with a significant level; ** represents that the factor at $\alpha = 0.05$ with a significant level.

2. Value T: examine if there is a significant correlation between the dependent variable Y and independent variable X, it is also known as “marginal test”.
3. Value F: examine if there is a significant correlation between the dependent variable Y and independent variable X, it is also known as “total test”.
4. Value P: value P < $\alpha$, it means that there is a significant correlation between the independent variable and dependent variable.