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Examining the Effects of Capital Structure on Cumulative Abnormal Return in the Ceramic and Tile Industry

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ABSTRACT

This study investigated the impact of capital structure on cumulative abnormal return (CAR) in the ceramic and tile industry. The purpose of this study was to answer the question of whether capital structure affects CAR or not. This is an applied research study in terms of aim and descriptive-survey in terms of method. The statistical population consisted of ceramic and tile industries listed on the Tehran Stock Exchange (TSE). Accounting information required was extracted from the financial statements of companies listed on the TSE. Eight companies were selected from the selected industries as a sample from 2001 to 2011. This study employed the multivariate regression method to test the research hypothesis. Besides, the panel data model was utilized, whose significance was determined using F and t statistics. Model autocorrelation test was also performed using the Durbin-Watson test. The results indicated that leverage had a significant positive effect on CAR in ceramic and tile industries.

Keywords: *Capital Structure, CAR, Leverage, Ceramic and Tile Industry*

INTRODUCTION

Capital structure information is important and valuable not only for a specific user but also for a country's entire economy. To achieve their desired goals, company managers can transform their capital structure. An improper capital structure has a devastating effect on all areas of a company's activity, leading to several issues, such as inefficient product marketing, inefficiency in and inability to employ labor effectively (Aghaei et al., 2009).

Both financing and investment decisions of companies are made prophetically. Regarding financing decisions, the company exploits the currently available funds to meet its obligations to suppliers of financial sources in the future. On the other hand, in terms of investment decisions, the company ignores some current benefits in the hope of gaining more in the future (Namazi and Shirzadeh, 2005).

Although most experimental research has been carried out on the capital structure model in the capital markets of the United States and several other developed countries, such as the United Kingdom and Japan, the capital structure also holds a special place in the market economy of developing countries. Unfortunately, the capital structure remains ambiguous in the economic systems of developing countries for two reasons. First, developing economies attach little importance to the role of economic entities in the process of economic development. Second, for the past two decades or so, economic entities in most underdeveloped countries have faced fundamental constraints in choosing the funding sources they need. These include the economic governance of the national state and the deprivation of non-governmental economic entities of the opportunity to compete, lack of market development and restrictions on the provision of

financial resources. However, research on the optimal capital structure is ongoing. Each research from a specific angle helps companies examine the factors affecting their capital structure to select a combination of financing sources with the highest ROE and, at the same time, the minimum capital cost, under the existing circumstances.

In examining the capital structure of companies, the combination of different financial sources used by companies in financing their required activities and investments is explained. It can be said that the purpose of determining the capital structure is to determine the composition of financial sources in each company to maximize the wealth of its shareholders. To make a decision, users of financial statements need a measure indicating the company's success in using the resources under its control.

On the other hand, numerous studies conducted in Iran and other countries have confirmed the correlation and significant relationship between the components of companies' financial statements and reports and stock returns. One of the most important institutional performance evaluation metrics at the moment is the stock rate of return (RoR). This metric alone provides investors with the information they need and is utilized to evaluate performance. The reduced value of this criterion is an alarm for the company, indicating improper performance. It contains a lot of information because performance appraisal based on market value provides investors with the information they need (Etemadi et al., 2009).

Return is a driving force and reward for investors in the investment process. Total return refers to all gains from a stock over a specific period, typically one year. In light of the foregoing, this study aims to investigate the impact of capital structure on CAR in the ceramic and tile industry.

Theoretical Foundations

Capital structure

Nowadays, due to the wide quality level of activities and the wide development of economic affairs, corporate financing decisions are among the complex issues raised to achieve maximum return and utility under the best conditions. Therefore, since they are primarily responsible for making such decisions, finance directors seek to achieve relationships between characteristic factors in companies. These issues include capital structure decisions (Aoun & Hwang, 2008).

Modigliani and Miller (1963) studied the capital structure, where the government's assumption of non-application of income tax was adjusted. The study hypothesized that government-approved income tax laws apply to companies. They argued that because debt interest expense is deducted from taxable income, and thus tax payments are reduced in corporate income tax calculation, the higher the amount of debt in the capital structure, the lower corporate tax liability and cash flow after taxes (CFAT), and the company's market value increases. This leads to conditions that require 100% of the required funds to be provided through borrowing. Also, according to government and tax laws, interest payments for enforcing borrowing policies are considered as tax deductive expenses. Therefore, applying borrowing policies for financing causes leverage brings several benefits to the company in the form of tax exemption. They also argued that since the cost of interest and preferential payments are deducted as a deductible expense from corporate taxable income in calculating corporate income tax, the more debt is used in the capital structure, the lower the corporate tax liability and the corporate resources desired by owners and creditors are further acquired. On the other hand, if a company refuses

to pay the cost of interest on its debts, funds and CFAT will increase, and firm value in the capital market will increase. This motivates capital market participants to use borrowing policies more and more to meet their financial needs (Frydenberg, 2004).

