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LONG-RUN STRATEGIC CAPITAL STRUCTURE

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Abstract

In the increasingly turbulent environment facing business the strategic management of the firm has become more predominate. However to date, the linkage between strategic management and financial management of the firm has largely not been explored. This research utilizes two different methods of analysis to confirm the linkage between capital structure and strategic posture of the firm. Specifically, managers were found to structure the selection of debt and capital intensity in a means consistent with the strategic goal of long-run control of systematic risk.

INTRODUCTION

For 35 years, since Modigliani and Miller's (1958) seminal article, researchers have tried to explain how firms choose their capital structure. This extensive interest exists because if an optimal structure can be identified a firm could maximize its value by reaching and maintaining that financial mixture. A wide variety of explanations have been offered to explain why firms pick the capital structure they do. For example, information asymmetries between firms' managers and the financial markets (Myers & Majluf, 1984), the tax shield of debt and non-debt expenses (DeAngelo & Masulis, 1980), and the use of debt to maintain managerial discipline (Grossman & Hart, 1982) have all been offered as explanations. This confusing mixture of answers lead Myers (1984), in his presidential address to the American Economic Association, to conclude that no clear solution exists as to why firms make certain choices concerning their debt/equity mix. To date, there still is no consistently accepted answer to this puzzle (Norton, 1990).

Increasingly, business people are seeking to manage companies in a strategic manner. The strategic model of the firm argues that improved firm performance occurs when the firm's managers select strategic goals and all of the activities of the firm are directed towards meeting those goals (Schendel & Hofer, 1976). A part of the firm's overall strategy is the firm's financial strategy and goals (Andrews, 1980). For greatest success the operating strategies of the firm should be consistent with one another. Thus, the financial strategy of the firm should be consistent with the firm's strategic objectives.

To date, the empirical investigations that sought to examine the impact of the organization's overall strategic goals on the firm's debt/equity mix are limited and inconclusive. One would expect that if the strategic perspective is correct capital structure should vary as managers attempt to fulfill the firm's strategic goals. One strategic goal that is directly impacted by the firm's debt/equity mix is its systematic risk (Mandelker & Rhee, 1984). Therefore, the efficacy of a strategic perspective of capital structure will be examined in this paper by investigating the control of systematic risk in firms over the long term through the adjustment of the firm's capital structure. The long-run total systematic is used since strategic events need time to demonstrate their full impact (Lubatkin & Shrieves, 1986). Thus, an additional unique contribution of this study is that it examines the "trade-off" between capital intensity and financial leverage in the light of the firm's long term beta. In this study, the long run beta covers an 18 year period; this is in contrast to earlier studies which have calculated beta over shorter periods with a maximum of 5 years previously being used.

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LITERATURE REVIEW

Despite a continuing stream of research on the topic (see John & John, 1993; Bagwell & Zecher, 1993) a full understanding of capital structure has not yet been achieved. One potential reason for this limited understanding is the lack of integration of organizational theory into the investigation (Frankfurter & Philippatos, 1992). One significant aspect of organizational theory which yet to be addressed in the investigation of capital structure is strategic management.

The strategic view of capital structure argues that managers actively seek to direct the firm's capital structure to support the firm's overall long term strategic goals (Barton & Gordon, 1987). There is partial evidence to support this analysis of capital structure. For example, Sandberg, Lewellen, and Stanley (1987) supported the idea that the firm's level of debt is consciously selected by managers. Similarly, Balakrishnan & Fox (193) found firm specific effects produced variances in firm leverage. However, while there is evidence that managers consciously select at least part of the firm's capital structure, it has yet to be established what parameters direct the selection of the firm's total capital structure.

The single attempt that has been made to investigate whether strategic goals direct the firm's capital choices examined the capital structure of 279 firms over four years (Barton & Gordon, 1988). This investigation found only partial support for the strategic perspective of capital structure with less than half of the authors' nine hypotheses not being rejected. However, as will be detailed later in the paper this lack of results may have been due to methodological problems in the research.

Despite these inconclusive results, strategic management researchers have increasingly demonstrated support for the concept of strategic capital structure. This support for the concept is illustrated by the efforts of strategy researchers to control for each firm's long term financial structure in empirical analysis by utilizing systematic risk as a control variable (Miller & Bromiley, 1990). However, an analysis of systematic risk, and in turn strategic capital structure, that emphasizes its control by firms challenges some traditional financial viewpoints.

