

Corporate tax and capital structure: some evidence and implications

1. INTRODUCTION

Four decades of research on capital structure has not conclusively answered the basic question of whether there is an optimal mix of debt and equity at the level of the firm. Textbooks present the issue as a problem of balancing the gains from leverage with the expected costs of bankruptcy (Gitman 2000, Ross, Westerfield and Jaffe 1999, Damodaran 1997, Altman 1993). Following the trade-off theory and using data from the Johannesburg Stock Exchange (JSE) Negash (2001) reported the insignificance of the net gain that may be stemming from increased use of interest bearing debt. When bankruptcy related costs were not invoked, the size of the present value of the tax shield over a perpetual period was comparable to the results obtained in NYSE based studies. The gain from leverage was estimated at between 13 and 18 percent of the market values of the firms in the sample. This paper extends the previous work on JSE and addresses the vexing issue of whether Miller's (1977) equilibrium theory is holding under existing tax code and capital structure irrelevancy is a feasible firm level policy.

In the presence of only corporate taxes capital structure irrelevance theory no longer holds unless the firm's marginal tax rate is zero. The corollary is that if corporate tax rate is different from zero, then taxes do not only affect financing decisions. The tax code may provide preferential treatment for (certain types of) investments. Further, investment and financing decisions may not be independent of one another. That is, the well-known Fisher's separation theorem no longer holds as investment and financing decisions cannot be realistically decoupled. Therefore, the need for the simultaneous consideration of investment and financing decisions and the interactions thereof becomes important.

DeAngelo and Masulis (1980) extend Miller's (1977) work and examine the effects of non-debt related tax shields on capital structure. They show that Miller's irrelevance (indeterminacy) theory is sensitive to realistic situations, such as the modification(s) of tax codes. More specifically, they show that the existence of non-debt related corporate tax shields, such as depreciation, is sufficient to overturn the leverage irrelevancy theorem. They state that optimal capital structure is feasible at the individual firm level. Hence,

corporate tax is central to the theory of capital structure.

Dammon and Senbet (1988) criticize DeAngelo and Masulis (1980) in that the model (only) partially recognizes the interaction between real and financial decision variables of the firm. Dammon and Senbet (1988) state that DeAngelo and Masulis did not fully incorporate the productive side of the economy and non-debt tax shields are exogenous in the model. The critique provides what it claims to be a more realistic look of the problem and shows that investment and optimal level of non-debt tax shields are endogenous. Thus, the endogenous- exogenous dichotomy adds another dimension to the debate on capital structure.

In a related work, Hodder and Senbet (1990) extend Miller's (1977) equilibrium theorem to the international setting. The stylized analysis was done in the context of perfect markets, differential international taxation and inflation. They state that if corporations engage in international tax arbitrage, no optimal capital structure exists for an individual firm. Thus, Hodder and Senbet (1990) show that Miller's equilibrium analysis can be extended to the international setting. They concluded that differences in international tax rate alone are incapable of dictating a particular capital structure for an individual firm. On the empirical side, gearing ratios cannot be expected to be the same in different tax jurisdictions. Textbooks, for example Gitman (2000:505) and Brealey and Myers (1991), contain figures that show relatively higher level of debt for firms that are based in Europe and Asia. Rajan and Zingales (1995) reported that aggregate level permanent debt capital ratio in the G7 countries had been fairly similar over the 1984-1991 period. *Ceteris paribus* the Rajan and Zingales (1995) report, economists attribute the difference to extent of financial intermediation, differences in institutional structures governing bankruptcy policy, debt renegotiation and differences in the market for corporate control. The literature on international accounting adds accounting method differences as an additional explanation.

Studies that estimate the tax benefit of leverage followed the spirit of Modigliani and Miller (1963). Kane, Marcus and McDonald (1984), Titman and Wessels (1988) and Fama and French (1998) estimate the value of the firm and the size of the tax shield from leverage assuming that the value function is linear; $V_L = V_U + T_c B^*$, where V_L and V_U respectively are the value of levered and unlevered firms. T_c is marginal corporate tax rate and B^* is the market value of corporate debt. Thus, over a perpetual period $T_c B^*$ is

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the gain from leverage. The magnitude of T_c , the type of the tax regime and tax rate changes become key factors for the choice of capital structure. In empirical work, how one defines and measures T_c (statutory, effective or marginal) is crucial. More importantly, for the theory to hold, a positive association between T_c and B^* should be observed.

Non-debt related tax shields are many and require special attention. First the tax code provides shelters for expenses like depreciation and amortization. Added to this is the fact that certain types of investments usually attract favour from the government. Dammon and Senbet's (1988) theoretical paper examines the effect of taxes and depreciation on investment and leverage levels. They state that production technology could be a factor for not observing the DeAngelo and Masulis (1980) trade off theory. *Ceteris paribus* the technology factor, if capital structure choice problem is to be primarily explained around corporate taxes, then it is proper for empirical researchers to consider the influence of both debt and non-debt related tax shields. This opens a Pandora-box simply because non-debt related tax shields are many, and vary in different tax jurisdictions.