Abnormal Stock Return

The abnormal return of a stock refers to the difference between its actual return and its expected return. On the other hand, the expected return of a stock is calculated, usually using different models. Financial and investment researchers have suggested specific models for specific situations. Most research on overreaction or underreaction has used two models: market adjusted return and market models. The present study has used the market adjusted return model. This model assumes that all bonds (securities) have the same expected return, and the return of each bond (security) is similar to the market return.

1. Models based on abnormal stock return

This model attempts to test the relationship between accounting information and stock return variables, which has its roots in experimental accounting research. In such models, abnormal stock return is usually shown as a function of accounting variables. Information content of a variable can be determined by testing the coefficients and importance of various variables. Such models attach great importance to calculating abnormal stock returns, which relies above all on an active, dynamic and efficient market, where companies' stock trades are continuous and responsive to information.

2. Using a market model with independent α and β for each company

Modern Portfolio Theory (MPT) and Cumulative Average Residuals (CARs) are the most commonly used models for determining short-term returns. In this model, a company's abnormal stock return is the difference between its actual return and its expected return, and the average cumulative return is the sum of average returns over the research period. The well-known market model is the most common way to determine the abnormal stock return of companies, where there is a regression relationship between corporate stock return and return on market securities (portfolio). The expected future return on stocks of a company is estimated in proportion to the market return by calculating the regression coefficients α and β based on historical information. A company's returns are calculated using the Capital Assets Pricing Model (CAPM). This model has two basic parameters, namely risk and return, and has high predictive power. This model is used in a highly efficient capital market, where investors are fully aware, financial transaction costs are zero, there are small restrictions on investments, no investment alone is so large to affect the stock price, all investors have the same expectations of risk and return on the market, and investors can lend or borrow at a risk-free interest rate. It should be noted that this model is not practically applicable due to an inefficient market, the selection of the problem index, the appropriate time horizon to guarantee the beta, and the fact that the real market portfolio composition is unknown.

The market model is calculated as follows:

$$R_{i,t} = \alpha_1 + \beta_1 \ R_{mt} + e_{i,t}$$

$$AR_{i\,t} = R_{i\,t} - (\alpha_1 + \beta\, R_{m\,t})$$

3. Using a market model with sample α and β

Although the usual method known in the previous paragraph is the most well-known method of measuring abnormal returns, another method can be used, which is to use the collected monthly data of companies to find more accurate α and β for sample companies and develop an expected return model for each of the sample companies. This model is used to calculate the monthly expected return for each company. An abnormal return of a company is the monthly expected return minus the actual return of that company. Also, a company's CAR in a given fiscal year is the abnormal monthly returns plus the company's abnormal annual returns.

4. The difference between firm return and market return

One way to determine abnormal returns is to differentiate between firm and market returns. In this method, it becomes simpler by losing α and making β equal to 1. This model, used in some stock return research, is used to compare the difference between market return and the company's actual return (abnormal return of the company) (Ziobrowski et al., 2004).

$AR = R_{i\,t} - R_{m\,t}$

Herein, abnormal return is determined using the firm return and market return difference model.

Research Background

In their study entitled "Leverage and Common Risk Factors in Stock Returns," Muradoglu & Sivaprasad (2008) examined the relationship between leverage and risk factors in stock returns. They introduced leverage as one of the important risk factors, which is ignored in the capital asset pricing model (CAPM). Their work is to shift the focus from capital asset pricing to portfolio leverage formation. They also divided stock returns into two groups, high and low, according to leverage. They argued that leverage is one of the most important factors in the stock market explaining stock returns. Their results showed that portfolio leverage could explain stock return variables better than CAPM.

