

# Profit Margin And Capital Structure: An Empirical Relationship

Nikolaos P. Eriotis, (E-mail: Nikolaos.Eriotis@aueb.gr), University of Athens

Zoe Frangouli, (E-mail: ventura@aueb.gr), Athens University of Economics and Business

Zoe Ventoura-Neokosmides, (E-mail: ventura@aueb.gr), Athens University of Economics and Business

## Abstract

*This study constitutes an attempt to investigate the relationship between debt-to equity ratio and firm's profitability, taking into consideration the level of firms' investment and the degree of market power. The study uses panel data for various industries, covering the period 1995-96. The main conclusions of our study are: a) firms which prefer to finance their investment activities through self-finance are more profitable than firms which finance investment through borrowed capital; b) firms prefer competing with each other than cooperating; c) firms use their investment in fixed assets as a strategic variable to affect profitability.*

## 1. Introduction

The structure-conduct-performance paradigm has played a very important role in studying the determinants of firms' performance (Bain, 1956). Most empirical studies on that area concentrated on the explanation of performance across industries by regressing profitability on structural and conduct variables at the industry level (Collins and Preston, 1969). Industry level data were used mainly because they are easily available. As the definition of industry is not satisfactory, there has been a shift of emphasis from industry to firm for the analysis of the structure-performance relationship (Shepherd, 1972). Nowadays, the structure-conduct-performance relationship is tested by the panel data method because its results take into consideration structural change as well as cyclical fluctuations (Domowitz et. al., 1986).

Few studies have used financial indices as independent variables (Hall and Weiss 1967, Gale 1972, Hurdle 1974, Oustapassidis 1998), in order to explain differences in firms' profit margins. Most of the studies have concentrated on issues such as R&D policies, advertising, economies of scale, e.t.c., to explain differences in price-cost margins (Clarke 1984, Connolly et. al 1984, Conyon et. al. 1991, Frangouli 1999, Gisser 1991, Martin 1979, Pagoulatos et. al. 1981). Financial factors may be considered as strategic conduct variables because they affect the cost of capital and thus the firm's performance. To measure dimensions of capital structure and uncertainty the relevant studies have used the debt-to-equity ratio, equity capital to total assets ratio, own capital to fixed assets ratio or fixed capital to total capital ratio. The relationship of financial factors and firms' profitability, is not always clear-cut. This relationship has been proved either positive or negative (Hall and Weiss 1967, Gale 1972, Hurdle 1974, Shepherd 1994, Oustapassidis 1998.)

The present study tries to investigate the relationship between debt-to-equity ratio and firm's profitability by taking into consideration the level of firm's investment and the degree of market power. The use of borrowed capital increases the level of investment undertaken by the firm without causing any additional cost for firm's owners other than interest expenses. This increases the return of invested capital by owners. However, borrowed capital increases the risk for the firms as well as for owners, because borrowed capital creates fixed expenses (i.e. interest), thus a minimum profit level is necessary for financing the level of interest. The study uses panel data on firms from various industries (53 firms), and covers the period 1995-96.

*Readers with comments or questions are encouraged to contact the authors via email.*

## 2. Analytical Framework and Variables

The monopolist's degree of market power is,

$$\text{Equation 1} \quad (p - mc) / p = 1 / e$$

where, p is the price for the product, mc is the marginal cost and e is the price elasticity of demand. In the case of constant returns to scale, marginal cost is equal to average cost (ac) where,

$$\text{Equation 2} \quad ac = (wL + \lambda p^k K) / q$$

The term wL stands for labor cost, the term  $\lambda p^k K$  is the rental cost of capital,  $\lambda$  is the rental cost per drachma's worth, of capital assets and includes the normal rate of return on investment. The term  $p^k$  is the purchase price of capital and q is the level of output. From equation (1) and (2) the equation (3) is derived.

$$\text{Equation 3} \quad (p q - w L) / p q = 1 / e + \lambda p^k K / p q$$

By assuming a linear relationship between market concentration and market power, then we have a version of equation (3), (Hay and Morris 1991, Martin, 1994), which can be estimated with firm level data. The linear version has the following form:

$$\text{Equation 4} \quad PM_{it} = a_0 + a_1 CR_t + a_2 F_{it} + a_3 I_{it} + u_t$$

The term PM refers to firms' profit margin, the term CR is the four-firm concentration ratio and is an index of the market power. The term F refers to the debt-to-equity ratio and is a measure of the financial structure of the firm. The term I stands for the firms' investment level and controls for the effectiveness of capital. In this way the terms F and I are proxies for the term  $\lambda p^k K$ .

