# How Does a Firm's Capital Structure Affect Stock Performance ?

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## Abstract

This paper examines the relationship between capital structure and shareholder returns in the UK between 1980 and 2008. Expanding on Modigliani and Miller's (1958) Proposition 2, returns are estimated using the asset pricing models of CAPM, Fama and French and of Carhart. The analysis shows that gearing (in the form of debt finance) is a characteristic that influences stock returns and that, in contrast to accepted finance theory, is negatively related to estimated returns. This relationship is tested empirically for robustness with other risk factors such as corporate tax rates and industry concentration, the results remain consistent throughout the analysis. If confirmed, the negative impact of debt financing on shareholder returns should trigger a major rethink on corporate financing strategies.
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## 1 - Introduction

Amongst the myriad of concerns a company management will be required to address, the issue of capital structure is one that is often relegated to the "engine room" of the finance department. All too often, and despite the best efforts of operational management dealing with day-to-day issues of corporate strategy and execution, an inappropriate capital structure can negate all such efforts to the extent of driving the company into administration or bankruptcy. Within the last decade, the successive debacles of the Dotcom Boom and Bust (2000 – 2002) and the Financial Crisis (2007 onwards) have shown that a wide range of companies in very different sectors have failed to manage this issue, often with deleterious results.

There is a dearth of management research focusing on capital structure of firms and the impact this has on firm performance measured in terms of stock returns (one of the key criteria by which managements are judged). At its simplest, capital structure is simply the mix of financial instruments used to provide the necessary long-term capital needed by any company. Generally these instruments will include equity in the form of shares, debt in the form of bank loans or bonds and hybrid instruments such as convertible stock. Of these, equity and debt are the two key ingredients in the overwhelming majority of cases.

Traditional corporate finance theory, as accepted by most practical decision makers, assumes that equity is the most expensive form of capital, as the required dividend needed to reward shareholders has to be paid out of after tax profits. It benefits, however, from the participation of generally passive equity shareholders who are unlikely to be armed with covenants over the firm's behaviour and who rank last in precedence in claims over the company's assets. In contrast, debt is the cheaper form of capital being deductible from profits before tax but generally is provided by banks or bondholders who do retain covenants against which a company management is judged. In recent decades it is the banks and, to a lesser extent, bondholders who have instigated administration or bankruptcy proceedings in the event of company underperformance.

Often regarded as the starting point of modern finance theory, Miller and Mogdiliani (1958) provide a guide for management to implement the most appropriate capital structure for any particular company. In their First Proposition Miller and Mogdiliani claim that the value of a firm is independent of its capital structure, (the so-called capital irrelevance supposition) thereby suggesting that any answer will do. This may explain why managements often concentrate on business strategy at the expense of

financing decisions hence the occurrence of (often spectacular) bankruptcies over recent decades.

However, this proposition was posited in an theoretical world with limited empirical testing. In the real world, a company financed overwhelmingly by debt runs an above-average risk of violating debt covenants and so being tipped by its creditors into administration, (a discontinuity not explicitly acknowledged by Miller and Mogdiliani). In contrast, a company financed entirely by equity, is foregoing the benefits of cheaper debt financing, therefore depressing returns to its shareholders.

Therefore a company is best served by a mixture of equity and debt to optimize its cost of capital. The optimal mix at anytime will depend on exogenous factors such as tax and interest rates, but stated pragmatically, the weighted average cost of company's capital (WACC) will fall as the proportion of debt increases, until such point when the company's ability to service the debt from operating cash flows comes into doubt – at which point the cost of debt will rise, thereby raising the WACC. Stated another way, returns to shareholders will rise with the increasing proportion of debt (i.e. leverage, defined as the ratio of Debt to Equity capital), until such point as the debt is seen to threaten the viability of the firm. Such returns, particularly those on shareholder equity, are generally regarded as the key indicators of management performance and very often feature as targets in executive compensation plans. Not surprisingly then, such metrics are of key interest to both management and shareholders.

This paper seeks to provide an explicit test of Miller and Mogdiliani theory by measuring the returns to shareholders as a function of increasing leverage. The study focuses on a broad range of companies in a broad range of sectors quoted on the London Stock Exchange during the period (1980-2008). It provides additional evidence to a body of similar such studies from the USA and elsewhere and provides what the present authors believe will be considerable food for thought for executives deciding on this key issue.

The main contribution of this paper is to use several risk adjustments in calculating abnormal returns as they could affect the balance of the relationship between returns and gearing. Our methodology uses the alphas from a number of asset pricing models on time series of individual firm data, namely, the CAPM, the Fama-French model and the Carhart model.

This study contributes to the literature by using the panel data of all non-financial firms listed on the London Stock Exchange (LSE), contains information for twenty-eight years and combines cross sectional data with time series. The findings indicate consistently that returns decrease in gearing. This contradicts MM's traditional finance theory and suggests that there is a

need for better understanding of the relation between gearing and abnormal returns. The conventional wisdom is that higher gearing is associated with higher firm risk and thus leads to higher returns. Once we account for the risk factors we show that the relation between gearing and abnormal returns is negative and remains so when we consider tax rates and industry concentration.

The paper is organised as follows. Section two provides the motivation linking firm gearing and stock returns. Section three describes the sample and methods used. Section four presents the results of the study and section five concludes.

## 2 – Literature Survey

Capital structure decisions are critical as a change in a firm's approach to gearing can increase or decrease the financial strains on the firm and affect the firm's performance (Findlay and Williams, 1987). Several studies in the financial literature examine the capital structure and financing choices that managers face. A change in the gearing ratio can affect a firm's financing capacity, risk, cost of capital, investment and strategic decisions, and ultimately shareholder returns.