In another study, Capital Structure and Abnormal Returns, Muradoglu & Sivaprasad (2012) examined the relationship between capital structure and CAR on equity and whether the capital structure is a relevant value for investors. To this end, they attempted to integrate the Modigliani and Miller theoretical framework by adopting an investment approach by estimating abnormal returns on portfolio leverage in time series for different risk groups. They divided all the industries on the stock exchange, except banks, insurance companies, financial institutions, etc., into different risk groups. They also examined the impact of capital structure on CAR by measuring CAR, firm size, leverage, interest rate, B/M, and P/E. They concluded that return on equity (ROE) increased with leverage for some risk groups and decreased for others using regression and correlation analysis. Also, CAR was added for most risk groups when the average leverage increased. This study showed a significant inverse relationship between leverage ratio and CAR. Also, P/E and B/M ratios and size, beta and interest rates have significant negative coefficients.

In their study entitled "Investigate the Effect of Financial Leverage on the Investments of Companies Listed on the Tehran Stock Exchange," Norvesh and Yazdani (2010) concluded that the relationship between leverage and investment in companies with lower growth opportunities is stronger than in companies with more growth opportunities using regression and correlation analysis. Also, a significant positive relationship was observed between leverage, dividend policy,

and profitability with firm value, while interest payment was shown to have an adverse effect on firm value.

In their study "Investigating the Effect of Financing Methods on Future Stock Returns," Kordestani and Najafi Omran (2010) examined the impact of different financing methods and how the proceeds from these methods are used on future stock returns. The data required for this study were collected from 65 companies admitted to the TSE during the period 1999-2006. The tests were performed using the panel and cross-sectional data. The findings indicated a significant correlation between the positive net forecast of change in total financing, the net change in external financing, and the change in net operating assets (NOA) provided through internal sources of finance with stock CAR. In addition, the relationship between the ratio of internal funds to external funds and stock CAR is stronger in high-growth companies than in low-growth companies. Also, cross-sectional data indicated a significant positive relationship between net change in internal financing and change in NOA provided through internal sources of finance with stock CAR.

In his research entitled "Identifying the Factors Affecting the Abnormal Return in the Initial Public Offering of Companies Newly Listed on the Tehran Stock Exchange," Garkaz (2011) investigated the possible factors affecting the abnormal return of new companies entering the TSE in the period 1999-2007. For this purpose, 73 qualified companies were selected by elimination method and surveyed for 12- and 24-month periods after being listed on the TSE. Among the six independent variables, namely firm size, type of ownership, earnings per share (EPS) forecast error, ROE, net profit margin, and debt-to-equity (D/E) ratio, debt-to-equity (D/E) ratio had a significant direct relationship with the abnormal return, while ROE had a significant inverse relationship with it. However, multivariate regression analysis generally showed that all six independent variables could simultaneously justify 13.7% of the abnormal return.

Research Hypothesis

Leverage has a significant effect on CAR in ceramic and tile industries.

Research Method

It is an applied research study in purpose and descriptive survey in method. The statistical population consists of ceramic and tile industries listed on the Tehran Stock Exchange (TSE). The required accounting information was extracted from the financial statements of companies listed on the TSE due to the greater investors' and financial analysts' attention to the stock market, the availability of information, and the transparency of their accounting information. Stock market requirements for timely dissemination of accounting information have provided the conditions for creating a more appropriate information environment for research (Bahramfar and Shams Alam, 2004). Therefore, eight companies from selected industries were selected in the research period, i.e., 2001-2011. During this period, income statements and balance sheets of companies listed on the TSE were collected. Also, stock price data was collected to calculate the abnormal return of companies.

The required data were collected from audited financial statements of TSE-listed companies, databases, Rahavard Novin software, and official company websites using document mining.

The research hypothesis was tested using the following multivariate regression model:

$$CAAR_{i,t} = \alpha + b_1 LEVERAGE_{i,t} + b_2 BETA_{i,t} + b_3 SIZE_{i,t} + b_4 {}^{P}/_{E_{i,t}} + b_5 ROA_{i,t} + e_{i,t}$$

Before model fitting, to test the research hypothesis, one should determine the type of data (panel or pooled) and test the classical assumptions of the regression model.