The data cover firms from various industries (i.e. capital goods industries and consumer goods industries). The term PM has been calculated as the profits to sales ratio and is a proxy for firm's profitability. The relevant data were obtained from balance sheets (published information). The four-firm concentration ratio has been calculated as the ratio of four-firm sales to total industry sales. The relevant concentration ratio refers to the industry that each particular firm is operating. The term F refers to debt-to-equity ratio. The relevant data were obtained from balance sheets (published data). The firms included in our sample have debt-to-equity ratios that range from low levels to very high levels, that is the sample is not biased as far as debt-to-equity ratio is concerned. The term I refers to investment level undertaken by each particular firm in the period covered by the study. The relevant data were obtained from the firms included in the sample. The level of investment undertaken refers to fixed assets.

The intertemporal variation of profits measures uncertainty, as owners and shareholders are not able to forecast profit rates. Therefore, if a higher debt-to-equity ratio shows greater uncertainty then, higher risk may lead to high profit margin. However, the use of borrowed capital may increase the level of investment that a firm is able to undertake, without any additional cost for the owners. At the same time it increases firms' and owners' risk due to interest expenses. Therefore, a minimum profit is required to cover interest expenses.

The sign of the coefficient  $a_2$  may not be expected a priori. Some empirical studies found a positive relationship whereas other studies found a negative one. A positive sign means an effective use of borrowed capital. A negative sign means either that the cost of borrowed capital is higher than its benefit from the investment, or that firms financed by retained profits are more profitable than those financed by borrowed capital.

The sign of the coefficient  $a_1$  is expected either positive or negative. A positive sign means that firms prefer to cooperate whereas a negative sign means that firms prefer to compete with each other. The sign of the coefficient  $a_3$  is expected to be positive. Firms undertake various investment programs. Their investment programs may be classified in three main categories: i.e investment in fixed assets, investment in R&D and market investment. Industrial organization theory considers all these categories of investment as firms' strategic variables, that is firms undertake various investment plans in order to confront actual and mainly potential competition. In this way the impact of investment on firms' monopoly power is expected to be positive.

We have estimated equation (4) by the panel data method to obtain the estimates of the parameters of the total model (pooled model), the fixed effect model and the random effect model. The total model assumes a single

slope coefficient and a single intercept for all cross-section units, which means that the intercepts and the slope do not vary over cross-section units. The fixed effect model assumes a common slope but each cross-section unit has its own intercept, which implies that the intercepts vary over cross-section units. The random effect model (variance components) assumes a common slope, but the intercepts ( $a_i$ ) are drawn from a common distribution with mean  $\alpha$  and variance  $\sigma_a^2$ .

In the random effect model, the intercept terms are treated as random rather than fixed and they are independent both of the residuals and mutually. Since the variance components estimates (random effect) are inconsistent when the individual intercepts are correlated with the independent variables, a Hausman test statistic is computed to test the correlation. The panel data procedure computes also the F-test for the hypothesis that the slope coefficients are equal.

**3. Results**

The following table presents the estimation results. We have reported the results for all models (total model, fixed effect model and the random effect model). We are aware of the fact that we have few time series data. This restricts considerably the dynamic character of the model.

**Table 1**

	<u>Total model</u>	<u>Fixed effect model</u>	<u>Random effect model</u>
$a_0$	38.4523 (5.9526)	-----	39.1845 (5.2521)
$a_1$	-0.31994 (-2.6737)	-1.04272 (1.6694)	-0.3316 (-2.3965)
$a_2$	-0.28265 (-4.5350)	-0.42262 (1.4700)	-0.2862 (-4.0039)
$a_3$	0.02880 (2.0097)	0.02939 (1.6825)	0.02852 (1.7186)
$R^2$	0.21	0.75	0.21
n	106	106	106
SER	12.78	10.20	12.67

*SER = standard error of the regression  
n = number of observations  
t values in parentheses*

The reported results indicate a negative and statistically significant relationship between concentration ratio and profit margin. The negative sign suggests that firms prefer to compete rather than to cooperate with each other. Nevertheless, concentration proved an important element for firms' profitability. There is also a negative and statistically significant relationship between debt-to-equity ratio and profit margin. The negative sign indicates that either the cost of borrowed capital is higher than its benefit from investment, or that firms financed by retained profits are more profitable than those financed by borrowed capital. However if we consider the signs of both  $a_2$  and  $a_3$  we suggest that firms preferring self-finance are more profitable than firms, which prefer borrowed capital. The negative relationship between the financial variable and the profit margin is in line with the results of Baker (1973), Hurdle (1974) and Oustapassidis (1998). The relationship between investment and profit margin is positive and statistically significant. This means that there is an effective use of capital.