This article is related to Muradoglu and Sivaprasad's previous studies (2011a, b), where abnormal returns are defined in excess of the market return and the risk free rate respectively, but uses a different methodology to demonstrate the existence of a gearing effect on UK stock returns. These models have been used extensively in the UK literature (Fletcher, 2001; Michou, Mouselli and Stark, 2007; Agarwal and Taffler, 2008; Gregory et al., 2013). We choose to use them together with risk adjusted excess returns to explain the relation between gearing and stock returns. We show that, regardless of the methodology we use for risk adjustments, estimated excess returns and firm gearing remain negatively related**.**

Michou, Mouselli and Stark (2007) point out that the results of estimating alphas for portfolios using the three factor model are sensitive as to how the SMB and HML factors are constructed and Dedman et al., (2009) illustrate that this can lead to different conclusions being drawn. Gregory Tharyan and Christidis (2013), also express caution as to whether such factors completely capture risk in the UK. They recommend long run tests of abnormal returns be based on characteristic matched portfolios. Although these factors are available for the UK, taking into account these concerns we

construct factor mimicking portfolios for SMB, HML and momentum on a much larger sample of all non-financial companies traded on the London Stock Exchange and using portfolio formation periods that take into account the timing of the release of balance sheet information.

MM's Proposition 2 states that expected stock returns should be an increasing function of gearing (debt). This proposition has become one of the foundations of corporate finance theory. MM state that the value of a firm is independent of its capital structure (Proposition 1). They argue that as debt increases the riskiness of the stock, equity shareholders will demand a higher return (Proposition 2). They test their theory in a restricted sample consisting of two industries, each representing a risk class, namely the oil sector and the utilities sector, they find supporting evidence. Schwartz (1959) argues that there exists an optimal capital structure for each firm as long as firms attempt to maximise the long-term market value of the shares.

More recent empirical evidence, however, shows mixed results on the direction and the extent of the effect of gearing on returns. Hamada (1972) and Bhandari (1988) examine the relation between common stock returns and systematic risk using samples of US firms and find that returns increase in gearing in agreement with MM's (1958) proposition 2. However, a number of authors find empirical evidence, mainly in the US, that the effect of gearing on returns is negative (see for example Dichev and Piotroski, 1999; Spiess and Affleck-Graves, 1999; Bradshaw, Richardson and Sloan, 2006; Billet, Flannery and Garfinkel, 2006; Penman et al., 2007; Dimitrov and Jain, 2008; George and Hwang, 2010; Korteweg, 2010; Muradoglu and Sivaprasad, 2012a, b).

In the UK, whilst most capital structure studies test aspects of capital structure theories (for example, Lasfer, 1995; Ataullah, Higson and Tippett, 2007; Dang 2011), little work has been published on the empirical relation between gearing and stock returns (Strong and Xu, 1997; Muradoglu and Sivaprasad, 2011a, b). This study extends the literature by employing a robust estimation of abnormal returns using three asset-pricing models, Sharpe's CAPM, Fama and French and the Carhart model. We show that regardless of the method of estimation, abnormal returns decline in gearing. We also take into account corporate taxes and the competitiveness of the industry where firms operate. Both variables may have direct effects on returns as well as affecting the relationship between returns and gearing. For example, MM (1963), Miller (1977), Martin and Sloane (1980), Graham (2000) and Dhaliwal et al., (2006) argue that, due to the tax benefits of debt financing, tax rates play an important role in explaining returns. Our findings indicate that

indeed tax rates explain stock returns and those firms paying higher corporate taxes earn higher returns.

In their study, Hou and Robinson (2006), show that industry concentration is also an important variable in explaining stock returns. They find that the degrees of concentration of industries have an impact in explaining stock returns across firms. In competitive industries returns tend to be higher due to pressures from competition and higher bankruptcy risks in comparison to concentrated industries. Our results are in agreement with Hou and Robinson's and indicates that firms in lower concentration industries experience higher returns.

In the past, studies that examined the relation between gearing and return used different definitions of returns. For example Hamada (1972) used accounting profits; Bhandari (1988) used inflation adjusted returns; more recently Dimitrov and Jain (2008) and Korteweg (2010) chose risk-adjusted returns, while Muradoglu and Sivaprasad (2011a) use market adjusted returns. This paper adopts a robust estimation of returns to shareholders: the excess return or alpha based on three widely used asset-pricing models, the CAPM, Fama-French (1993) and the Fama-French plus Carhart (1997). Carhart's four factor model encompasses all the traditional risk factors and is arguably a more robust estimator for returns.

In this study we measure gearing as the ratio of the book value of total debt to total capital. There is a need to use a broader definition of financial structure in order to account for the large measure of substitutability between the different forms of debt. Using book values in defining the capital structure encompass the total of all liabilities and ownership claims (Schwartz, 1959) and ensures that the effects of past financing are best represented (Rajan and Zingales, 1995). Graham and Harvey (2001) report that managers focus on book values when setting financial structures. Additionally, Barclay et al. (2006) show how book gearing is preferable when regressing financial gearing, as using market values in the denominator might spuriously correlate with exogenous variables.

## 2 – Gearing and Stock Returns

In their seminal work MM (1958) represent equity returns by the average cost of capital in a one-year period and conduct estimations on a cross-section of a particular risk class. This study represents equity returns as abnormal returns computed from the alphas of three asset pricing models. An

accepted feature of capital markets theory is that the principal sources of risk are determined by operating risk and financing risk represented by gearing.

Penman et al. (2007) decompose the book-to-price ratio into two components, one that pertains to business operations and one that pertains to financing activities. In contrast to MM (1958) proposition 2, they observe that the gearing component is negatively associated with expected stock returns in their US based sample of firms. They argue that this negative relation between gearing and stock returns indicates how gearing should be priced and taken into account whilst evaluating risk in the asset pricing models.

MM (1963) explain that, due to the tax advantage of debt, shareholders would benefit from debt in the capital structure. The traditional view is that there are tax benefits to debt, but that beyond a certain level, these are counter balanced by costs associated with bankruptcy and financial distress. Dhaliwal et al. (2006) examine the relation between gearing, corporate taxes and the firm's implied cost of capital in a sample of US firms between 1985 and 2004, when corporate taxes are taken into account they find that returns decrease in gearing.