$CAAR_{i,t}$: Cumulative abnormal return i in year t

a: A constant (fixed value)

$LEVERAGE_{i,t}$: Leverage of stock i in year t

$Beta_{i,t}$: Systematic risk of stock i in year t

$Size_{i,t}$: Size of firm i in year t

$P/E_{i,t}$: Price-to-earnings ratio of each stock i in year t

$ROA_{i,t}$: Return on asset i in year t

e_t: Period error

Independent Variable

Leverage

Herein, leverage is an independent variable as well as a measure of capital structure. Leverage is defined as the use of fixed-cost financing methods (such as debts and preferred stocks). It is used in the hope of increasing common stock returns. Leverage is useful when a company provides ordinary shareholders with funds acquired through fixed-cost liabilities or fixed-dividend preferred stock to do something that returns a fixed cost of funds. Utilizing leverage will be detrimental if the company fails to achieve a return equal to fixed-cost funds by implementing predicted plans. Leverage usefulness is measured based on its impact on earnings per share of ordinary shareholders (Namazi and Shirzadeh, 2005). Leverage is measured using the following ratio:

Leverage = (Total assets) / (Total debt) × 100

Control Variables

The control variables are systematic risk, firm size, P/E ratio, and ROA.

Systematic Risk

Risk refers to a situation in which an adverse event is likely to occur or is expected to occur in the future. Systematic risk arises from general market developments over the economy (or general market movements) and is not specific to a particular company. The beta index measures a company's coordinated movement with general market movement or systematic risk. Systematic risk is non-diversifiable. Indeed, systematic risk is the minimum inherent stock [crash] risk, sometimes called fundamental risk in the investment literature. It is an irreducible risk for all bond portfolios, which cannot be eliminated by financial asset diversification. The beta index is calculated using the monthly stock returns of the sample companies (R_i) and the monthly return on the market portfolio (R_m), which are calculated using Excel spreadsheet software using the following formula (Dian, 2012):

$$\beta = \frac{COV(R_i, R_m)}{\delta_m^2}$$

Firm Size

Firm size is measured using four criteria: total sales, total sales logarithm, total average, and total assets, with total sales and total assets as the most common. That is, the larger the total sales and total assets of a company, the larger the size of that company, and vice versa. However, the total book value of assets can be a faculty as a measure of firm size in countries with high inflation rates (Iatridis, 2008). This research used the total sales logarithm criterion to measure the firm size.

Log $(SALE_{it}) = SIZE_{it}$

$SIZE_{it}$: Size of firm i in period t

$SALE_{it}$: Sale of i in period t

Price-To-Earnings Ratio (P/E ratio)

The price-to-earnings ratio (P/E ratio) is the ratio for valuing a company that measures its current share price relative to its earnings per share (EPS).

Return on Assets (ROA)

One measure of corporate management's ability to beat the market in terms of available resources is the return on assets (ROA). Management is expected to utilize available assets to maximize returns. Cost of interest and taxes do not affect how assets are used. Therefore, the profit used in this ratio is operating income (profit). This ratio indicates that the management of several rials has earned a profit for each rial of assets used (Bahramfar and Shams Alam, 2004). The return on assets ratio (ROA) is found by dividing net income by total assets. In general, it measures the return on available assets in profitability and can be thought of as the return on capital employed (ROCE) (Aghaei et al., 2009).

ROA = (Total assets) / (After-tax profit or loss)

It should be noted that returns are calculated in monthly periods.

Dependent Variable

Herein, the cumulative abnormal rate ($CAAR_{i,t}$) is the dependent variable, which is calculated as follows:

$CAAR_{i,t} = \sum AR_{i,t}$

The abnormal return of any stock is the difference between the actual return and the market return of that stock, which is calculated as follows:

$AR_{i,t} = R_{i,t} - R_m$

where $AR_{i,t}$, $R_{i,t}$, and R_m are abnormal, actual, and market returns, respectively.

The actual return of each common stock is determined based on the following:

a) Fluctuations in share prices during the investment period
b) Cash earnings per share (cash EPS)
c) stock rights (preemption rights)
d) Stock dividends or bonus shares

where:

$R_{i,t}$: Return on stock i in year t

p_1: Stock price at the end of the year t

p_0: Stock price at the beginning of the year t

α: Percentage increase in capital

D: Cash earnings per share (cash EPS)

R_m denotes the market return. Different alternatives are usually used to calculate the expected return per share, which is calculated as follows:

$$R_m = \frac{I_1 + I_0}{I_0}$$

Where, I_0 is the total market price index of all common stocks declared by TSE at the beginning of the year, and I_1 is the year-end market price index.

Findings

Table 1 lists the results of the F-Limer test. As can be seen, since p-value = 0 (<0.05), the panel data method is adopted. Also, since the p-value of the Hausman test is 0 (<0.05), the fixed-effects method is adopted.

