Financial Indices And Profitability:
An Empirical Investigation.

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Abstract

This article deals with the impact of debt-to-equity ratio and investment on Greek manufacturing firms' profitability, the latter measured by return on equity. The estimation results obtained by the panel data procedure revealed a strong positive, though different, impact on firms' profitability.

Introduction

$\mathscr{T}$he structure-conduct performance paradigm has played a fundamental role in studying the determinant of performance across a wide range of industries (Bain 1956, Collins and Preston 1969). However, regressions of average industry profits on industry structure and conduct variables are less popular nowadays. There is a shift of emphasis to the panel data approach for their results take into consideration both structural changes and cyclical variations (I. Domowitz et al, 1986).

Empirical studies used several variables to approach the idea of performance identified by profit margin, the latter being the difference between the price of the product and its marginal cost. However, the shortage of data on marginal cost induced scholars to use several alternative approaches for profit margin such as: gross profits to sales ratio, net profits to sales ratio, sales to product cost ratio, return on equity and return on assets. The use of each one of those variables depends upon the type of analysis performed.

It has been argued that the rate of return is a better index of profitability when financial variables are taken into consideration as explanatory ones (Heffernam 1996, Vassiliou 1998). However, very few studies have used financial variables as independent ones. Financial variables measure the dimensions of capital structure and uncertainty. The relationship of financial variables and profitability is not clear-cut (Hall and Weiss 1967, Gale 1972, Hurdle 1974, Shephard 1994, Oustapassidis 1998, Vassiliou and Frangouli 2001).

Some studies found a positive impact of financial variables on profitability (Hall and Weiss 1967, Gale 1972, Oustapassidis 1999, Vassiliou and Frangouli 2001), whereas other studies found a negative impact (Baker 1973, Hundle 1974). Baker (1973) and Hundle (1974), found a negative impact of capital to total assets ratio on profitability. Oustapassidis (1998) used the theory of strategic groups and found a positive impact of leverage ratio on firms' profitability.

His study refers to the Greek dairy sector. Vassiliou and Frangouli used the panel data approach and found a positive impact of leverage ratio on firms' profitability in the case of the Greek baking sector. Hall and Weiss (1967) found a positive impact of capital to total assets ratio on firm's profitability.

The present study uses panel data of firms from various industries for the period 1995-1996 and investigates the impact of both debt-to-equity ratio and investment on firm's performance. We have taken into consideration these two impacts for the following reason: The use of borrowed capital may increase the level of investment without any additional cost for firm's owners. The rational investment of borrowed capital will increase

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firm's profitability. The study covers firms from various industries and approach firm's profitability by the return on equity ratio, which is considered to be the most appropriate profitability ratio for reasons already, stated.

Analytical Framework and Variables.

By far the most popular measure of firm's financial performance among investors is the return on equity ratio. This ratio equals net income divided by equity capital. It is a measure of the efficiency with which the firm employs owner's capital (Vassiliou 1998). Thus, this ratio measures the percentage return to owners on their investment in the firm. Return on equity is influenced by various financial indices, which measure the dimensions of capital structure and uncertainty. As financial variables may be considered the following: the ratio of borrowed capital to own capital (D/F), the ratio of equity capital to total assets (F/A). We may as well consider the ratio of own capital to fixed assets (F/AIN), the ratio of fixed assets to total assets (AIN/A) and the ratio of the value of the reserves formed through withholding profits to equity capital (S/F).

Own capital to fixed assets ratio (F/AIN) shows the firm's ability to cover long-term investment by own capital. The impact of this index on firm's profitability is expected to be positive. The positive impact presupposes that the cost of borrowing (i.e. interest rate) will be lower than the revenues due to sales.

If the ratio of fixed assets to total assets (AIV/A) shows a large proportion of fixed assets to circulating assets, we expect a negative impact on firm's profitability.

If the ratio shows a low proportion of fixed to circulating assets we expect a positive impact on firms profitability. This happens because the firm invests in circulating assets, which will increase its activity and therefore its profitability.

The ratio financial reserves formed through undistributed profits to equity capital (S/F) is a measure of self-financing. This index is expected to have a positive impact on profitability in the case of very high interest rates. However, it is expected to have a positive impact even in the case of low interest rates. By this we mean that the firm could borrow with low cost to improve its activities and to invest own capital in a different portfolio.

Debt to equity ratio varies according to the nature of the business and the volatility of cashflows. A comparison of the debt ratio for a given firm with those of similar firms gives a general indication of the creditworthiness and financial risk of the firm. The firm uses debt-to-equity ratio as a strategic variable. The size of debt-to-equity ratio can be low when financing or investment has been made through the use of accumulated past profits of through capital increase:

1. When debt-to equity ratio is low due to extensive self-financing of investment through past profits, the return on equity can be expected to be relatively high, other things being equal, since the firm does not impute a cost on the use of own financial reserves.