This paper addresses three issues. In the first section the size of the tax shield will be examined. The first conjecture is that tax system differences and problems associated with measurement will not allow the empiricist to show unambiguously the benefits predicted in MM (1963). Despite this conjecture, examining the expected association between the tax rate and the extent of leverage will be the focus of the work. The second issue is the role of non-debt related tax shields. That is, in addition to interest, other expenditures that are favoured by the Income Tax Act, namely Section 12c, will be studied. The trade off theory will be examined by explicitly measuring one debt and one non-debt related tax shield variables. The endogenous-exogenous debate regarding the tax variable will be examined in the methodology section. The third issue relates to the cross sectional properties of leverage ratios. The remaining part of the paper is organized as follows. Section 2 reviews the literature and Section 3 discusses the methodology and the data. Section 4 presents the result. Conclusion and directions for future research are indicated in Section 5.

2. LITERATURE REVIEW

Taxes do not only influence the extent of leveraging up but also affect the type of security that firms prefer to issue. For instance Carter and Manzon (1995) show that firms make greater use of redeemable preference shares if they have lower marginal tax rates. This finding supports the proposition that firms that cannot make efficient use of tax shields prefer to issue a security that is tax favoured in the hands of the holder. Alford (1993) also shows that firms issue convertible

preferred stocks when they cannot make efficient use of debt related tax shields.

Related to this is the size of the tax rate itself. Intuitively if interest is tax deductible, then the size of the shield, $T_c B^*$ (where $B^* = r_d B / K_d$, r_d is interest rate and B is face value debt, K_d is the cost of risk free debt) will be altered. That is, the gain from leverage will be affected by the extent of the movement of T_c . This implies, for instance, a reduction in the (top) statutory corporate tax rate reduces the amount of cash outflow. Yet the value formula $V_L = V_U + T_c B^*$ predicts reduction in V_L irrespective of whether T_c is defined as statutory, effective, top tax rate or marginal tax rate. Further, $T_c B^*$ can be linear as in Modigliani and Miller (1963) or nonlinear as in Talmore, Haugen and Barnea (1985). As noted above, irrespective of the type of benefit function one envisages, the theory predicts a positive association between the tax variable (marginal tax) and the size of the debt (cumulative or incremental). Further, the model envisages a steady state or a long-run equilibrium. Few studies have been able to corroborate this prediction. For instance Fama and French (1998) find the opposite. They reported that the tax effect of debt financing does not significantly affect firm value. Gupta and Newberry (1997) reported that effective tax rates (ETRs) are negatively associated with leverage. Nonetheless, works that did not report positive association are viewed as anomalous results, often criticized either on the ground of poor model formulation or the researcher's inability to recognize the problem of the endogeneity of the tax status of firms or both. Further, the proper proxy for the tax variable (marginal or effective) has never been properly articulated.

Dammon and Senbet (1988:359) state that increases in allowable investment related tax shields due to changes in corporate tax code are not necessarily associated with reductions in leverage at the individual firm level when investment is allowed to adjust 'optimally'. They underscore that the effect of an increase in allowable investment related tax shield on firm leverage depends critically on the trade off between the 'substitution effect' (advanced by DeAngelo and Masulis) and the 'income effect' associated with an increase in optimal investment. Further, they show that in cross sectional analysis, firms with higher investment related tax shields need not have lower debt related tax shields if firms employ different production technologies. According to Dammon and Senbet (1988) for firms that have same technologies, the association between investments related tax shields and financial leverage is strictly negative. Nonetheless this prediction may not always hold if advances in technology are affecting all industries on the same footing or if technology is viewed as an endogenous factor.

Kale and Noe (1992) reported that corporate leverage ratios have not changed very much over time. They state that by allowing the cost of financial distress to be related to the size of the firm's tax shield, it can be shown that when financial distress costs vary with leverage gains, the optimal level of debt will be insensitive to changes in the corporate tax rate (Kale and Noe 1992:79). In contrast Dotan and Ravid (1985) state that tax is endogenous in leverage and investment decisions. Graham, Lemmon and Schallheim (1998) study of the association between debt, lease and taxes provides evidence that shows the endogeneity of the tax status of the firm in a financing decision. According to them studies that focus on association between tax rate proxies and corporate financial policy indicators report spurious correlations. Graham et al. (1998) warn that if the endogeneity issue is not properly addressed, the experiment can yield a biased result. Biased results show a negative association between debt and taxes. To overcome this problem they suggest the use of 'before-financing' tax rate.

In spite of the centrality of the tax variable, few papers attempt to estimate it carefully. A number of papers use proxies such as effective tax rate (tax paid/EBIT) and dummy variables when a firm has net operating losses and loss carry-overs. Graham (1996) states that such proxies could be misleading and suggests that a simulated tax variable, calculated along the lines shown in Shevlin (1990) gives a more refined measure of the tax status of a firm. Graham (1996:46) goes further and states that a firm's ability to carry losses and credits forward and backward makes it unlikely that examining current period financial statements will provide an accurate assessment of a company's marginal tax rate. More recently, Graham (2000) develops a new method to estimate marginal tax rates (MTRs). His 'tax benefit function' contains an appealing 'kink'. The kink is purporting to be a rough guide for knowing whether the firm is fully using its debt capacity. Graham (2000) states that by leveraging up to the kink a typical firm could add between 7,5% and 15,7% to its value.