Table 1: Results of F-Limer and Hausman tests

Model	F-Limer test			Hausman test		
	F-Limer statistic	Probability	Result	χ2 statistic	Probability	Result
1-4	12.63	0.00	Panel	41.91	0.00	Fixed-effects

Table 2: Durbin-Watson statistic

Durbin-Watson statistic	No-autocorrelation range
1.63	2.5 <*DW*< 1.5

Since the Durbin-Watson statistic is 1.63, the regression model is non-autocorrelated (if the Durbin-Watson statistic is around 2, there is no autocorrelation).

Table 3: Model homoscedasticity

Statistic value	*p-value*
F-statistic (1.06)	0.39

According to the table above, since the p-value of the White test is 0.39 with a significance level higher than 0.05 (p-value ≥ 0.05), H0 (homoscedasticity) is accepted, indicating the absence of the problem of heteroscedasticity of residuals. After ensuring that the classical assumptions are valid, the regression model is fitted to the data to test the research hypothesis.

Table 4: Results of data analysis to test the research hypothesis in the ceramic and tile industry

Variable	Factor	SD	t statistic	p-value
CAAR	2.16	21.0	5.35	0.00
Leverage	1.75	3.23	3.54	0.00
Beta	-0.09	0.44	-0.20	0.84
Size	1.72	3.91	1.06	0.13

P/E	0.34	0.17	3.03	0.01
ROA	0.008	0.05	0.15	0.88
R-squared		0.75	F statistic	14.75
Adjusted R-squared		0.70	Prob(F-statistic)	0.00

Since the f-statistic p-value is 0 (p-value ≤ 0.05), H0 is rejected, indicating that not all regression coefficients are zero simultaneously. Therefore, there is a significant concurrency relationship between the independent and dependent variables.

In research hypothesis testing, the effect of leverage on CAR in the ceramic and tile industries accepted in the TSE is measured. According to Table 4, since the p-value of the variable "Leverage" is 0 (p-value ≤ 0.05), H0 (lack of a relationship between leverage and CAR in the ceramic and tile industry) is rejected. Therefore, leverage significantly affects CAR in the ceramic and tile industry. Also, since the leverage ratio is positive (1.75), it positively affects CAR. Therefore, the research hypothesis is accepted.

Also, since the significant levels of systematic risk, firm size, and ROA are higher than 0.05, H0 is accepted. Therefore, with a 95% confidence interval, it can be said that the above variables do not have a significant effect on CAR in the ceramic and tile industry, while the significance level of the P/E ratio variable is less than 0.05. Therefore, H0 is rejected. With a 95% confidence interval, it can be said that the P/E ratio variable has a significant effect on CAR in the ceramic and tile industry.

The model's adjusted R^2 is 0.70, indicating that 70% of the changes in the dependent variable are explained by (or related to) the independent variable.

Conclusions

The company's financial structure is a combination of debts and equity, by which the assets of the company are financed. Different theories have been put forward about the capital structure and the factors affecting it. It seems necessary to examine and identify the factors affecting the financial structure and the combination of sources of corporate finance in any way. This study attempted to determine the effect of capital structure on CAR using fixed-effects multivariate regression models by F-Limer and Hausman tests.

Testing the research hypothesis in ceramic and tile industries showed that leverage had a significant positive effect on CAR. With an increase in leverage, abnormal returns are expected to increase. In this regard, Muradoglu and Sivaprasad (2012) examined the impact of capital structure on CAR in nine industries: oil and gas, raw materials, industry, consumer goods, health, telecommunications, utility, and technology. They considered each of the above industries as a risk group. They concluded that ROE increased with leverage for some risk groups and decreased for others. In industries such as utility, also addressed by MM, companies had abnormal returns, which increased with leverage. In most other industries, companies experienced abnormal returns, which decreased with leverage.

In their study entitled "Investigating the effect of capital structure on the profitability of companies listed on the Tehran Stock Exchange", Arbabian and Grayly (2009) showed a positive relationship between leverage and profitability. Kordestani and Najafi Omran (2010) investigated the effect of financing methods on future stock returns. They concluded a significant

positive relationship between net change in internal financing and change in NOA provided through internal financing sources with stock CAR.

Considering the results obtained in this study, it is suggested to consider leverage in different industries at the time of portfolio formation because it affects CAR according to the type of industry, as shown in this study. It's not so challenging to address the leverage and calculate its variables. Therefore, the effectiveness of leverage, on the one hand, and its simple calculation, on the other hand, allows both professional and non-professional investors to use this factor as easily as possible. Therefore, it is suggested to use this factor in Iran's capital market.

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