CORPORATE TRADE-OFF HYPOTHESIS: AN INVESTIGATION OF RELATIONSHIP BETWEEN BUSINESS AND FINANCIAL RISK

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Abstract

This survey is focused on the investigation of the concept of the corporate trade-off hypothesis (CTH), which suggests that firms adjust business risk and financial leverage to obtain the desirable amount of total systematic risk. The empirical tests were carried on a sample of 319 firms from the food and beverage manufacturing sector that covered the period 2008-2016. Prior empirical research has examined the relationship between business and financial leverage using market data. The aim of this research was to explore this relationship using accounting data. The use of accounting data made it possible to include unlisted companies in our survey. The results show that there is an inverse relationship between the variables of operating beta and mean debt ratio, which measure business risk and financial leverage respectively. Consequently, the empirical findings support the hypothesis that the corporate trade-off hypothesis is operative, for the cluster of food and beverage manufacturing companies.

Keywords: Systematic Risk, Business Risk, Financial Leverage, Trade-off Hypothesis, Operating Leverage, Financial Risk

1. INTRODUCTION

The purpose of this paper is to investigate the effect of business and financial risk in order to determine the level of systematic risk. Both Modigliani and Miller (MM) (1966) theory and the Capital Asset Pricing Model (CAPM) (Sharpe 1963) provide mechanisms for the evaluation of stock returns as a function of systematic risk. In the CAPM, beta coefficient is an index of systematic risk (see for example Fama & French, 1992; Fama, 1970; Gahlon & Gentry, 1982; Gonedes, 1975; Lev, 1974; Levy, 1971; Rosenberg & McKibben, 1973). Theoretically, systematic risk is determined by business risk and financial risk. According to the corporate trade-off hypothesis (CTH), as noted by Mandelker and Rhee (1984), operating and financial leverage can be combined in a number of different ways to obtain the desirable level of risk of the common stock. Sekara, Gowrib and Ramyac (2014) agree that, excluding debt, business risk is the basic risk of the company's operations. The greater the business risk, the lower the optimal debt ratio. Jordan, Ross, and Westerfield (2007) explain that companies with a lower probability of facing financial distress ought to be able to borrow more than those with a greater probability of facing financial distress. Burrow et al. (2006) further explain that degree of operating leverage and degree of financial leverage are the tools to measure business risk and financial risk respectively, while the degree of combined leverage is the tool to measure the whole risks. Financial leverage can be considered as one among many factors that affect business risk according to Dinh Tran and Ngoc Huy (2015). High business risk can be offset by low financial leverage and vice versa. The static trade-off theory implies that firms should balance tax advantages to be gained from debt with the costs of financial distress (earnings volatility, bankruptcy costs) (Hillier et al., 2011). Additionally, a more successful firm will take on more debt because the firm can reduce the taxes from its higher earnings due to the extra interest (Deesomsak et al., 2004; Hillier et al., 2011). Trying to find the optimal capital structure and maximize firm's value they trade off the benefits of debt financing again bankruptcy costs and high-interest rates. Anupam and Banerjee (2015) agree that business risk is

statistically significant to have an influence in taking capital structure related decisions. According to Alaoui (2016), systematic risk changes with changes in capital structure. Mouton and Smith (2016) indicate that the South African top 40 companies depict a negative relationship between their capital structures and the profitability and risk variables. As the profitability and risk variables increase, the top 40 companies will decrease their debt levels; and lowering the debt-equity ratio negatively affects the valuation of the company.

Zeitun and Tian (2007), and Salim and Yadav (2012) investigated the relationship between debt level and firm's performance and agree that earnings are negatively correlated with short-term debt, but positively related with long-term debt. On the other hand, Hasan et al. (2014) finds that earnings are positively associated with short-term debt, but negatively associated with long-term debt. The existence of a positive relationship between profitability and capital structure implies that the more debt in the capital structure causes the more performance of the firm and that evidence support the trade-off theory. Consequently, negative relationship between profitability and debt is not consistent with trade-off theory. Amos and Jeremiah (2013), Iavorskyi (2013), Canarella et al. (2014), Ramadan and Chen (2015), and Gharaibeh (2015), validate the negative relation between the debt and profitability.

Tianyu (2013) observes that capital structure tends to be negatively correlated with firm's performance in developing countries whereas, positively correlated with the same in developed countries. Margaritis and Psillaki (2010), Matemilola et al. (2011), Warokka et al. (2011), Samuel (2013), Aliakbar et al. (2013) and Nguyen and Nguyen (2015) evidence a significant positive relation between leverage and performance in French, African, Malaysian, Iranian and Vietnam firms respectively.