3. HYPOTHESIS, METHODOLOGY AND DATA

When Modigliani and Miller (1963), Miller (1977), DeAngelo and Masulis (1980), Dammon and Senbet (1988), Hodder and Senbet (1990) and Fama and French (1998) are taken together, they yield a number of testable hypotheses. The first research question is the examination of whether there is a positive association between corporate tax rate and extent of debt. The second hypothesis tests whether extent of leverage is inversely associated with investment related tax shields. The identification of the determinants of leverage is the third research question.

Testing these hypotheses is by no means easy, as the controversy on methodology is as intense as the theory itself. Graham's (2000) methodology contrasts the conventional approach of measuring the tax benefit from the use of debt. He reported that the new method sets the average benefit at 9,7% of market value while the traditional yields 13,2%. He further claims that the new measure of the tax benefit of debt provides information about not just the marginal tax rate but also the entire tax benefit function. He states that having an entire tax benefit function allows the researcher to quantify the tax advantage of debt by integrating the area under the tax benefit function.

Graham's approach brings several problems. They are both epistemological and technical. From the epistemology perspective the endogeneity problem is forcing us to abandon the use of actual/institutional data. True, debt related/equivalent financial instruments and the existence of an array of investment/finance related tax deductibles complicate the research. Yet one cannot abandon examining ontological facts because they are complex. Further, it is important to note that the firm faces an exogenously determined tax schedule and, firms in reality spend considerable amount of money in seeking expertise and/or managing their tax liability. Thus, the endogeneity concept advanced in economic theory fails to adequately explain the problem at hand.

On the technical side, the model assumes that corporate earnings follow a 'pseudo' random walk with a drift; $\Delta EBIT_{it} = \mu + \epsilon_{it}$ where $\Delta EBIT_{it}$ is the first difference in earnings, μ is the sample mean of $\Delta EBIT_{it}$ and ϵ_{it} is the drift that is normally distributed with a mean of zero and its variance equals the variance of $\Delta EBIT_{it}$. This formulation is not uncommon in finance and accounting research. Nonetheless, several issues can be raised. They range from evidence of non-randomness to distributional factors in long horizon studies (Li and Maddala, 1997). Ceteris paribus short term issues, whether the actual tax bill follows a random walk process or like most economic variables reverts back to a long run trend remains unclear. Further, in an environment of tax planning, randomness is not a plausible premise. In short even if one is able to show the randomness of earnings, a similar degree of randomness cannot be expected for the tax bill. Moreover, little information is given about the behaviour of the error terms (ϵ_{its}). Marginal tax rate (MTR) is defined in present value terms (Graham 2000: 1937). This complicates the process as it introduces additional problems that are associated with cost of capital estimation.

From a utilitarian perspective, the model mimics the American tax system, which is characterized by loss carry-backs and carry forwards, progressive tax and investment tax credits (now abandoned). Thus, the usefulness of the methodology for tax regimes that do not resemble the American system is unclear. Finally

the tax literature and the general prediction of economic theory of income tax reporting, which states that tax payers have incentive to report more (less) income as tax rates increase (decrease), is ignored. Taxpayer's perceptions of the tax environment and uncertainty about tax policy are not considered. To estimate the MTRs and thus the benefit of leverage (unused debt capacity), Graham (2000) relied on simulation.

Statutory tax, income tax expense (as reported in the income statement), actual tax paid (as reported in the cash flow statement) and marginal or incremental tax are competing proxies for T_c . To appreciate the controversy here, but cognizant of the definition in the original thought, the analysis begins by looking at Modigliani and Miller (1963). Copeland and Weston (1983) simplify the derivation by focusing on a cash based income statement of the following type.

- R = Revenues
- Vc = Variable costs
- Fcc = Fixed cash costs
- Dep = Depreciation expense
- NOI = Net operating income
- rB = Interest on debt ($r * B$)
- EBT = Earnings before tax
- T = Tax ($T_c * EBT$)
- NOIAT = Net operating income after tax

The above income statement and the variables in it can be written as:

$$NOIAT + Dep - I + rB = (R - Vc - Fcc - Dep - rB) (1 - T_c) + Dep - I + rB \quad \dots (1)$$

Assuming that $Dep = I$, where I is investment to maintain existing activities, we can rewrite [1] as:

$$\begin{aligned} NOIAT + rB &= (R - Vc - Fcc - Dep) (1 - T_c) - rB + rBT_c + rB \\ &= EBT (1 - T_c) + rBT_c \quad \dots (2) \end{aligned}$$