**4. Conclusions**

Financial structure is a very important element for firms' profitability. Firms may use their debt-to-equity ratio to affect profitability. Some firms choose a high debt-to-equity ratio, whereas others prefer to choose a lower one. The successful selection and use of the debt-to-equity ratio is one of the key elements of the firms' financial strategy. Most of the studies undertaken to examine the impact of financial indices on firms' profitability have used industry level data. Studies, which have used various financial indices to capture the financial structure, found either a positive or a negative impact on firms' profitability. We have used firm level data from various industries and we have found a strong negative impact of the debt-to-equity ratio on firms' profitability. Generally, this means that

either the cost of borrowed capital is higher than the benefit from investment or that firms which prefer to finance their investment activities through self-finance are more profitable than firms which finance investment by borrowed capital. In our study we may say that the firms that finance their investment activities by retained profits, are more profitable than those that finance their activities through borrowed capital. We also found a negative and statistically significant impact of concentration on firms' profitability, which means that although firms take into consideration their interdependence they prefer to compete with each other than to cooperate.

### 5. Suggestions for Future Research

The research could be continued with a sample continuing small and big industrial companies in order to identify if exist a difference in the use of the financial variable according to the size of the companies. 📖

### 6. References

1. Bain, J.S., *Barriers to New Competition*, Cambridge, M.A: Harvard University Press, 1956.
2. Baker, S.A., 'Risk, Leverage and Profitability', *Review of Economics and Statistics*, Vol.55, pp. 503-07,1973.
3. Clarke, R., "Profit Margins and Market Concentration in the U.K. Manufacturing Industry", *Applied Economics*, Vol.16, pp.567-71, 1984.
4. Collins, N. and Preston L., 'Price-Cost Margin and Industry Structure', *Review of Economics and Statistics*, Vol.51, pp.271-86, 1969.
5. Connolly, R.A., and Hirschey, M., "R&D, Market Structure and Performance", *Review of Economics and Statistics*, Vol.66, pp.678-81, 1984.
6. Conyon, M. and Machin, S., "The Determinants of Profit Margins in U.K. Manufacturing", *Journal of Industrial Economics*, Vol.39, pp.369-82, 1991.
7. Domowitz, I., Hubbart, G.R., and Peterson, B., 'Business Cycles and the Relationship Between Concentration and Price-Cost Margin', *Rural Journal of Economics*, Vol.17, pp.1-17, 1986.
8. Frangouli, Z., "Product Differentiation and Monopoly Power: An Empirical Relationship", *International Review of Economics and Business*, Vol. XLVI, No.1, pp. 125-130.
9. Gale, B., 'Market Share and the Rate of Return', *Review of Economics and Statistics*, Vol.54, pp.412-23, 1972.
10. Gisser, M., "Advertising, Concentration and Profitability in Manufacturing", *Economic Enquiry*, Vol.29, pp.148-65, 1991.
11. Hall. M. and Weiss, L.W., "Firm Size and Profitability", *Review of Economics and Statistics*, Vol.49, pp.319-31, 1967.
12. Hay, D. and Morris, D., *Industrial Economics and Organization, Theory and Evidence*, Oxford University Press, 1991.
13. Hurdle, G.L., "Leverage Risk, Market Structure and Profitability", *Review of Economics and Statistics*, Vol.56, pp. 478-85, 1974.
14. Martin, S., *Industrial Economics: Economic Analysis and Public Policy*, Prentice-Hall, 1994.
15. Martin, S., "Entry Barriers, Concentration and Profits", *Southern Economic Journal*, Vol.46, pp.471-88, 1979.
16. Oustapassidis, K., "Performance of Strategic Groups in the Greek Dairy Industry", *European Journal of Marketing*, Vol.32, pp.962-73, 1998.
17. Pagoulatos, E. and Sorenson, R., "A Simultaneous Equation Analysis of Advertising, Concentration and Profitability", *Southern Economic Journal*, Vol.47, pp. 728-41, 1981.
18. Shepherd, W.G., "The Elements of Market Structure", *Review of Economics and Statistics*, Vol.54, pp. 25-37, 1972.
19. Shepherd, W.G., *The Economics of Industrial Organization*, Prentice-Hall International, 1994.