This study uses accounting data to investigate CTH. Ball and Brown (1968), Beaver and Manegold (1975), and Beaver, Kettler, and Scholes (1970) in their empirical studies, and Bowman in his theoretical study have proved that accounting variables are suitable for the prediction of systematic risk, and so, we can use them to investigate CTH. Kanatani and Yaghoubi (2017) used the degree of operating leverage as a measure of business risk, the degree of financial leverage as a measure of financial risk and degree of combined leverage as a measure of entire risk.

The remainder of this paper is organized in the following manner. In the next section, we provide a review of the literature on the subject area and we present the Corporate Trade-off Hypothesis. In the third section, we present our research methodology. Section four includes our sample profile and the empirical results of our study. Finally, we provide a discussion of our result along with limitations of this study and suggestions for future research.

2. LITERATURE REVIEW: THE CORPORATE TRADE-OFF HYPOTHESIS

According to this theory, companies seek to obtain optimum capital structure and weigh up the advantages and disadvantages of an additional monetary unit of debt. According to the trade-off theory, default risk works as a mechanism that offsets debt financing in order to safeguard firms from bankruptcy, thus preventing them from using debt in excess. Default risk gives rise to either direct or indirect financial distress costs. (Jose´ Lopez-Gracia Z Francisco Sogorb-Mira 2008) Business and financial risk are the components of systematic risk. Therefore, operating and financial leverage that relate to business and financial risk, respectively, could be combined in order to achieve the desirable level of total systematic risk. Accordingly, high operating leverage could be offset by low financial leverage and vice versa. For example, an increase of the fixed cost combined with a decrease of the variable cost for every product unit, leads to an increase of the degree of operating leverage and subsequently to the increase of systematic risk.

Nevertheless, the firm's decision for the increase of the degree of operating leverage could be associated with the decrease of financial leverage, so that the higher business risk could be offset by lower financial risk. For example, this could happen in the case that the firm makes capital-intensive investments using equity capital instead of debt financing. Furthermore, if we have two companies with the same level of business risk, the firm with the higher debt ratio, which measures the financial leverage, will have a higher beta coefficient. This means that the firm will have a higher total systematic risk. Putting it in another way, firms with low business risk could specify their capital structure in such a way as to achieve low weighted average cost of capital associated with an acceptable level of systematic risk.

The beta coefficient of a firm with financial leverage is related to the beta coefficient that the same firm would have under the assumption of zero financial leverage. According to Hamada (1972), we have

$$\frac{\beta_L}{\beta_i^u}=\frac{V_i}{V_i} \quad (1.a)$$

or

$$\beta_i=\left[\frac{V_U}{V_i}\right]\beta_i^u \quad (1.b)$$

where, V_i, is the value of the levered firm, V_u is the value of the unlevered firm, β_i reflects the total systematic risk, and β_i^u reflects the systematic risk without financial leverage, i.e., business risk.

Assuming that the MM model holds, we have

$$V_u=V_i+D \quad (2)$$

where, V_i and V_u, are given above, and D is the market value of the firms debt. Substituting e.g. (2) to e.g. (1.b), the later can be expressed as:

$$\beta_i=\left[1+\frac{D}{V_i}\right]\beta_i^u \quad (3.a)$$

where, D/V_i, corresponds to the firm's capital structure, namely the ratio between debt financing and equity, with both expressed at market values.
In addition, if we consider income tax, then Eq. (2) becomes:

$$V_u=V_i+D-\varphi D \quad (2.a)$$

where, φ denotes the tax rate. In this case, eq. (3.a) can be expressed as:

$$\beta_i=\left(1+\frac{(1-\varphi)D}{V_i}\right)\beta_i^u \quad (3.b)$$

Equation (3.b) is the same with the equation obtained by Rubinstein (1973). Specifically, Rubinstein used the equation:

$$\beta_i = \beta_i^u + \beta_i^u(1-\varphi)(D/E) \quad (4)$$

where, E is the market value of equity of the firm. In this equation, β_i^u denotes the business risk, i.e. systematic risk without financial leverage. On the other hand, $\beta_i^u(1-\varphi)(D/E)$ denotes the financial risk. Therefore, we can conclude that financial leverage creates financial risk, which when added to business risk determines the total systematic risk.

3. METHODOLOGY

According to the above statements, this paper is concerned with the relationship between operating and financial leverage in order to determine the total systematic risk. To accomplish this, we apply the following procedure.

The first step is to estimate the total systematic risk β_i, for each firm i. By applying ordinary least squares (OLS) method we estimate the regression parameters of the linear equation,

$$r_{it} = a_i + \beta_i r_{Mt} + e_{it} \quad (5)$$

where, r_{it} is the return of equity (ROE) of firm i, and r_{Mt} is the market return for period t. The firm's (ROE) is derived from the relationship:

$$r_{it} = \frac{EBT_{it}(1-\varphi)}{EQ_{it-1}} \quad (6)$$

where, EBT_{it} are earnings before tax, and EQi_t denotes shareholders equity at the beginning of period t.