By looking at an infinite time horizon and using an expectation operator, the first term is discounted at cost of equity, ρ and the second term by before tax cost of risk free debt; K_d . Consequently, the value of a levered firm, V_L becomes:

$$V_L = \frac{E(EBT)(1 - T_c)}{\rho} + \frac{rBT_c}{K_d} \quad \dots (3)$$

Equation [3] is popularly known as Modigliani and Miller's Proposition II (MM II). The question that must be answered now is the definition of T_c in the second term (above). Note that marginality is neither assumed nor is evident in this formulation. In fact it resembles the South African tax environment. In contrast, DeAngelo and Masulis (1980:7) define T_c as 'statutory

marginal' corporate tax rate. Two issues arise. First, it is unclear why statutory marginal tax (understood to mean the top tax rate in a progressive tax schedule) becomes relevant when we know that there are several tax minimization techniques allowed by the tax code. That is, there is a difference between statutory marginal and actual marginal tax rates. Second, the validity of the model in an environment where the tax system does not tax incremental corporate earnings at higher rates needs further study.

3.1 Data and preliminary statistics

Using financial statement data for the 1991-1998 period, effective tax rates (ETRs) and marginal tax rates (MTRs) were calculated. Effective tax rate is defined as the ratio of actual tax paid (net of secondary tax, etc) as reported in the cash flow statement and earnings before interest and taxes. Homaifar, Zietz and Benkato (1994), Davis (1987), Graham (1996; 2000) advise that consistent with the theory, the relationship between debt and tax shield be tested using tax rates calculated before the effects of debt. In short they suggest the use of 'before financing' measure of tax to avoid the problem of endogeneity. Taking these leads both ETRs and MTRs were calculated using earnings before interest and taxes (EBIT) figures. The paper considered only one non-debt related tax shield and one debt related tax shield. Depreciation expense and interest paid were the two variables. That is, other types of financing and investing methods that have the potential to attract tax (for example lease, amortizations of intangibles and tax recoveries) were not considered.

Marginal tax rate (MTR) was defined as the ratio of actual incremental tax paid (as reported in successive cash flow statements) to incremental earnings before interest and taxes (as reported in successive income statements). Net operating losses affect both ETRs and MTRs calculations. Firms with losses were excluded. Note also that deferred tax was not included as it is difficult to discern its actual cash flow implications. Loss carryovers (allowed) and carry-backs (disallowed) were ignored and assumed to remain constant over the study period. Further, while differencing the EBITs and tax paid figures, negative values provide meaningless ratios. Thus, MTR for a firm in a particular year is set to zero if the calculation resulted in a negative figure. This process reduced the sample size by almost a third; making the MTR data too few for statistical validations.

The profile of the research environment and other relevant statistics are given in Table 1. The table is to be read in conjunction with Figures 1 and 2. The data was pooled from the annual reports and McGregor's publications, and relates to companies listed on the industrial sector of the JSE. The upper part of Table 1 shows tax rates over the eight-year period. Figure 1 shows the annual average tax rates for the period

between 1991 and 1997. Note that the difference between average statutory rate and average effective rate over the eight years period was about 17%. Marginal tax rate was between effective and statutory tax rates. The sample size for ETRs ranged between 47 and 60 firms but note that MTRs were estimated using much fewer observations. Figure 2 gives a profile of the situation at the individual firm level. It shows the ETRs for randomly selected firms. A visual inspection indicates high degree of volatility and suggests some degree of randomness. It gives no indication of tax planning. Yet, as noted earlier, for firms that have some form of tax planning, pure randomness cannot be expected. Even censored (Tobit) regressions as in Graham (2000) are unlikely to solve the problem. A change in the tax regime is another factor that weakens the argument for the use of simulation to estimate tax rates.