Antoniou, Guney and Paudyal (2008) argue that the impact of the effective tax rate varies across countries, suggesting that differences in their institutional arrangements and traditions may contribute to the capital structure decisions of firms. Following their work, this paper uses effective corporate tax rates to account for all allowances and reliefs offered by a particular tax system and eliminate all measurement and bias errors resulting from the use of proxies for tax (Lasfer, 1995). Our findings indicate that the returns decrease in gearing where firms' tax rate is zero as well as where it is greater than zero.

Previous studies have examined the effects of industry and industry concentration on capital structures and stock returns (Arditti, 1967; Chambers, 1974; Hull, 1999; Mackay and Phillips, 2005; Hou and Robinson, 2006). Peles and Schnell (1979) examine how industry averages represent target levels for a firm's liquidity ratio. Arditti (1967) explains that some risks are endogenous to each industry grouping and hence the true nature of the gearing return relation can be disclosed only by testing the effect of industry concentration on gearing. Hull (1999) finds that the stock value is influenced by how a firm changes its gearing in relationship to its industry average. Campello (2003) shows the effects of capital structure on product market outcomes for a cross section of industries. He provides evidence that firms that rely on debt are more likely to reduce their investment in market share-building during downturns

Hou and Robinson (2006) offer clear evidence that industry concentration is an important economic determinant for understanding stock returns. Importantly, industry concentration can also affect the financing needs of companies. We analyse the relation between industry concentration and stock returns and find that the effect of gearing on returns remains negative for low and high concentration firms.

## 2 – Data and Method

The source of all our data is Thomson Reuters DataStream. The study starts with 2,673 companies listed on the London Stock Exchange from 1980 to 2008. To enter the sample, a firm's fiscal year-end gearing ratio and stock price series for at least the preceding 12 months have to be available. All financial companies, including banks, investment companies, insurance and life assurances, as well as companies that have changed the fiscal period end date during the research period are excluded. Thus, 1,092 [1] financial companies are removed, another 490 companies are excluded because they do not have matching year-end gearing ratios and stock prices for all subsequent years. We also exclude 173 companies with short quotation experience, 130 companies with a market value of less than £1 million and firms with negative market-to-book values.

The resulting sample contains 6852 firm year-end observations of 792 companies listed on the London Stock Exchange from 1980 onwards[3]. Firms are ranked according to the gearing that is available from annual reports with year-end dates of December 31st or before, every year. The paper uses the capital gearing definition (DataStream code: WC08221) to represent the gearing of companies in the sample. It represents the total debt to total financing of the firm.

This paper takes into account industry concentration and tax rates as explanatory variables that might have an effect on the debt-return relationship. We use end of year Balance Sheet figures to estimate both variables. Tax is the effective corporate tax rate for year *t*. It is estimated as the ratio of total tax paid by the firm in year *t* to the total taxable income in year *t*. We measure industry concentration using the Herfindahl Index, which is defined as:

$$Herfindahl_j = \sum_{i=1}^{I} s_{ij}^2 \quad (1)$$

[1] In the sample 12 firms are dual listed.

Where $s_{ij}$ is the market share of firm *i* in industry *j*. The study performs the above calculations for each industry and then averages the values over the past three years. This is to ensure that the Herfindahl measure is not unduly influenced by potential data errors (Hou and Robinson, 2006). We use net sales to calculate market share, as this is the most common Herfindahl measure. Small values of the Herfindahl Index (0-1,800) imply that many competing firms operate in the industry, while large values (1,800-10,000) indicate that market share is concentrated in the hands of a few large firms.

Panel A of Table 1 provides a summary of the various sectors, number of firms in each sector, firms' age, and their capital structure. There are a total of nine sectors[2]. The second column provides information on the number of firms in each sector over the period and we find that the industrials and consumer services sectors have the largest number of firms with 302 and 212 respectively and the Utilities sector has the lowest number with 14 firms. The third column provides information on the number of firms that are in each sector. The fourth column provides the average gearing in each sector with Utilities having the highest at 46.86 percent and the lowest gearing at 24.55 percent in the Technology sector. The fifth and sixth columns provide the minimum and maximum range for gearing that ranges from zero to 99.73.

Panel B of Table 1 presents the summary statistics for the four variables: monthly stock returns, gearing, tax-rates and the Herfindahl Index. We calculate gearing, tax and Herfindahl Index as of year-end Balance Sheet figures. The sample's mean and the median returns are -0.02 and -0.05 percent respectively with a standard deviation of 12.11 percent. The mean and median values for gearing are 27.2 percent and 25.9 percent, respectively, its standard deviation is 19.45 percent, with a range between 0 and 99.67 percent. High kurtosis indicates "fat tails", i.e. higher frequencies of outcomes at the extreme negative and positive ends of the distribution. From the JB statistic we observe that there is non-normality in the data set.

**Table 1 Summary Statistics**

This table reports the summary statistics of our sample. Panel A provides a summary of the various sectors, number of firms in each sector, firms' age, and their capital structure. Panel B provides the summary statistics of the returns, gearing, tax and the Herfindahl Index.We have a total of 6852 year-end observations for a sample of 792 companies for the period 1980-2008. We calculate the abnormal returns for the

[2] Appendix 1 for the various industry sectors

sample of 792 non-financial firms from 1980-2008. The abnormal returns are estimated by using the asset pricing models of CAPM, Fama-French and Fama-French plus Carhart. To perform the regressions we use panel least square and fixed effects for firms with whitening in the cross-sections. We obtain gearing from Datastream (Datastream code WC08221). Gearing represents the total debt to the total financing of the firms. We rank the gearing of each company from low to high. HI refers to the Herfindahl Index refers to the degree of high concentration of firms. It is estimated by calculating the sum of squared sales based market shares of all firms in that industry in a given year and then averaging over the past three years. Low concentration firms range from 0-1800 and high concentration firms are those that range from 1800-10000.