The strategic perspective argues that depending on the goals of the firm, and the disposition for risk by the firm's managers in meeting those goals, that a firm's capital structure will vary. However, it has typically been argued by those using the capital asset pricing model (*CAPM*) that the relevant measure of profitability is return adjusted to reflect the systematic risk. Thus, classic financial theory argues: since shareholders can manage systematic risk present in the financial market they should do so; the firm should not try to manage risk by varying its long term capital structure. But, Aaker and Jacobson (1987) demonstrated that systematic risk can impact the profitability of the firm and its strategic business units. They found that the impact of one unit increase in the systematic and business risk lead to significantly different levels of return. Thus, there is evidence of a potential benefit to firms from properly managing their systematic risk through their long term financial structure.

It is recognized that investors will try to control the risk present in their own portfolios (Hax & Majluf, 1984). However, it is not as well recognized that managers also have incentives to seek to control systematic risk of their firm's stock. Portfolio theory builds on the assumptions that stockholders can fully diversify and that capital markets operate without imperfections such as transaction costs and taxes. But the reality is that many investors are not, or can not afford to be, fully diversified. Additionally, transaction costs can act as an impediment to full diversification (Constantinides, 1986). Finally, there is evidence that firms can achieve reduction in systematic risk that the individual could not achieve on their own (Lubatkin & Chatterjee, 1994). Therefore, some investors will value control of systematic risk in a stock. If the investors do value such control, then managers can increase the attractiveness of their stock managers by controlling the risk their firm represents to the investors. If the stock is more attractive to investors it will allow the financial manager to reduce the cost of capital, specifically the cost of equity due to the increased capital from any new stock issued. Thus, again a benefit to the firm can occur from properly managing systematic risk.

Agency theory is another widely recognized theory in the finance literature but it is one largely ignored in regards to the development of a firm's capital structure. The theory argues that managers will maximize their own wealth (Jensen & Meckling, 1976). It has been demonstrated that a determinant of a top manager's compensation is the stability of the cash flows of the firm (Amihud & Lev, 1981). Thus, a manager may find it is desirable to have a stable cash flow over time rather than a cash flow which, while totally higher, has greater variability. The control of systematic risk can provide such stability of the cash flow. Also, it has been shown that the stabilization of cash flows helps to entrench managers in their positions and to make their removal less likely (Schleifer & Vishny, 1992); which again should encourage the manager to seek control of the systematic risk of the firm.

Finally, a large portion of a top manager's personal wealth is typically invested in the stock of their principal employer (Vancil, 1987). Thus, the control of systematic risk becomes important for the manager since the risk of the firm impacts his/her personal wealth. Agency theory would argue that in such a situation that managers would actively seek to control the systematic risk of the firm. Such an alignment between the manager's disposition for risk and the firm's strategy would also be viewed as appropriate by strategic management researchers (Donaldson & Lorsch, 1983).

In summary, it is reasonable to expect managers to seek to control the firm's systematic risk. One of the principal tools through which managers can control systematic risk is the capital structure of the firm.

To further examine the implications discussed above this paper utilizes the Mandelker and Rhee (1984) decomposition of systematic risk into three elements:

a. degree of operating leverage (*DOL*);
b. degree of financial leverage (*DFL*);
c. the intrinsic unleveraged risk (β^*).

The decomposition of this model suggests that for a given level of total systematic risk there is an inverse relationship between the amount of debt used and the firm's asset structure. This inverse relationship leads to the corporate trade-off hypothesis, as the level of total systematic risk of the firm increases the management will seek through its functional strategy for capital structure to control that risk. Therefore, the hypotheses for investigation in this research are:

Hypothesis 1: For a given level of systematic risk, there is a negative relationship between a firm's capital intensity (business risk) and its financial leverage (financial risk).

Hypothesis 2: As the level of systematic risk increases, the negative relationship between a firm's capital intensity and debt levels will become stronger.

The above hypotheses are also intuitively appealing in the light of finance studies on related topics. Studies such as Bradley, Jarrell and Kim (1984) have shown a negative relationship between debt and earnings volatility; additionally, studies such as those by Hill and Stone (1990) have established the relationship between betas, earnings, and returns. These studies suggest that firms with high betas are likely to have high earnings volatility, and therefore, are likely to prefer low debt equity ratios. However, the uniqueness of this study lies in its examination of whether the same holds true from the long term perspective.