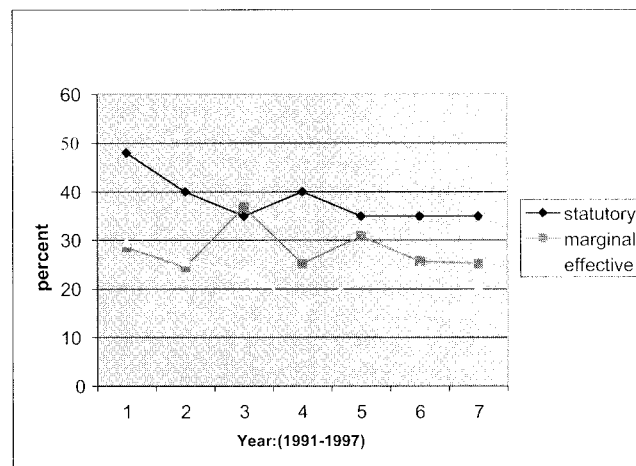


Figure 1: Average tax rates

Table 1: Tax rate, debt and related statistics

Year	98	97	96	95	94	93	92	91	Average: 1991-98
Tax rate:									
Statutory	0,35	0,35	0,35	0,35	0,35	0,40	0,48	0,50	0,398
Marginal (MTR)	0,25 (34)*	0,26 (24)	0,31 (22)	0,25 (58)	0,37 (26)	0,24 (29)	0,29 (28)	N/A+	0,270
Effective (ETR)	0,20 (53)	0,24 (56)	0,22 (59)	0,17 (60)	0,23 (52)	0,25 (50)	0,29 (47)	0,29 (56)	0,230
Other statistics:									
Current liability/Total assets	0,469	0,512	0,417	0,427	0,387	0,376	0,368	0,376	0,417
Deferred tax/Total assets	0,043	0,039	0,035	0,033	0,020	0,021	0,025	0,023	0,029
Interest paid/ Turnover	0,027	0,032	0,029	0,024	0,017	0,021	0,024	0,025	0,026
Depreciation/Turnover	0,029	0,043	0,026	0,025	0,042	0,041	0,033	0,031	0,032
Fixed assets/Tangible assets	0,422	0,432	0,479	0,460	0,350	0,360	0,360	0,360	0,410
Short term borrowings/ Tangible assets	0,063	0,062	0,023	0,030	0,048	0,052	0,052	0,055	0,047
Long term debt/Total asset	0,147	0,151	0,137	0,136	0,083	0,084	0,090	0,081	0,113
Long term debt/BV of equity	0,241	0,206	0,216	0,224	0,273	0,291	0,286	0,223	0,234
Current ratio	1,78	1,70	1,74	1,72	1,72	1,73	1,77	1,59	1,70
Quick ratio	1,09	1,04	1,04	1,03	1,03	1,01	1,06	0,92	1,01
Interest bearing debt/Total assets	0,214	0,199	0,152	0,165	0,124	0,127	0,137	0,139	0,157
Cash flow//Total assets++	0,105	0,130	0,160	0,120	0,140	0,150	0,150	0,180	0,14
Market value equity/Book value equity	1,39	2,44	2,32	2,59	1,98	2,41	2,02	1,61	2,12
Percentage of firms that increased their debt level	56%	42%	50%	58%	50%	40%	50%	N/A	N/A

* Figures in the parenthesis show the number of firms used to calculate the averages.

+ Not available

++ Cash flow from operations as reported in the cash flow statement.

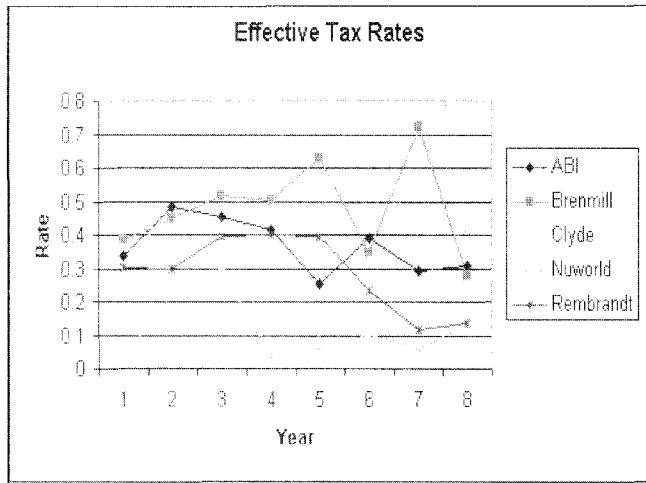


Figure 2: Tax rates (for randomly selected companies)

Table 1 also contains debt related statistics. It is interesting to note that the share of long-term debt in the permanent capital formation is small. Over the eight years period average long-term debt as a proportion of total assets and owners' equity constituted respectively about 11 percent and 23 percent. Short-term interest bearing debts were about five percent of total tangible assets. This allows us to approximate the total interest bearing debt at about 16% of total tangible assets. Deferred tax constitutes less than three percent while the ratio of current liabilities to total assets was about 42%. The rest of the table is self-explanatory.

3.2 Determinants of leverage

Several papers have reported variables that purport to be explanatory factors of leverage. Corporate and personal taxes, asset tangibility, collateral value of assets, degree of capital intensity, profitability, cash flows, liquidity, earnings volatility, share price volatility, beta, dividends, industry, interest and inflation rates have been reported. Prior studies did not show whether aggregate (cumulative) debt or incremental debt is relevant. Short-term interest bearing debt is often excluded from the analysis. A closer look at the characteristics of this debt however indicates that it is usually of a revolving nature. Further, pecking order theory (see Shyam-Sunder and Myers (1999) for example) also suggests that managers prefer the use of internal sources of finance to external sources. Additionally, when managers elect to go to external sources the preference is for debt than for equity. However in emerging markets long term corporate debt instruments are not commonly traded in well-functioning organized exchanges. This situation allows the banks to dominate the debt market (Beim and Calomiris, 2001).

Focusing on the trade-off theory, DeAngelo and Masulis (1980) predict an inverse relationship between

leverage and investment tax shield while the association between corporate tax rate and debt level is expected to be positive. As stated earlier testing these relationships requires finding proper proxies for tax, leverage and investment and debt related tax shields. Secondly, ideally the study should differentiate between long run steady equilibrium determinants of capital structure and short run contemporaneous relationships. Homaifar, Zietz and Benkato (1994) reported that short run contemporaneous relations are insignificant. They state that short run and long run relationships between non-debt tax shields and leverage are randomly distributed around zero, making their results inconsistent to DeAngelo and Masulis's non-debt tax shield hypothesis.