2. When debt-to-equity ratio is low due to financing of investment through capital increase, one of the following two can happen:

2a. When capital increase is high and the investment activity has a long gestation period (heavy manufacturing industry, investment on railroads etc) then, since only past investment yields annual return during that period, the overall yield of total investment (past investment plus investment being implemented) is going to be low because the value of the denominator (i.e. total invested capital) has increased, while the value of the nominator (i.e. profits) has not. The situation will change only after the capital being invested becomes operational and starts generating new profits.

2b. When capital invested has a very short gestation period (i.e. light manufacturing companies, trading companies), the period of low return-on equity will be limited as the new capital will start yielding profits soon. The present study is based on data concerning forty (40) firms from various industries. Thirty-two firms

produce consumer goods and eight firms produce capital goods. These firms have been selected using as criterion a medium to low level of debt to equity ratio (less than 40%).

The following simple linear form expresses the estimated model

Equation 1

We have estimated equation (1) using panel data. Panel method computes means by groups, performs F tests between groups, and provides estimates for the total model, the fixed effect model, and the random effect model. The basic pooled or total regression model is:

$ROEit = a0 + a1Zit + a_2Iit + Uit$

where
$ROEit$ = return - on - equity of the i[th firm]
Zit = debt -to-equity ratio of the i[th firm]
Iit = investment level of the i[th firm]

Equation 2

Where a is the overall intercept. This model assumes a single set of slope coefficients for all observations. The fixed effect model or within model assumes that there are common slopes, but each cross section unit has its own intercept, which means that it may or may not be correlated with the X_s.

$Y_{it} = a + X_{it}b + U_{it}$

Equation 3

The random effects model or varcomp model resembles the fixed effect model, but assumes that the intercepts are drawn from a random distribution with means a and variance σ_a^2. The estimates for this model will not be consistent if the individual intercepts are correlated with the independent variables. Panel method computes and reports the Hausman statistic test for correlated effects by comparing the random effect and fixed effect estimation.
In the random effect model the intercepts terms are treated as random rather than as fixed and are independent of the residuals and mutually independent. Since the variance component estimates are inconsistent when the individual intercepts (a_i) are correlated with the independent variables, a Hausman statistic test is computed to test for correlation.

$Y_{it} = a_i + X_{it}b + U_{it}$

The panel data procedure computes all the relevant F-test, i.e. for the hypotheses that slope coefficients are equal.

Results

We observe a positive and statistically significant correlation between debt-to-equity ratio and return on equity, as well as between investment and return on equity. These results show that firms, which make productive investments and have a rational use of their capital, reinforce their return on equity. However, we should observe that the relatively inadequate time series data somewhat restrict the dynamics of the model. The value of the F-tests results induced us to accept the hypothesis of a common slope and different intercept. The variation of intercepts across cross-section units implies that there exists inter-firm variability. By this we mean that although firms use a low level of debt-to-equity ratio and have productive investment, their impact on their profitability is not the same.
The following table contains the results of the investigation

Table 1

	Total model	Fixed effect model	Random effect model
a_o	-1.92486 (-0.217214)	-	5.5890 (0.519559)
a_1	0.454287 (2.78951)	0.187794 (2.31479)	0.303125 (2.571015)
a_2	0.088962 (2.55757)	0.235868 (2.136559)	0.085924 (1.85490)
R^2	0.30	0.65	0.81
N	80	80	80
SER	27.10	12.96	18.70

SER   standard error of the regression
N number of observations
t statistic in parentheses

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This means that the different impact on return on equity is influenced by the factors which determine the low level of debt-to-equity ratio: whether the low level is due to capital increase and short gestation period or to accumulation of past profits used for self-financing.

However it should be reminded that our sample consists of 40 firms, 32 of which were, light manufacturing having a rather short gestation period.

Conclusions

Capital structure and the rational use of funds may be considered as firms' strategic variables for their impact on firms' profitability. Few studies have used financial variables as explanatory and their results have shown that the impact of these variables on firms' profitability is not always clear cut. The present study applied panel data method to estimate the impact of debt-to equity ratio and investment on firms' profitability. Return on equity was selected to measure profitability because it is considered as the best profitability index when financial variables are taken into consideration as explanatory. The positive and statistically significant impact of both debt-to equity ratio and investment level on firms' profitability support the hypotheses that: The selection of a low debt-to equity ratio, which is due to the fact that either capital increase and investment activity has a very short gestation period, or that capital accumulation of past profits used for self-financing, has a positive impact on return on equity. However, the value of the relevant F-test for the joint hypotheses of a common slope and different intercept leads to the result that there is a different impact (in both cases positive) on return on equity. This result is related to the consideration of 40 firms, 32 of which were, light manufacturing. We may suppose that the rest of them used their past profits for self-financing.   📖

Suggestions for Future Research

The research could be continuing by investigating the impact of structure measured by the revenant concentration ratio on firms' profitability.

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