METHODOLOGY

In analyzing capital structure a number of methodological problems must be overcome. First, the principal investigation of strategic capital structure (Barton & Gordon, 1988) has been criticized for the regression model used for analysis (Ruefli, 1990). It was argued that the introduction of a performance mean and the mean itself into the same regression equation was inappropriate and resulted in findings that were ungeneralizable. Such a methodology does not control the shifting of stock and market values over time. Ruefli (1990) cited Barton and Gordon (1988) as a principle example of research where such an inappropriate methodology had been applied.

In addition to Ruefli's (1990) criticisms, other criticisms can be made of that principal study. Barton and Gordon (1988) assumed that the factors introduced into their regression were independent variables. However, their research showed the variables were interactive. Additionally, the initial research also claimed that the methodology controlled for financial context. However, it is unclear how they operationalized this.

The methodology used in this investigation builds on the previously cited decomposition of systematic risk by Mandelker and Rhee (1984). This analysis of systematic risk allows several of the problems faced by the prior investigation to be overcome. For example, the multiplicative nature of this decomposition considers the interaction of variables. Also, the absence of considering the financial context can, in part, be overcome through this methodology since firms with similar risk can be classified together to form homogeneous risk classes. The use of a capital asset pricing model (*CAPM*) also overcomes the criticism of Ruefli (1990) that Barton and Gordon (1988) had used the performance mean and the mean itself into the same regression.[1]

The *CAPM* postulates that the equilibrium return on any risky security is equal to the sum of the risk-free rate of return, the risk premium measured by the product of the market price of risk and the security's systematic risk (Beta). Mandelker & Rhee (1984) proved that Beta (β) can be expressed as the product of three elements. First, the risk due to the firm's asset structure, which can be captured as the firm's degree of operating leverage (*DOL*). This variable represents the firm's capital intensity. Second, the firm's risk due to its financial structure which can be expressed as its degree of financial leverage (*DFL*). This variable represents the firm's debt intensity. Finally, the firm's intrinsic risk (β^*) which is the uncertainty faced by an all-equity and all-variable cost firm. Therefore, β can be expressed as:

Equation 1

$$\beta = (DFL)(DOL)(\beta^*)$$

Equation (1), demonstrates that the firm's intrinsic risk β^* is magnified by *DOL* and *DFL*.[2] Additionally, it is known that *DOL* will increase as capital intensity increases (Rubenstein, 1973; Hamada, 1972) and that *DFL* will increase as the firm's debt level increases (Percival, 1974).

Examining equation (1), an all equity firm's systematic risk would be (*DOL*)(β^*) since *DFL* equals one. The finance literature defines this type of risk as business risk, β_U (Chance, 1982). Therefore, for an all equity firm, equation (1) becomes:

Equation 2

$$\beta = (DOL)(\beta^*) = \beta_U$$

From equation (2), it is easy to recognize that as *DOL* increases (due to the asset intensity) the level of business risk also increases. Thus, the relationship between the firm's capital intensity and business risk is positive.

Beta should, theoretically, be determined by business risk and financial leverage. Therefore, substituting equation (2) into (1), we have:

Equation 3

$$\beta = (DFL)(\beta_U)$$

Equation (3), demonstrates that the firm's systematic risk, β, can be expressed as the product of two elements, business risk (β_U) and the firm's financial risk (*DFL*). It also demonstrates that as debt financing for the firm increases so does the level of systematic risk. However, equation (3) also suggests that there are multiple combinations of β_U and *DFL* which can be used to generate the same level of β. Finally, using equation (3) we can express the financial leverage *DFL* as,

Equation 4

$$DFL = \beta/\beta_U$$

Thus, for a fixed level of β, the equation (4) can be re-written as:

Equation 5

$$DFL = k/\beta_U$$

where k is a constant of proportionality.

Equation (5) allows us to show the proposed inverse relationship and supports the corporate trade-off hypothesis. Specifically, the management is able to make asset structure decisions can be offset by an adjustment in the financial leverage to maintain a constant systematic risk (β). Therefore, equation (5) demonstrates our argument that the management is able to control and maintain the strategically selected level of systematic risk.