An additional point to consider is the income and substitution effects of leverage. Dammon and Senbet (1988) predict that DeAngelo and Masulis's trade off theory depends on the relative magnitude of the two (income and substitution of equity for debt or vice versa) and they show that the income effect is dominant. They state that firms with greater non-debt tax shields are likely to employ more debt. However, an increase in capital depreciation increases the probability that the firm's interest deductions will be partially or totally redundant in sheltering taxable corporate income (Dammon and Senbet, 1988:365). This implies that increases in investment related tax shields are not necessarily associated with decreases in interest tax shields.

Table 2 contains Pearson's correlation coefficients. Eight years average figures were used. Contrary to what is predicted in DeAngelo and Masulis, but similar to Boquist and Moore (1984), the correlation coefficient between interest paid and depreciation expense (both deflated by turnover) was insignificant. This means, ceteris paribus, a negative association between investments related tax shields and debt related tax shields is not observed. Note that both interest and depreciation are subjected to the same tax rate. Table 2 further shows that the association between tax (ETRs and MTRs) and extent of debt (L) is statistically significant and the sign of the relation is negative. This finding is inconsistent to the spirit advanced in Modigliani and Miller (1963) but corroborates, albeit indirectly, Fama and French (1998).

On a year-to-year basis, the association between ETRs and extent of leverage (long term debt/book value of equity) is negative in all the eight years and statistically significant in five of the eight years (Table 3). This is consistent with Gupta and Newberry's (1997) findings. A similar trend is seen when lagged values were used for ETRs. The negative association was also observed when the MTRs were used as a proxy for T_c . Interestingly, interest paid (I/TN) and depreciation (D/TN) showed a positive association. This might be because of the nature of the deflator. When incremental debt, ΔL_{td} (in both its year to year

and lagged forms) was considered, inconclusive results were obtained.

Table 2: Pearson's Correlation Coefficients, r^* (Based on average figures for the period 1991-98) (r)

	ETR	MTR	L	F	I	D	S	M	C
ETR	1,00								
MTR	0,65	1,00							
L	-0,37	-0,27	1,00						
F	-0,14	-0,00	0,16	1,00					
I	-0,16	-0,20	0,31	0,20	1,00				
D	-0,05	0,02	-0,01	0,49	0,09	1,00			
S	-0,04	0,04	0,20	0,28	0,02	-0,01	1,00		
M	0,13	0,16	-0,11	0,00	-0,07	-0,11	0,30	1,00	
C	0,17	0,26	-0,21	0,04	-0,13	-0,10	0,21	0,36	1

Critical values of r at 95% for sample size (N) 60 = 0.254 and when N = 70, $r = 0.235$.

Column description:

- ETR = Effective tax rate. Computed as the ratio of actual tax paid to EBIT
MTR = Marginal tax rate. Computed as the ratio of change in actual tax paid to change in EBIT
L = Leverage (long term debt/shareholders equity)
F = Asset tangibility (fixed assets/tangible assets)
I = Interest paid/turnover
D = Depreciation/turnover
S = Size (natural logarithm of assets)
M = The Market to book ratio of equity
C = Cash flow ratio (the ratio of cash flow from operations as reported in the cash flow statement to total assets)

4. RESULTS AND ANALYSIS

Based on the theories of asset tangibility, collateral value, agency, managerial opportunism and various empirical reports (see Harris and Raviv 1991 for reviews) the following relationship for leverage was postulated.

$$L = f(T_c, I, S, D, M, C, F) \quad \dots (4)$$

A linear relation is assumed and all the variables are defined as before. A total of twenty OLS regressions were run using (a) eight years' average figures (b) annual data over an eight year period (c) one year lags and (d) incremental debt. The result is given in Table 4. First, except in the case of the lagged forms (regression numbers 12 to 17) the coefficients of the two tax proxies (MTR and ETRs) are negative. In ten of the eleven regressions corporate tax rate is an

important variable of leverage (t-statistics greater than one). The four lagged regressions, represented by (-1) gave mixed results. Overall, the ETRs explain extent of leverage better than MTRs. Second, cash flow from operations (C) in the same year and in a lagged form is the second best explanatory variable of leverage. The sign of the coefficients have been predominantly negative. Third, depreciation has been insignificant and the signs of the regression coefficients were mixed. Therefore, no conclusion can be made. The lagged regressions indicate that the single most explanatory factor of current leverage was previous year level of leverage. This was observed when both incremental and cumulative debt indicators were used. Fourth, as expected, interest paid 'explains' leverage level. In nine out of the twenty regressions depreciation and interest moved in opposite directions. Therefore the trade-off theory can neither be supported nor refuted firmly.