Panel A

| Sector | Nos of Firms | % of Firms < 25 years of Age | Avg Gearing | Min. Gearing | Max. Gearing |
|---|---|---|---|---|---|
| Oil&Gas | 23 | 20 | 27.14 | 0 | 97.37 |
| Basic Materials | 36 | 26 | 28.35 | 0 | 97.15 |
| Industrials | 302 | 231 | 29.20 | 0 | 99.67 |
| Consumer Goods | 81 | 63 | 28.91 | 0 | 91.69 |
| Healthcare | 37 | 28 | 29.02 | 0 | 97.93 |
| Consumer Services | 212 | 170 | 26.56 | 0 | 99.73 |
| Telecommunications | 20 | 17 | 29.36 | 0 | 95.51 |
| Utilities | 14 | 14 | 46.86 | 0 | 95.63 |
| Technology | 67 | 60 | 24.55 | 0 | 96.8 |

Panel B

| | Stock Returns | Gearing | Tax | Herfindahl Index |
|---|---|---|---|---|
| Mean | -0.02 | 27.15 | 0.27 | 1211.78 |
| Median | -0.05 | 25.86 | 0.30 | 700.70 |
| Std Dev. | 12.11 | 19.45 | 0.14 | 1175.70 |
| Kurtosis | 13.20 | 3.20 | 4.19 | 10.08 |
| Skewness | 0.99 | 0.63 | 1.38 | 2.33 |
| Minimum | -87.76 | 0.00 | 0.00 | 330.53 |
| Maximum | 269.10 | 99.67 | 0.89 | 9741.05 |
| JB statistic | 682378.00 | 531.98 | 603.50 | 30486.20 |

*Returns Estimation Models*

We use Sharpe's Capital Asset Pricing Model (CAPM), the Fama-French three factor model and the Carhart four factor model to estimate abnormal returns for each stock. Stock returns for each company are calculated monthly, using the percentage change in consecutive closing prices adjusted for dividends, splits and rights issues (Fama et al. 1969). Next, the study estimates abnormal returns in excess of the risk-free rate.

For CAPM, we estimate the intercept term alpha by performing the regression and a sixty month estimation period using a rolling window for every month:

$$R_t - r_{ft} = \alpha_{CAPM} + \beta_1 Exrm + \varepsilon_t \quad (2)$$

Re-arranging equation (2), abnormal returns are defined as:

$$\alpha_{CAPM} = R_t - r_{ft} - \beta_1 Exrm - \varepsilon_t \quad (3)$$

where, $R_t$ is the monthly stock returns at time *t*, $r_{ft}$ is the one month UK Treasury discount bill used as a proxy for the risk free rate; $\alpha_{CAPM}$ is the intercept which indicates an abnormal return, $\beta_1$ is the slope coefficient from the CAPM regression, Exrm is the excess return of the market (proxied by the FTSE All Share Index) over the one month UK Treasury discount bill and $\varepsilon_t$ is an error term. Following Fama-French (1993), Exrm is the proxy for the market factor in stock returns which is the excess market return over the one month UK treasury

For the Fama-French three factor model, we compute the intercept using a sixty month estimation period and monthly rolling windows as follows:

$$R_t - r_{ft} = \alpha_{FF} + \beta_1 SMB + \beta_2 HML + \beta_3 Exrm + \varepsilon_t \quad (4)$$

Re-arranging equation (4), abnormal returns are defined as:

$$\alpha_{FF} = R_t - \beta_1 SMB - \beta_2 HML - \beta_3 Exrm - \varepsilon_t \quad (5)$$

$\alpha_{FF}$ is the intercept which indicates an abnormal return; $\beta_1, \beta_2, \beta_3$ are estimated by regressing stock's monthly excess returns on the monthly market excess returns, market-to-book, and size factor returns for the estimation period. We examine stocks' excess returns based on the portfolio approach formed by sorting companies according to size and market-to-book values. SMB is the

size mimicking portfolio and, HML is the market-to-book mimicking portfolio. The portfolio SMB (small minus big is meant to mimic the risk factor in returns related to size. It is the difference, each month between the simple average of the returns on the three small stock portfolios (S/L, S/M, and S/H) and the simple average of the returns on the three big-stock portfolios (B/L, B/M and B/H) Hence, SMB is the difference between the returns of the small and big stock portfolios. The portfolio HML (high minus low) is meant to mimic the risk factor in returns related to market-to-book equity (FF 1993). It is the difference each month between the simple average of the returns on the two high-ME/BE portfolios(S/H and B/H) and the average of the returns on the two low ME/BE portfolios (S/L and B/L). Thus, HML is the difference between the returns of the high ME/BE and low ME/BE stock portfolios.

Finally, the study estimates abnormal returns using the Carhart's four factor model using a sixty month estimation period with monthly rolling windows,

$$R_t - r_{ft} = \alpha_{FF+C} + \beta_1 SMB + \beta_2 HML + \beta_3 Exrm + \beta_4 MOMENTS + \varepsilon_t \quad (6)$$

Re-arranging equation (6), abnormal returns are defined as:

$$\alpha_{FF+C} = R_t - r_{ft} - \beta_1 SMB - \beta_2 HML - \beta_3 Exrm - \beta_4 MOMENTS - \varepsilon_t \quad (7)$$

Where $\alpha_{FF+C}$ is the intercept which indicates an abnormal return; MOMENTS is the momentum mimicking portfolio. The portfolio MOMENTS (high minus low) meant to mimic the risk factor in returns related to momentum (Carhart 1997). It is the difference each month between the simple average of the returns on the three (deciles 8, 9, 10) high returns portfolios and the average of the returns on the three(deciles 1,2,3) low returns portfolios. Thus, MOMENTS is the difference between the returns of the high and low returns stock portfolios. $\beta_1$, $\beta_2$, $\beta_3$ and $\beta_4$ are estimated by regressing stock's monthly excess returns on the size factor, market-to-book factor, monthly market excess returns and momentum for the estimation period. In all the above regressions, the intercept term $\alpha$ indicates an abnormal return. To estimate the abnormal returns for each stock *i* at time *t* we use 60 monthly returns in excess of the risk-free rate prior to month *t*.

We proceed to test our hypothesis by first determining how abnormal returns at the firm level, as estimated above, are correlated with the gearing of the firms. Following Penman et al. (2007) we expect abnormal returns to decline in gearing. We also test whether corporate tax rates and industry concentration hold additional explanatory power.