To help visualize the relationship expressed in equations (3) and (5) it is possible to graphically demonstrate the proposed interactions (see Figure 1). Conceptualize two firms, *H* and *M*, with different asset structures and thus with different levels of unleveraged risk, $\beta_{U,H}$ and $\beta_{U,M}$. It is possible for these firms to obtain the same level of total systematic risk by consciously selecting their financial leverage (*DFL*). Therefore, firm *H* can combine its level of risk $\beta_{U,H}$ with the lower level of financial leverage DFL_{HBetaU} for a given level of β. This same level of β is then also obtained by firm *M*, with $\beta_{U,M}$, by the firm consciously selecting higher debt level DFL_{LBetaU}

Therefore, each firm is associated with two risk-index measures: 1) β_U, which is partially determined by the firm's asset structure, and 2) β, which is the magnification of the β_U due to debt financing. Firms can be classified together by their β_Us to form particular classes of firms that share the same business risk (Chance, 1982). Similarly, firms can be classified together by their β to form classes of firms with the same systematic risk. Thus, using equations (3) and (5), by holding systematic risk constant through the use of different β classes, the relationship between business risk, which is partially determined by the capital intensity (asset structure) and debt can be examined.

DEVELOPMENT OF DATA

Once the βs are controlled, the hypothesis can be tested by evaluating the relationship of β_U and debt levels. To conduct such an analysis data on debt, β, and β_U must be generated for a sample of firms.

To measure debt it has been argued that the annual debt to equity ratio is too unstable (Hamada, 1972). Therefore, the mean debt to equity ratio (*MDR*) for the period examined; i.e., the average of the annual book value of long term debt to equity ratios was used as a proxy for the financial leverage variable. Financial data for various firms were drawn from the Standard and Poor's 1990 Compustat Tapes (Annual) for the years 1969-1987. Data for 1988 and 1989 was not used since there was missing data for many firms. To develop the *MDR* variable consistently for all firms, those companies whose fiscal year did not end on December 31 were eliminated from the sample following the methodology of (Chance, 1982). There were 810 firms which met this criteria.

The development of the β_U values for each firm required two stages of data development. As per the methodology of Chance (1982), first a time series of unleveraged returns had to be developed. It was assumed that in the development of such a time series that the interest paid on the firm's debt and the average tax rate from the firm's financial statements may be applied for each period, and that the Modigliani and Miller model of firm evaluation (Modigliani & Miller, 1958; 1963) holds as an approximation (Chance, 1982). These assumptions allow the estimation of the firm's unleveraged cash flow. However, we use annual data to avoid the problems faced by Chance (1982) who used quarterly data. We follow the relatively newer Chance (1982) methodology in preference to the older Hamada (1972) method (i.e., first calculating the leveraged beat and then unleveraging the ß using Hamada's adjustment to obtain β_U).

With this information it was then possible to develop the β_U values for all firms in the sample from the market model relationship:

Equation 6

$$RU_t = a_u + (\beta_U)(RM_t) + e_{ut}$$

where:

RU_t = the unleveraged return for period t[3]
β_U = the risk of the unleveraged firm
RM_t = the market rate of return[4]
a_u = the intercept term
e_{ut} = error term

The e_{ut} were assumed to be homoscedastic, serially uncorrelated and uncorrelated with RM_t. Residual analysis revealed these assumptions to be reasonable. The market rate of returns were obtained by using the Standard and

Poor's 500 stock composite index as a proxy for the market. This data was drawn from the Standard and Poor's *Daily Stock Price Index* and *Daily Stock Price Record*. RU_t and RM_t were calculated for each firm for each year from 1969-1986. Thus, β_U s are obtained for each firm using time-series data. The same data is used to calculate the total returns.

Finally, the betas (βs) for each firm in the sample were estimated from the market model relationship in equation (7).

Equation 7

$$RT_t = a + (\beta)(RM_t) + e_t$$

where:

RT_t = total return for period t[5]
β = Beta for the firm
RM_t = market rate of return for period t
a = the intercept term
e_t = error term

In the second stage, the βs and β_Us calculated above, are used cross-sectionally using the *MDR* data to study the relationship between β_U and capital intensity.

ANALYSIS

As previously stated, the researchers identified 810 firms which had a fiscal year end of December 31st and which possessed all the necessary information for analysis. These firms reflected a wide range of two and four digit SIC codes and firm sizes. This wide distribution of firms should control for confounding variables. For the calculation of each firms βs and β_Us, a regression has to be made using the specific firm's data over the 1969 - 1986 time period. Thus, before the cross sectional analysis to study the relationship between β_Us and capital intensity could be performed, 1620 regressions needed to be performed to develop the firms' βs and β_Us.

To make the study meaningful, it is necessary that firms have similar systematic risk. Thus, those firm with negative or very high βs, or β_Us, or *MDR*s were eliminated from the sample. The result was a final sample of 592 firms with βs between 0 and 1.50.