At this juncture it is proper to consider factors that are likely to jeopardize the results of this work. The result is vulnerable to four criticisms. They are the long-term versus short-term debate, concerns of causality, collinearity and whether corporate debt behaviour can be better explained by theories other than the trade off model. Homaifar, Zietz and Benkato (1994) state that the OLS regressions computed without the use of some form of distributive lag models are short-term and therefore do not show 'the long run steady state equilibrium' as predicted in the trade off theory. In this research one year lagged values for ETRs did not consistently and significantly show positive association. We could not increase the lag period because of data limitation. Further, the use of three year lags is common in works that examine target adjustment models.

If one wants to address the causality issue properly, it may be preferable to formulate the research questions along the lines of structural equation models (Joreskog and Sorbom, 1979, Falk and Miller, 1992). The collinearity problem is common in cross sectional studies but even if one takes the argument to the extreme, it does not affect the main conclusions of this paper. The pecking order theorem is in competition to the trade off model. It requires a separate work.

Table 3: Pearson's correlation coefficients (r)

Variables	98	97	96	95	94	93	92	91
L, ETR	-0,52	-0,19	-0,34	-0,28	-0,24	-0,26	-0,02	-0,40
L, ETR(-1)	-0,40	-0,41	-0,20	-	-0,23	-0,05	-0,09	-
L, ETR(-2)	-0,49	-0,39	-	-	-0,05	-0,09	-	-
L, MTR*	-0,17	-0,10	-0,39	-0,22	-0,23	0,10	-0,30	-
L, MTR(-1)	-0,08	-0,29	-0,08	-0,23	0,09	-0,06	-	-
L, I/TN	0,31	0,10	-0,09	0,02	0,56	0,29	0,42	0,55
L(-1), I/TN	0,38	-0,03	0,07	-	0,41	0,30	0,46	-
L, D/TN	0,60	0,45	0,14	0,08	-0,15	-0,16	-0,03	0,15
L, D/TN (-1)	0,49	0,22	0,01	-	-0,14	0,01	0,01	-
I/TN, D/TN	0,42	0,21	0,18	0,28	0,33	0,66	0,36	0,54
I/TN, D/TN(-1)	0,41	0,17	0,21	-	0,35	0,56	0,31	-
L, F	0,16	0,14	0,19	0,21	0,31	0,14	-0,02	0,15
L, F(-1)	0,19	0,20	0,20	-	0,28	0,14	-0,08	-
L, S	0,47	0,29	0,35	0,36	0,17	0,15	0,07	0,12
L, S (-1)	0,43	0,25	0,33	-	0,16	0,11	0,05	-
L, C	-0,13	-0,26	-0,17	-0,17	-0,06	-0,25	-0,25	-0,15
L, C(-1)	-0,26	0,04	0,03	-	-0,19	0,00	-0,07	-
L, M	-0,10	0,02	0,16	-0,03	0,04	0,36	0,04	-0,04
L, M(-1)	-0,09	-0,04	0,16	-	0,41	-0,01	-0,07	-
Δ Ltd, ETR(-1)	-0,19	-0,16	0,22	0,01	-0,03	0,17	-	-
Δ Ltd, ETR(-2)	-0,04	-0,11	-0,16	0,29	-0,08	0,09	-	-
Δ Ltd _t /Ltd _(t-1) , MTR _t	-0,15	0,25	-0,27	0,03	0,29	-0,01	0,0	-
Δ Ltd _t /Ltd _(t-1) , MTR(-1)	0,07	0,42+	-0,13	0,40+	-0,02	0,27+	-	-

* Note that the sample size for MTRs is small

+ Potential area for further research

Critical values at 95% when sample size is 50 $r = 0.278$, when sample is 20 $r = 0.444$

Key:

L = Leverage (long term debt/equity)
L(-1) = Leverage, one period lag
I = Interest paid
C = Cash flow from operations

F = Asset tangibility
ETR = Effective tax rate
ETR (-1) = Effective tax rate, one period lag
ETR (-2) = Effective tax rate, two periods lag

D = Depreciation Expense
 Δ Ltd = Change in long term debt
M = Price to book ratio
 Δ Ltd (-1) = Change in long term debt, one period lag

MTR = Marginal tax rate
D/TN(-1) = Depreciation/turnover, one period lag

MTR(-1) = Marginal tax rate one period lag
F(-1) = Fixed assets one period lag

TN = Turnover
C (-1) = Cash flow, one period lag

5. CONCLUSIONS

This paper has addressed the thorny issue of capital structure. The notion advanced in Modigliani and Miller (1963) and whether capital structure irrelevancy theorem is observed in actual situation was examined by following the spirit contained in DeAngelo and Masulis's (1980) seminal work. In an environment where incremental earnings are not taxed progressively and using data for 64 firms that were listed in the JSE's industrial sector for the 1991-1998 period, we find a negative association between the tax rate variables and extent of leverage. Further, the trade off between investments related tax shields and debt related tax shield is not observed. Thirdly, leverage is best explained by its own lagged values.

Additionally, factors such as cash flows, asset tangibility, size and actual taxes paid explain leverage.