To do so we estimate equations (8) through (10) accordingly. The number of year-end observations is 6852. To increase the robustness of our findings we conduct additional estimations for sub-samples of firms with non-zero gearing and zero gearing as well as for firms operating in high and low concentration industries.

$$\alpha_{it} = \delta + \lambda Gearing + \varepsilon_t \quad (8)$$

$$\alpha_{it} = \delta + \lambda_1 Gearing + \lambda_2 Herfindhal - Index + \lambda_3 Taxrate + \varepsilon_t \quad (9)$$

$$\alpha_{it} = \delta + \lambda_1 Gearing + \lambda_2 Herfindahl - Index + \lambda_3 Tax - rate + \lambda_4 Gearing * AvgHI + \lambda_5 Gearing * Tax - rate + \varepsilon_t \quad (10)$$

In equations (8), (9) and (10), $\alpha_{it}$ are the abnormal returns[9] found for each asset pricing model as in (3), (5) and (7), $\delta$ is a constant and gearing is measured as the ratio of total debt to total equity plus debt. In equation (10) the study examines the effective tax rate paid by companies; the Herfindahl Index and two interaction terms, one between gearing and industry concentration, one between gearing and tax rate, $\varepsilon$ is the error term. We estimate all regressions using panel least square and fixed effects for firms. Following Flannery and Rangan (2006) our approach uses fixed effects for firms in the panel to account for the richness of individual firms' unique information and for the possibility of varying degrees of risk acceptance in ownership decisions (Schwartz, 1959). We also tested for structural breaks in the data using Quandt-Andrews test with probabilities calculated using Hansen's (1997) method and find that no significant structural breaks exist in our sample.

## 5 – Findings

*Returns and Gearing*

The regression results of equations (8) to (10) with excess returns estimated using different asset pricing models as in equations (3), (5) and (7) for all firms with gearing ratios ranging from zero to ninety-nine percent are shown in Table 2. For the overall sample, when abnormal returns are estimated with

the CAPM, our regressions results indicate a negative and significant relation between gearing and returns when gearing is the sole explanatory variable. Hence, and in contrast to accepted theory, managers would appear to enhance shareholder returns by avoiding gearing altogether. The first column of Table 2 shows that a 1 percent increase in gearing is associated with a 0.04 percent decline in abnormal returns. This result is economically significant. For example if the median gearing firm in our sample with a gearing ratio of 25% increases its gearing to 35%, this will be associated with a 0.4% decline in its monthly abnormal returns that corresponds to a 4.8% decline in annual abnormal returns, underperformance that any manager would naturally strive to avoid.

Next, when returns are estimated using the Fama-French model and then regressed according to equation (8) our results still indicate that returns decline with gearing. However the negative change in return here becomes smaller, as a 1 percent increase in gearing is associated with a 0.01 percent decline in returns. The results remain similar when we use the four factor Fama-French and Carhart model; we find that a negative and significant relation between gearing and returns persists; a one percent increase in gearing is again associated with a 0.01 percent decline in returns. Still this result is economically significant. If the median gearing firm in our sample with a gearing ratio of 25% increases its gearing to 35%, this will be associated with a 0.1% decline in its monthly abnormal returns that corresponds to a 1.2% decline in annual abnormal returns.

When we use cross-sectional regressions as per equation (9), where we include tax rates and industry concentration as additional explanatory variables, gearing remains negative and significant. When returns are estimated with the CAPM, we find that firms on higher tax rates earn higher returns, as expected. In the second column, where returns are estimated using Fama-French, we find that for every one percent increase in gearing returns fall by 0.01 percent. This result is consistent with our previous findings where gearing was the only explanatory variable. The coefficient for the tax rate remains positive, indicating that firms on higher tax rates achieve higher returns. Finally, in the third column, our findings are confirmed, when we estimate returns using the four-factor Carhart model a negative and significant relation between monthly abnormal returns and gearing persists. For every one percent increase in gearing, the decline in returns remains 0.01 percent. The coefficient for tax rate remains positive but becomes insignificant.

The interaction terms for gearing and AvgHI test the moderating effect of industry concentration on the relation between gearing and returns. When returns are estimated with the CAPM, the coefficient on the interaction

term is negative indicating that for firms with high concentration the negative effect of gearing on returns is accentuated. Results remain similar when returns are estimated using the Fama-French model and four factor Carhart model. The interaction term for gearing and tax rate shows the moderating effect of corporate tax rates on the relation between gearing and returns. The coefficient estimate for the interaction term is insignificant for estimations with CAPM and Fama-French three factor model. When returns are estimated with the four-factor model, the coefficient on the interaction term is positive and significant indicating that for firms that pay higher taxes the negative effect of gearing on returns is reduced. The results from interaction terms are consistent with the positive coefficient estimates for tax rates and negative coefficient estimates for industry concentration ratios.

**Table 2 Returns and Gearing**

This table reports our cross-sectional regression results on returns, gearing, tax-rate and Herfindahl Index. We have a total of 6852 year-end observations for a sample of 792 companies for the period 1980-2008. We calculate the abnormal returns for the sample of 66 non-financial firms from 1980-2008. The abnormal returns are estimated by using the asset pricing models of CAPM, Fama-French and Fama-French plus Carhart. To perform the regressions we use panel least square and fixed effects for firms with whitening in the cross-sections. We obtain gearing from Datastream (Datastream code WC08221). Gearing represents the total debt to the total financing of the firms. We rank the gearing of each company from low to high. HI refers to the Herfindahl Index refers to the degree of high concentration of firms. It is estimated by calculating the sum of squared sales based market shares of all firms in that industry in a given year and then averaging over the past three years. Low concentration firms range from 0-1800 and high concentration firms are those that range from 1800-10000. Figures in parentheses represent the t-statistics. *** for 1% level, **5% level and *10% level of significance.