These 592 firms were then subdivided into groups which had similar levels of β (Chance, 1982). The sample was initially divided into 3 groups of firms with the groups being approximately equal in size (Method 1). The use of this grouping method was chosen since it adequately addressed the tradeoff between having sufficient numbers of firms in each interval for statistical analysis while ensuring the firms had similar enough levels of β to be considered comparable. The division of the sample into equal groups produced unequal β categories in each cell. To ensure that this inequality in β intervals did not impact the results, the analysis was repeated (Method 2) using groups with equal β intervals of 0.50 (Chance, 1982) though unequal in group size.

Once the risk was controlled through the establishment of β classes, the inverse relationship (or, the corporate trade-off hypothesis) between the firm's asset structure (capital intensity) and level of debt (financial structure) could be investigated. This was done by examining the β_U and corresponding *MDR* values for each β class using the least squares regression equation:

Equation 8

$$\beta_U = A + C\,(MDR_i) + ee_i$$

where: β_{Ui} = Beta unleveraged, and, MDR_i = mean debt to equity ratio for the i^{th} firm, and ee_i is an error term.

If C is a negative value, a negative relationship between capital intensity and debt is indicated but the causality may be in either direction. The regression is used to verify the trade-off between unleveraged Betas and debt. Thus the regression of *MDR* on β_U could be just as appropriate. Therefore, the following equation is also investigated:

Equation 9

$$MDR_i = A^* + (C^*)(\beta_{Ui}) + ee^*_i$$

where ee^*_i is the error term and MDR_i, β_{Ui} are defined in equation (8).

Again a negative coefficient C^* would indicate that debt and capital intensity are inversely related.

RESULTS

The results of the regressions, within each β group, using Methods 1 and 2 are summarized in Tables 1 and 2 respectively. The third column contains the estimated value for *C* for β_U regressed on *MDR*. The fourth and fifth columns respectively, represent the $R^2$and the probability for the entire regression equation. The higher the R^2 value the greater the variance in risk explained by the debt/asset structure. The t-values are given in the brackets. Note that for the least squares regressions β_U regressed on *MDR* and *MDR* regressed on β_U produce the same t-values, $R^2$and probability for regressions using either equations (8) or (9). Column six contains the estimated value for C^* for *MDR* regressed on β_U.

TABLE 1
Regression Results (Method 1)

Models: $\beta_U = A + C(MDR)$ and $MDR = A^* + C^* (\beta_U)$

β Group	Group Size	Estimate C	R^2	Regression F Values	Estimate C*
[0.00 - 0.78]	197	-0.1536*** (-4.812)	0.1016	23.154	-0.6910
[0.79 - 1.07]	198	-0.3199*** (-9.678)	0.3199	93.668	-1.0109
[1.08 - 1.50]	197	-0.4761*** (-15.160)	0.5386	229.823	-1.1362

Note: *** significant at 1% level.

A review of the results in Table 1 and 2 indicates strong support for the theoretical proposition that management influences and controls the level of systematic risk through its selection of assets and debt structure; thus, hypothesis 1 is supported. A closer review of the results in these Tables indicates a strong negative relationship between debt and capital intensity for all three β groups based on a 2-tail test of significance.

It is interesting to note that the adjusted R^2 is the highest for the group of firms with the greatest risk. For example, the finding in Table 1 for the β group 1.08-1.50 that 54 percent of the variance in risk was explained by the debt/capital interaction is extremely strong. Such a finding is consistent with theory. If firms seek to control the risk presented to the investor in order to make their stock more attractive, that control of risk should become more critical as the risk faced by the firm increases. Thus, hypothesis 2 is supported, firms with high levels of systematic risk do engage in trade-off more actively than do firms with low levels of risk.

There are some limitations to this study which should be recognized. First, this research limited the impact of any given industry or environment by obtaining a large sample representing a wide range of industries. However, the use of strategic capital structure may be acute in particular environments. For example, it is argued that some firms, frequently referred to as turnaround firms, quickly gain control of their costs including their debt expense (Bibeault, 1982). It may be that firms in decline will pursue the use of strategic capital structure more actively since such firms must manage their funds more actively through such means as the capital structure to survive. Therefore, future research may seek to expand the examination of strategic capital structure to different environments.

TABLE 2
Regression Results (Method 2)

Models: $\beta_U = A + C(MDR)$ **and** $MDR = A^* + C^* (\beta_U)$

β Group	Group Size	Estimate C	R^2	Regression F Values	Estimate C*
[0.00 - 0.50]	68	-0.0888** (-2.373)	0.0647	5.633	-0.8851
[0.50 - 1.00]	266	-0.2637*** (-8.939)	0.2294	79.898	-1.0563
[1.00 - 1.50]	258	-0.4550*** (-16.581)	0.5160	274.938	-1.1381

Note: ** significant at 2% level.
*** significant at 1% level.