There are several avenues for future research. Replication of this work with a bigger sample and time horizon by using structural time series (see for example Bai, Lumsdaine and Stock, 1998) and/or cross sectional (Joreskog and Sorbom, 1979) methods has the potential to enhance our understanding of the nature of the association between leverage and firm value. Examining industry differences and the search for a methodology that exteriorises endogeneity are issues that require the attention of future research. Studying whether the pecking order theory of debt is superior in explaining corporate debt behaviour in South Africa is another direction.

Table 4: Regression output

Reg No.	Dependent Variable	Constant	L	T _c =MTR	T _c =ETR	F	I	D	M	S	C	N	Adjusted R ²
1	L ₍₉₁₋₉₈₎	-0,490+ -1,052		-0,4088 -1,6730		0,1359	2,7159	-0,8312	-0,0243	0,0398		61	11,8%
2	L ₍₉₁₋₉₈₎	-0,3385 -0,7360			-0,8656 -2,5176	0,0807	2,7330	-0,8294	-0,0223	0,0374		61	17%
3	L ₍₉₁₋₉₈₎	-0,4064 -0,9094			-0,8208 -2,4096		2,6606	-0,6559	-0,0139	0,0439	-0,4415	61	19%
4	L ₍₉₈₎	-0,9055 -2,2441			-0,5465 -1,6547	-0,2211	1,5508	4,1385	2,2757	0,0587	-0,1526	48	42,7%
5	L ₍₉₇₎	-0,6523 -1,5583			-0,3862 -1,8171	-0,0264	1,4651	0,3208	0,0476	0,0476	-0,5214	47	19%
6	L ₍₉₆₎	-1,2058 -2,1911			-0,8791 -2,6340	0,2353	-0,2295	-1,2428		0,0789	-0,3923	50	16,4%
7	L ₍₉₅₎	-0,8711 -2,0488			-0,7520 -2,8497	0,2866	-0,4978	-5,3040		0,0653	-0,7565	57	19,8%
8	L ₍₉₄₎	-0,1421 -0,1811			-0,4186 -1,2644	1,1994	12,479	-4,6367	0,0644	-0,0151	1,1776	35	45,5%
9	L ₍₉₃₎	-0,4817 -1,0529			-0,0607 -0,3451	0,3972	12,912	-5,8714	0,0145	0,0179	0,5943	35	56,7%
10	L ₍₉₂₎	0,0527 0,0747			-0,7595 -1,6117	-0,3454	10,075	1,1585	-0,0059	0,1221	0,4480	26	47%
11	L ₍₉₁₎	0,8146 0,7740			-1,3951 -2,7644	0,8258	3,0942	-2,4858	0,0193	-0,0360	1,1879	31	27%
12	L ₍₉₈₎	-0,4627 -1,6787	0,692(-1)* 6,7405		-0,4076(-1) -2,8327	0,073(-1)	0,148(-1)	0,319(-1)		0,031(-1)	-0,176(-1)	47	69,5%
13	L ₍₉₇₎	0,1117 0,2722	0,2628(-1) 2,4376		-0,5201(-1) -2,0452	0,184(-1)	-0,085(-1)	-1,009(-1)		0,005(-1)	-0,143(-1)	50	22,3%
14	L ₍₉₆₎	-0,1352 -0,4143	1,044(-1) 10,167		0,1181(-1) 0,5756	-0,002(-1)	-0,222(-1)	1,410(-1)		0,002(-1)	0,337(-1)	56	69,8%
15	L ₍₉₄₎	-0,0841 -0,3170	0,8985(-1) 8,5188		0,0318(-1) 0,3119	0,3562(-1)	2,1122(-1)	-1,825(-1)		-0,003(-1)	0,2009(-1)	34	89,5%
16	L ₍₉₃₎	-0,2957 -1,3308	0,6852(-1) 9,2591		0,1589(-1) 1,0170	0,3417(-1)	-1,6297(-1)	-3,7011(-1)		0,0173(-1)	-0,2835(-1)	26	85,5%
17	L ₍₉₂₎	-1,4774 -1,1441	0,9101(-1) 3,6621		0,3426(-1) 0,4802	-0,2451(-1)	7,0173(-1)	-2,003(-1)		0,0475(-1)	2,8389(-1)	30	50,7%
18	Δltd ₍₉₈₎	-0,4626 -1,6787	-0,308(-1) -3,0017		-0,4071(-1) -2,8327	0,073(-1)	0,148(-1)	0,319(-1)		0,031(-1)	-0,175(-1)	47	16%
19	Δltd ₍₉₇₎	0,112 0,2722	-0,737(-1) -6,8345		-0,5201(-1) -2,0452	0,184(-1)	-0,085(-1)	-1,009(-1)		0,005(-1)	-0,143(-1)	50	49,2%
20	Δltd ₍₉₆₎	-0,085 -0,2632	0,065(-1) 0,6259		0,1741(-1) 0,8395	-0,048(-1)	-0,135(-1)	1,667(-1)		-0,001(-1)	0,443(-1)	57	0%

+Row 1: OLS coefficients Row 2: T-values *(-1)=one-year lag N = number of observations in the cross sectional regression

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