| | CAPM | Fama-French | Fama-French+Carhart |
|---|---|---|---|
| C | 1.26*** | 6.68*** | 0.52*** |
| | (12.90) | (10.77) | (17.74) |
| Gearing | -0.04*** | -0.01*** | -0.01*** |
| | (-11.83) | (-4.11) | (-10.78) |
| C | 4.15*** | 0.56*** | 0.85*** |
| | (15.68) | (16.46) | (-12.10) |
| Gearing | -0.04*** | -0.01*** | -0.01*** |
| | (-11.93) | (-9.93) | (-12.10) |
| Tax-rate | 6.53*** | 0.98*** | 0.70 |
| | (18.91) | (11.85) | (0.71) |
| HI | 0*** | 0*** | 0*** |
| | (-20.64) | (-17.65) | (-11.79) |
| C | 3.78*** | 0.41*** | 0.76*** |
| | (8.87) | (8.29) | (10.73) |
| Gearing | -0.03*** | -0.01*** | 0.01*** |
| | (-3.11) | (-3.60) | (-5.13) |
| Tax-rate | 6.33*** | 0.99*** | 0.08 |
| | (8.95) | (10.91) | (0.76) |
| HI | -0.01*** | 0*** | 0*** |
| | (-12.73) | (-7.74) | (-7.69) |
| Gearing*AvgHI | -1.58*** | -0.92*** | -0.04*** |
| | (-4.14) | (-10.82) | (-4.20) |
| Gearing*Taxrate | 0.01 | -0.09 | 0.02*** |
| | (0.31) | (-0.02) | (3.21) |

*Robustness tests*

We perform robustness tests by taking firm and industry characteristics into account to ensure the stability of our findings. Robustness checks are carried out to substantiate the effect of gearing on returns for sub-samples of non-zero gearing firms, for non tax-paying firms and for firms in highly concentrated industries.

It is argued that there are potential benefits to debt financing (Miller, 1977; Graham, 2000). We examine the effect of gearing exclusively on non-zero gearing firms. Dang (2010) contends that excluding zero-gearing firms helps to increase the average gearing ratio significantly. Hence this test provides a better understanding of the relation between stock returns and gearing for firms that use predominantly debt financing. Table 3 presents the cross-sectional regression results when gearing is the sole explanatory variable, as in equation (8) and when other risk factors are added, as per equations (9) and (10), on a sample where zero gearing firms are excluded. The paper estimates returns using all three pricing models.

When we apply equation (8) where gearing is sole explanatory variable and estimate returns with the CAPM our results still indicate a negative and significant relation between gearing and returns. The decline in returns for an additional unit of gearing remains 0.04 percent as it was the case for the overall sample. The results for this sub-sample remain unchanged with respect to the overall sample when we estimate returns with the Fama-French model. We find that this is also the case when returns are estimated with the Carhart model.

When tax-rates and industry concentration are included as additional explanatory variables the gearing coefficient remains negative and significant, for CAPM returns a 1 percent increase in gearing still leads to a reduction in returns of 0.04 percent. When returns are estimated using the Fama-French model and Fama-French plus Carhart the results do not change with respect to the overall sample, the coefficient for gearing remains negative and significant, for a one percent increase in gearing returns fall by 0.01 percent in both models. .

When returns are estimated with the CAPM, the coefficient on the interaction term for gearing and AvgHI is negative. Results remain similar when returns are estimated using the Fama-French model and four factor Carhart model. When we test the interaction term for gearing and tax rate, the coefficient on the interaction term is positive and significant only when returns are estimated with the four-factor model. These results are consistent with those reported above in Table 2. They indicate that for firms with high

concentration the negative effect of gearing on returns is accentuated and for firms paying high taxes the negative effect of gearing on returns is reduced.

**Table 3 Returns and Non-Zero Gearing Firms**

This table reports our cross-sectional regression results on abnormal returns, gearing, tax-rate and Herfindahl Index on a sample of non-zero gearing firms. We have a total of 6852 year-end observations for a sample of 792 companies for the period 1980-2008. We calculate the returns for the sample of 792 non-financial firms from 1980-2008. The abnormal returns are estimated as by using the asset pricing models of CAPM, Fama-French and Fama-French plus Carhart. To perform the regressions we use panel least square and fixed effects for firms with whitening in the cross-sections. We obtain gearing from Datastream (Datastream code WC08221). Gearing represents the total debt to the total financing of the firms. We rank the gearing of each company from low to high. HI is the Herfindahl Index; it refers to the degree of high concentration of firms. It is estimated by calculating the sum of squared sales based market shares of all firms in that industry in a given year and then averaging over the past three years. Low concentration firms range from 0-1800 and high concentration firms are those that range from 1800-10000. Figures in parentheses represent the t-statistics. *** for 1% level, **5% level and *10% level of significance.

| | CAPM | Fama-French | Fama-French + Carhart |
|---|---|---|---|
| C | 1.29*** | 0.42*** | 0.50*** |
| | (7.57) | (12.71) | (20.74) |
| Gearing | -0.04*** | -0.01*** | -0.01*** |
| | (-7.39) | (-9.46) | (-10.78) |
| C | 4.24** | 0.56*** | 0.71*** |
| | (-2.11) | (13.94) | (18.69) |
| Gearing | -0.04** | -0.01*** | -0.01*** |
| | (-2.71) | (-11.21) | (-14.10) |
| Tax-rate | 6.50*** | 0.95*** | 0.65*** |
| | (12.71) | (18.71) | (13.84) |
| HI | 0 | 0*** | 0** |
| | (-1.27) | (-3.50) | (-2.45) |
| C | 3.78*** | 0.41*** | 0.76*** |
| | (8.87) | (6.89) | (17.73) |
| Gearing | 0.03*** | -0.01 | -0.01*** |
| | (-3.11) | (-1.18) | (-7.13) |
| Tax-rate | 0.33*** | 0.90*** | 0.08 |
| | (8.95) | (7.65) | (0.76) |
| HI | 0*** | -0.01*** | -0.01*** |
| | (-12.73) | (-6.26) | (-9.69) |
| Gearing*AvgHI | -0.15*** | -0.9*** | -0.01*** |
| | (-4.14) | (-9.89) | (-6.20) |
| Gearing*Tax-rate | 0.01 | 0.01 | 0.02*** |
| | (0.31) | (0.53) | (6.21) |

Following Dhaliwal et al. (2006) the paper examines further the relation between gearing and stock returns by dividing the sample into tax-paying and non-tax paying firms as we investigate the effect of gearing risk premium in relation to tax shields. Table 4 reports the cross-sectional regression results of equations (8), (9) and (10) for the two sub-samples. Firms are classified according to whether they pay a tax-rate equal to or

greater than zero. The estimates for the gearing coefficients do not change in sign. When returns are estimated using the CAPM, the gearing coefficient is negative and significant. A one percent increase in gearing leads to a 0.08 percent decline in returns when the tax rate is equal to zero.