Second, this study does not examine the interaction between strategic capital structure and firm performance. The evidence presented here demonstrates that as a strategic goal strategic capital structure is relevant. Future research should expand this investigation to examine how such strategic goals impact and interact with resulting firm performance.

SUMMARY AND CONCLUSIONS

This study demonstrates the relevance of the concept of long run strategic capital structure. The evidence presented illustrated that there is a relationship between the strategic long-term goals of the firm and its capital structure decisions. Specifically, there is a joint impact of both asset structure and capital structure on systematic risk. Our empirical findings suggest that, the interaction between asset and financial structure explain a large portion of the variation in beta. The proposed hypotheses received strong support. Managers do engage in trade-offs to control and maintain the strategically selected level of systematic risk and that trade-off is stronger the higher the level of systematic risk.

For the practitioner manager the study has the benefit of demonstrating that the control of systematic risk is a strategic goal pursued by most firms. The study also has provided one more potential answer to the capital structure puzzle. This research demonstrates that new means of examining the problem are justified.

This study uses a different perspective to address a problem that has plagued finance researchers for many years. The results confirm that there is an integration of the various business facets. This research used the literature from strategic management and finance to gain a better understanding of what laymen might consider to be a traditional finance topic, capital structure. There are other areas where integration of finance and strategic management research may allow a greater understanding of the behavior of business firms. For example, how finance tools can be used by firms to gain a competitive advantage over other firms remains largely unexamined.

Future research should continue to expand our understanding of capital structure. However, it is clear that the strategic perspective is important to the potential answers to the capital structure puzzle. This research also supports the need for greater investigation of the commonalities and differences in the fields of strategic management and finance since both of these fields are an integral part of any firm's success.

ENDNOTES

1. It has been suggested that a *CAPM* may not be appropriate for the study of all strategic issues (Bettis, 1983; Oviatt, 1989). This criticism of *CAPM* is based on the argument that a wider range of stakeholders, such as employees and other member of the community, should be considered in evaluating strategic issues. Notwithstanding this argument, the examination of capital structure is most concerned with the providers of the debt and equity, the stockholders and creditors. The analysis of other stakeholders is not of a central concern here. Thus, the *CAPM* is acceptable for this investigation.

2. In this paper, for the purpose of analysis, the decomposition of beta as suggested by equation (1) is followed. This equation relies on the decomposition suggested by Mandelker and Rhee (1984) rather than the more widely recognized decomposition suggested by Huffman (1983). Mandelker and Rhee (1984) was selected due to its ability to provide fresh insights to the problem of interest.

3. Thus, the unleveraged return in time period t can be obtained as follows:

$$RU_t = \frac{(N_t)(d_t) + (N_t)(P_t) - (N_{t-1})(P_{t-1}) + (I_t)(1-T)}{(VL_{t-1}) - (D_{t-1})(T)}$$

where:

RU_t = unleveraged return for the period t, 1 period = 1 year
N_t = number of shares outstanding at the end of period t
N_{t-1} = number of outstanding shares at the end of period ($t-1$)
d_t = per share cash dividends in period t
P_t = per share price at the end of period t
P_{t-1} = per share price at the end of period ($t-1$)
VL_{t-1} = market value of the firm at the end of period $(t-1) = (N_{t-1}) \times (P_{t-1})$
D_{t-1} = long term debt at the end of period ($t-1$)
T = average corporate tax rate for period t
I_t = amount of interest paid in period t

4. The corresponding market return in time period t can be obtained as follows:

$$RM_t = \frac{(MI_t) - (MI_{t-1})}{(MI_t)}$$

where:

RM_t = market return for the period t
M_{it} = value of the market index at the end of period t
MI_{t-1} = value of the market index at the end of period ($t-1$)

5. Total returns are calculated as follows:

$$RT_t = \frac{(N_t)(d_t) + (N_t)(P_t) - (N_{t-1})(P_{t-1})}{(N_{t-1})(P_{t-1})}$$

where:

RT_t = total return for the period t, 1 period = 1 year
N_t = number of shares outstanding at the end of period t
N_{t-1} = number of outstanding shares at the end of period ($t-1$)
d_t = per share cash dividends in period t
P_t = per share price at the end of period t
P_{t-1} = per share price at the end of period ($t-1$)

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