Furthermore, market return is defined as the weighted average return on equity of a large number of firms from different sectors,

$$r_{Mt} = \sum_{i=1}^{v} w_i r_{it} \quad (7)$$

where, ν is the number of firms, and w_i the weight assigned to firm's j (ROE).

The second step is to estimate the business risk, β_i^u i.e. systematic risk that firm i would have in the case of zero financial leverage. The OLS method is applied again in order to estimate the regression parameters of the linear equation

$$r_{it}^u = a_i^u + \beta_i^u r_{Mt} + e_{it}^u \quad (8)$$

where r_{it}^u denotes firm's i ROE without financial leverage for period t. Contrary to r_{it} values, which are being calculated directly from existing accounting data that refer to net income and shareholders equity, r_{it}^u values cannot be derived directly. For this reason we determine the net income that firm i could have under the assumption of zero financial leverage for period t, and the market value of the same firm at beginning of period t.

Using market variables, Chance (1982), formed the following equation for the computation of r_{it}^u

$$r_{it}^u \frac{N_t d_t + N_t p_t - N_{t-1}p_{t-1} + 1_t(1-\varphi)}{VL_{t-1} - D_{t-1}} \quad (9)$$

where, N_t is the number of outstanding shares, d_t is the dividend paid in period t, P_t is the share price for period t, VL_{t-1} and D_{t-1} denote the market value of the firm and the value of debt at the beginning of period t, φ is again the income tax coefficient, and I_t, denotes the amount of interest paid for period t.

In the present paper, we apply a different approach since we use accounting instead of market data. In particular, using accounting variables we replace the numerator of the ratio in (9) by:

$$EBT(1-\varphi) + I(1-\tau) = EBIT(1-\varphi) \quad (10)$$

where, EBIT defines the earnings before interest and tax.

Furthermore, the denominator of the ratio in (9) shows the firm's market value at the beginning of period t minus the market value of debt multiplied by the income tax coefficient φ. Adding and subtracting the market value of debt in the denominator, we obtain:

$$\begin{aligned} VL_{t-1} - D_{t-1} + D_{t-1} - \varphi D_{t-1} \\ = (VL_{t-1} - D_{t-1}) \\ + D_{t-1}(1-\varphi) \end{aligned} \quad (11)$$

Using accounting data, we substitute in Eq. (11) all market values with the shareholders' equity value $EQ_{t-1}$and the accounting value of debt Δi,t-l minus a percentage of this debt related to income tax. Therefore, the ratio in (9) becomes

$$r_{it}^u = \frac{EBIT_{IT}(1-\varphi)}{EQ_{it-1} + \Delta_{it-1}(1-\varphi)} \quad (12)$$

The third step is to classify firms into risk groups using as criterion their total beta. This classification is essential because in order to investigate CTH, we should have firms with the same level of total systematic risk. An ideal risk group would be the one that includes firms with equal values of bi. However, for practical reasons, we are restricted to accept a reasonable dispersion at the total systematic risk of firms comprising a particular risk group. This procedure may be criticized as weakening the homogeneity assumption of the firms comprising the various risk groups. However, the particular classification of the firms into risk groups that we have adopted proved to be very satisfactory. With reference to each risk group, we use again the OLS method in order to estimate the regression parameters of the following equation:

$$\beta_{ik}^u = a + c_{ik}(\Delta/EQ)ik + \varepsilon \quad (13)$$

where, k=1,2,3…,n denotes the risk groups and x=1,2,3….,y.

In this equation, the variable $(\Delta/EQ)ik$ indicates the financial leverage of the firm i, classified in the k risk group. For each firm we use the average debt/equity ratio of the past five years.

Relative to this variable, Hamada states that "The annual debt to equity ratios are much too unstable..." and Chance (5) adds that "...in both book and market value tests, the five-year average debt/equity ratio proved to be a better proxy for the leverage variable.."

The sign of the regression parameter c_k in the Eq. (13) is important. In particular, a negative value of this parameter indicates that CTH is valid. This means that a lower financial leverage of a firm included in a specific risk group is related to higher business risk and vice versa.