When the Fama-French model is used our results still indicate a negative and significant relation between gearing and returns, however the coefficient here is lower than with the CAPM estimation. A 1 percent increase in gearing is associated to a 0.01 percent decline in returns, as was the case for the overall sample. The results are similar when returns are estimated using Fama-French and Carhart as reported in the last two columns. The negative and significant relation between gearing and returns persists to the same extent of the overall sample.

The coefficient estimate for the interaction term on gearing and industry concentration is negative for tax-paying firms and positive for non-tax paying firms. This is an interesting result; for firms in high concentration industries that do not pay taxes the negative effect of gearing on returns becomes weaker, while for tax-paying firms in concentrated industries the negative effect of gearing on returns is increased.

**Table 4: Returns, Gearing and Tax Effects**

This table reports our cross-sectional regression results on abnormal returns, gearing and Herfindahl Index. We have a total of 6852 year-end observations for a sample of 792 companies for the period 1980-2008. We calculate the returns for the sample of 792 non-financial firms from 1980-2008. The abnormal returns are estimated by using the asset pricing models of CAPM, Fama-French and Fama-French plus Carhart. To perform the regressions we use panel least square and fixed effects for firms with whitening in the cross-sections. We obtain gearing from Datastream (Datastream code WC08221). Gearing represents the total debt to the total financing of the firms. We rank the gearing of each company from low to high. The Herfindahl Index refers to the degree of high concentration of firms. It is estimated by calculating the sum of squared sales based market shares of all firms in that industry in a given year and then averaging over the past three years. Low concentration firms range from 0-1800 and high concentration firms are those that range from 1800-10000. Figures in parentheses represent the t-statistics. *** for 1% level, **5% level and *10% level of significance.

| | CAPM | | Fama-French | | Fama-French + Carhart | |
|---|---|---|---|---|---|---|
| | Tax-rate=0 | Tax rate>0 | Tax rate=0 | Tax rate>0 | Tax rate=0 | Tax rate>0 |
| C | 0.68*** | 0.49*** | 1.56*** | 0.78*** | 2.34*** | 0.83*** |
| | (5.77) | (7.89) | (14.70) | (17.80) | (11.79) | (21.73) |
| Gearing | -0.08*** | -0.01*** | -0.01*** | -0.01 | -0.01*** | -0.01* |
| | (-3.64) | (-13.04) | (-7.89) | (-1.14) | (-4.79) | (-1.59) |
| HI | 0*** | 0*** | -0.01*** | 0*** | -0.01*** | 0*** |
| | (-9.56) | (-9.74) | (-15.52) | (-4.66) | (-13.65) | (-7.31) |
| C | 11.08*** | 4.73*** | 1.86*** | 0.64*** | 1.94*** | 0.7*** |
| | (8.26) | (13.82) | (14.70) | (17.81) | (11.79) | (20.73) |
| Gearing | -0.07*** | -0.01* | -0.01*** | -0.01*** | -0.01*** | 0 |
| | (-3.73) | (-1.58) | (-7.89) | (-1.15) | (-4.79) | (-1.59) |
| HI | -0.01*** | -0.02*** | -0.01*** | 0*** | 0*** | 0*** |
| | (-10.45) | (-9.55) | (-15.52) | (-4.66) | (-13.64) | (-7.31) |
| Gearing *AvgHI | 0.1*** | -0.5*** | 0.2* | -0.01*** | 0.44 | 0*** |
| | (3.37) | (-5.76) | (2.12) | (-9.82) | (1.34) | (-5.98) |

We now divide our sample on the basis of industry concentration. The reason for doing so is to perform a robustness check on the extent to which the relation between gearing and returns is affected by industry concentration (Hou and Robinson, 2006). Table 5 reports the cross-sectional regression results when returns are estimated with CAPM, Fama-French and Fama-French plus Carhart and where the firms are classified according to the degree of industry concentration. In the first column we report the results for CAPM returns estimates; the results indicate that the coefficient for gearing is negative and significant for firms whether they operate in low or high concentration industries. The coefficient estimates for the tax rate remain positive.

When the Fama-French and Carhart models are used, results show that the relation between gearing and returns remains negative and significant, however the effect of gearing becomes smaller than with the CAPM estimates

as it is the case for the overall sample. This finding is consistent across low and high concentration industries.

The coefficient estimate for the interaction terms for gearing and tax rates are significant and positive only when returns are estimated with the four-factor model. The value of the interaction term is higher for firms in highly concentrated industries indicating that the negative effect of gearing on returns is reduced as industry concentration increases.

**Table 5: Returns, Gearing and Industry Concentration**

This table reports our cross-sectional regression results on abnormal returns, gearing, tax-rate and Herfindahl Index. We have a total of 6852 year-end observations for a sample of 792 companies for the period 1980-2008. We calculate the returns for the sample of 792 non-financial firms from 1980-2008. The abnormal returns are estimated by using the asset pricing models of CAPM, Fama-French and Fama-French plus Carhart. To perform the regressions we use panel least squares and fixed effects for firms with whitening in the cross-sections. We obtain gearing from Datastream (Datastream code WC08221). Gearing represents the total debt to the total financing of the firms. We rank the gearing of each company from low to high. The Herfindahl Index refers to the degree of high concentration of firms. It is estimated by calculating the sum of squared sales based market shares of all firms in that industry in a given year and then averaging over the past three years. Low concentration firms range from 0-1800 and high concentration firms are those that range from 1800-10000. Figures in parentheses represent the t-statistics. *** for 1% level, **5% level and *10% level of significance.

| | CAPM | | Fama-French | | Fama-French + Carhart | |
|---|---|---|---|---|---|---|
| | HI<1800 | HI>1800 | HI<1800 | HI>1800 | HI<1800 | HI>1800 |
| C | 7.91*** | 6.68*** | 1.86*** | -1.04*** | 2.11*** | 0.76*** |
| | (12.46) | (7.09) | (26.94) | (-8.19) | (35.75) | (-4.03) |
| Gearing | -0.01*** | -0.04*** | -0.01*** | -0.01*** | -0.01* | -0.01*** |
| | (-4.98) | (-4.71) | (-5.15) | (-7.63) | (-1.57) | (-7.47) |
| Tax-rate | 6.35*** | 4.25*** | 1.05*** | 0.87** | 0.86*** | -0.42*** |
| | (7.95) | (4.08) | (10.72) | (2.31) | (5.73) | (-5.03) |
| HI | -0.01*** | 0*** | 0*** | 0*** | 0*** | 0*** |
| | (-16.38) | (-10.17) | (-24.42) | (13.11) | (-38.38) | (11.09) |
| C | 7.92*** | 7.38*** | 1.76*** | -1.38*** | 2.02*** | -0.59*** |
| | (12.06) | (7.09) | (28.04) | (-7.99) | (33.07) | (-3.97) |
| Gearing | -0.04*** | -0.1*** | -0.01 | 0 | -0.01*** | -0.01** |
| | (-3.85) | (-3.47) | (-0.00) | (-1.04) | (-4.49) | (-2.59) |
| Tax-rate | 6.36*** | 7.64*** | 1.2*** | 1.06*** | 0.66*** | -1.04*** |
| | (7.94) | (4.08) | (10.93) | (3.92) | (5.66) | (-5.11) |
| HI | -0.01*** | 0*** | 0*** | 0*** | 0*** | 0*** |
| | (-15.54) | (-9.33) | (-31.41) | (11.95) | (-32.94) | (-10.84) |
| Gearing *AvgHI | 0 | 0 | 0** | 0*** | 0*** | 0* |
| | (0.09) | (1.17) | (-2.83) | (-4.21) | (-4.09) | (-1.51) |
| Gearing *Tax-rate | 0 | 0 | -0.01 | 0 | 0.01* | 0.04*** |
| | (0.26) | (0.00) | (-1.78) | (-0.23) | (1.85) | (6.19) |

## 6 – Conclusion

This study investigates the effect of firm gearing on shareholder returns. We test empirically Modigliani and Miller's proposition 2 by estimating monthly abnormal stock returns for UK listed companies between 1980 and 2008. We use three asset pricing models, namely, Sharpe's Capital Asset Pricing Model (1964), Fama-French (1993) model and Carhart (1997) model.

Accepted capital structure theory indicates that the financing risk imposed by gearing should be rewarded with higher returns, however the studies cited, mainly in relation to US listed companies, generate ambiguous results. In contrast to Modigliani and Miller's proposition, our results indicate that returns in UK listed companies have a consistent negative, albeit small, relation with gearing. In all the three models used for the estimation, returns decrease in gearing. Taken to its logical conclusion, this finding would suggest managements would best enhance shareholder returns by avoiding gearing as much as possible.

The findings are robust to other risk factors and are consistent with Penman et al (2007) who argue that the gearing component of book to price ratio is negatively associated with future returns. The inverse relation between returns and gearing weakens when we estimate returns with Fama-French and the Carhart models. Clearly the risk factors included in these models have additional explanatory power on stock returns.

The negative relation of gearing with abnormal returns remains unaffected when other factors such as effective tax rates and industry concentration are included in the regression equations. The magnitude of the impact of gearing on abnormal returns diminishes as these variables are taken into consideration; however the relation between gearing and abnormal returns remains significant and negative. We believe that the inverse relation exist as investors prefer firms with financial flexibility and hence they earn higher returns when investing in low levered firms.

If verified across differing markets, the consequences of our conclusions should not be underestimated. If shareholder returns are not appreciably enhanced by bank or bond financing, then the financing of the corporate sector could be best achieved by other sources. Perhaps it is no accident that, following the Dotcom Crash, many of the World's surviving technology companies ( several amongst the largest corporations in the World) amassed very substantial cash reserves (thereby abolishing any reliance on debt financing) to finance their future expansion.

If so confirmed, the current authors believe our conclusions may generate a shift in financing practice – reducing the role of banks and bonds in the financing of corporates and boosting that of their ultimate owners, shareholders. The strength of this paper is to show that the negative relation between excess returns and gearing is robust across a number of important risk factors, in one of the main global markets. Future research will be beneficial if samples are expanded to test if our findings can be generalised to other countries using these risk factors. Further avenues for research could include examining market specific risk factors such as industry cost of capital.

**Appendix 1 UK SIC Industry Classification**

| Code | Industry | Sector |
|---|---|---|
| 1 | Oil and gas | Oil & Gas Producers |
| | | Oil Equipment & Services |
| 1000 | Basic Materials | Chemicals |
| | | Forestry & Paper |
| | | Industrial Metals |
| | | Mining |
| 2000 | Industrials | Construction & Materials |
| | | Aerospace & Defense |
| | | General Industries |
| | | Electronic & Electric Equipment |
| | | Industrial Engineering |
| | | Industrial Transportation |
| | | Support Services |
| 3000 | Consumer Goods | Automobiles & Parts |
| | | Beverages |
| | | Food Producers |
| | | Household Goods |
| | | Leisure Goods |
| | | Personal Goods |
| 4000 | Healthcare | Healthcare Equipment & Services |
| | | Pharmaceuticals & Biotechnology |
| 5000 | Consumer Services | Food & Drug Retailers |
| | | General Retailers |
| | | Media |
| | | Travel & Leisure |
| 6000 | Telecommunications | Fixed Line Telecommunications |
| | | Mobile Telecommunications |
| 7000 | Utilities | Electricity |
| | | Gas, Water & Multi utilities |
| 9000 | Technology | Software & Computer Services |
| | | Technology Hardware & Equipment |

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