4. EMPIRICAL STUDY

In order to carry out the empirical tests we used a sample of Greek firms from the food and beverage manufacturing sector whose financial statements were audited by a Greek certified accountant. We have chosen our sample from firms for which data could be found in the accounting database of the department of Business Administration at the University of Macedonia. In this study we used a sample of 319 firms from the food and beverage manufacturing sector, which satisfied the following selection criteria referring to total assets and a number of persons employed in the year 2008: a) They had total assets over 5 million euros b) They occupied more than 50 employees. Furthermore, for the computation of the average market return, we used ROA from 4000 firms belonging to different sectors of economic activity. This allows us to assume that these firms constitute a portfolio approximating satisfactory market diversification. Accounting data were obtained from ICAP database.
Table 1 shows the twelve risk groups (k=l,2,3...,12) as well as the total number of firms included in each group. We note that the extreme risk groups, i.e. the first and the twelfth groups. Included firms that could hardly belong to the same risk group mostly because they present a wide range of beta coefficients. In this table, the risk groups appear in the first column, the range of values of the beta coefficient appears in the second column and the number of firms comprising each group appears in the third column.

Table 1. Classification of firms to risk groups

k	*β_j group interval*	*Number of firms*
1	[,-1]	35
2	[-1 , -0,5]	22
3	[-0,5 , -0,2]	28
4	[-0,2, 0]	27
5	[0, 0,2]	29
6	[0,2 , 0,4]	21
7	[0,4, 06]	28
8	[0,6, 1,0]	43
9	[1,0, 1,2]	18
10	[1,2, 2,0]	27
11	[2,0, 3,0]	21
12	[3,0 ,]	20

The test for the validity of CTH is applied separately to each risk group. The results of the regression analysis are presented in table 2. Columns (1) and (2) indicate the number of risk groups and the number of firms, which are included in each risk group. Column (3) shows the values of the a_k parameter, whereas column (4) presents the values of the parameter c_k. Column (5) displays the value of t-statistic of the parameter c_k and column (6) indicates the coefficients of determination adjusted for the degrees of freedom.

Considering the results presented in table 2, we conclude that all the values of the regression parameter c_k are negative. Eight of these values are statistically significant for confidence level 5% (seven are statistically significant for confidence level 1%). Therefore, only four out of twelve values of parameters c_k are not statistically different from zero at the confidence level 5%, i.e. the parameters c_1 c_2, c_3 and c_{12}. It is important, however, to note, that in these cases the corresponding values of t-statistic are greater than one and that the lowest values are those of the extreme risk groups. Although the values of R^2 are low, they could, however, be accepted, given the fact that we have used cross-sectional data. Again, the lowest R^2 values are those of the same extreme risk groups.

Table 2. Repression results, β_{ik}^{u}=a+c_{ik}(Δ/EQ)$_{ik+\varepsilon}$

K	*Number of Firms*	*Coefficient a_k*	*Coefficient c_k*	*t-statistic of c_k*	$\overline{R^2}$
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
1	35	0,478	-0,334	-1,350	0,09
2	22	1,656	-0,617	-1,480	0,07
3	28	1,570	-2,205	-2,407	0,21
4	27	0,187	-0,349	-1,791	0,11
5	29	0,588	-1,014	-1,986	0,11
6	21	0,393	-0,765	-6,179	0,65
7	28	0,21	-0,118	-7,110	0,65
8	43	2,372	-2,433	-2,664	0,13
9	18	1,570	-2,206	-2,407	0,22
10	27 .	0,593	-0,588	-2,856	0,22
11	21	1,794	-0,350	-4,049	0,44
12	20	0,406	-0,084	-1,282	0,04

In the framework of the above statistical analysis, we could accept that the CTH is valid in the eight out of the twelve risk groups. The firms included in these eight groups represent the 70% of the total number of firms used in this study. However, we could accept with a lower confidence level, i.e 10%, that the CTH is also valid for the remaining four risk groups representing the rest 30%.

5. CONCLUSIONS

The scope of this study was to investigate the effect of business risk on the determination of financial leverage and of the level of total systematic risk. According to the Corporate Trade-off Hypothesis firms adjust financial leverage to business risk, in order to determine the desirable level of total systematic risk. Former studies, like that of Mandelker and Rhee (1984), have proved that firms tend to achieve a desirable level of a systematic risk keeping a trade-off relationship between financial leverage and operating leverage. Using accounting data referring to a large number of firms from the Greek food and beverage manufacturing sector, the regression analysis has shown similar results, i.e. CTH is valid at least for the 70% of these firms. Therefore, we may conclude that the firms of the food and beverage industry tend to consider the trade-off relationship between the financial leverage

and the operating leverage, in determining their desirable levels of total systematic risk. Consequently, whenever these firms have already high operational leverage and they do not want to increase their total systematic risk, they tend to reduce their financial leverage, for example by using more equity capital instead of loans in financing their new intensive investment projects. In this way, the level of business risk becomes an important factor in the determination of the firm's financial structure.

As far as the limitations of the study, the main limitation is that it cannot be generalized due to the fact that the study has been conducted for only one cluster the food and beverage manufacturing companies. Additional research may also investigate the validity of CTH using market data. Further research that examines the corporate trade-off hypothesis in other national settings could also be undertaken.

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