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RETURNS AND LEVERAGE

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ABSTRACT

In this paper, we examine the relation between stock returns and leverage. Expanding on Modigliani and Miller (1958)'s Proposition II, stock returns are expressed as abnormal returns estimated using the asset pricing models of CAPM, Fama-French and Fama-French plus Carhart. We find that returns are decreasing in firm leverage. We empirically test this relation with other risk factors and find that the results remain robust. This evidence suggests that leverage should be priced as a risk factor and requires adequate presentation in common asset pricing models.

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1. Introduction

Capital structure decisions have been one of the most contentious topics in the finance literature. In the real world of finance, capital structure decisions are critical as a shift in the company's attitude to leverage could increase or decrease the financial strains on companies. Modigliani-Miller (1958; henceforth MM), state that the value of a firm is independent of its capital structure but argue that as debt increases the riskiness of the stock, equity shareholders will demand a higher return on their stocks (Proposition II). They test their theorem in a restricted sample consisting of two industries representing a risk class each, namely the oil sector and the utilities sector and find supporting evidence. The existing empirical evidence, however, appears to elude an explanation to this theory. Some authors (Hamada, 1972; Bhandari, 1988, Dhaliwal, Heitzman and Li, 2006) show that returns increase in leverage; others show that they decrease in leverage (Korteweg, 2009, Dimitrov and Jain, 2008, Penman, Richardson and Tuna 2007). The theoretical impact of these propositions on corporate finance is immense. This paper explores the link between leverage and stock returns, contributing towards the existing empirical evidence of asset pricing implications of leverage.

The previous empirical work on capital structure is mainly focused on examining the factors that affect capital structure decisions (e.g. Titman and Wessels, 1988; Rajan and Zingales, 1995; Booth, Aivazian, Demiguc-Kunt and Maksimovic, 2001), and testing the various well-known theories of capital structure (Frank and Goyal, 2003; Flannery and Rangan, 2006). Recent studies have attempted to examine the leverage-risk return relation (Dimitrov and Jain, 2008; Penman et al. 2007; Korteweg, 2009; George and Huang, 2009). However, these studies use various representations of returns; accounting profit (Hamada, 1972);

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inflation adjusted returns (Bhandari, 1988); risk-adjusted returns (Korteweg, 2009, Dimitrov and Jain, 2008). In our paper, we argue that we use a very robust estimation of returns which is the returns or alphas based on the asset pricing models.

The main objective of this paper is to test Proposition II. We use a more robust estimation of returns and leverage. We represent returns to shareholders as abnormal stock returns estimated using the well-recognised asset pricing models of CAPM, Fama-French (1993) plus Carhart (1997) four factor model that encompasses all the risk factors and is arguably a more robust estimator for returns. We measure leverage as the ratio of the book values of total debt to total capital. There is a need to use a broader definition of financial structure in order to measure the large measure of substitutability between the various forms of debt and thus using the book values encompasses the total of all liabilities and ownership claims (Schwartz, 1959). The use of book values of debt and equity in defining the capital structure 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, Morellec and Smith (2006) show how book leverage is preferable in regressions of financial leverage as using market values in the denominator might spuriously correlate with explanatory variables. We use panel data that contains information for twenty eight years and combines the cross section with the time series. We examine all non-financial firms. Besides firm leverage, we use other risk factors at the firm level such as interest rates, tax rates and industry concentration.

Dhaliwal, Heitzman and Li (2006) examine the relation between leverage, corporate taxes and the firm’s implied cost of capital. They find that though the cost of equity capital increases with leverage; they find that when corporate taxes are introduced, it reduces the risk premium. Following their work, we include corporate effective tax rates and find those similar results in both cases; where firms' tax rate is less than zero or where it is greater than zero. Factors influencing industry help explain firm structure. Previous studies have examined the effect of industry on capital structures and stock returns (Mackay and Phillips, 2005) and the degree of concentration (Hou and Robinson, 2006). Hou and Robinson (2006) offer evidence that industry concentration, a feature of product markets is important for understanding stock returns. They argue that it is an important economic determinant in understanding the cross-section of stock returns. Thus we also include industry concentration as an additional variable in our analysis. We find that firms in low and high concentration industries have returns that decline in leverage.

Our empirical findings indicate that returns decrease in leverage. This contradicts one of the fundamental principles of finance theory; and suggests that we need a better understanding of how leverage is priced. It also indicates that leverage has been largely ignored in common asset pricing models. The negative relation between leverage and returns is also robust to the additional risk factors such as interest rates, tax rates and industry concentration.

According to finance theory, the principal sources of risk are determined by the operating risk that arises from firms' operations and the other from the financing risk represented by leverage. Penman et al. (2007) decompose the book-to-price ratio into two components; a component that pertains to business operations and a component that pertains to financing activities. They observe that the leverage component is negatively associated with stock returns. They argue that this negative

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relation between leverage and stock returns indicates how leverage should be priced and should be taken into account whilst evaluating risk in the asset pricing models.

The paper is organized as follows. In Section 2 we describe the rationale behind our sample selection procedure, the variables we use, and the method we apply. We present our results in Section 3 and conclusions in Section 4.

2. Data and Methods

We use DataStream as the source of our data and we begin with all the 2673 companies listed in the London Stock Exchange from 1980 to 2008. The requirement for each firm year observation in order to enter the sample is the availability of a fiscal year end leverage ratio and stock price series for at least the preceding twelve months of that company. 1092 financial companies including banks, investment companies, insurance and life assurances and companies that have changed the fiscal period end date during the research period are removed from the sample, while 490 companies were removed because they did not have matching year-end leverage ratios and stock prices for all subsequent years. A further 173 companies with short quotation experience were excluded from the analysis. Finally, a further 126 companies with a market value of less than 1 million was removed. The resulting sample contains 10267 firm year-end observations of 792 companies listed from 1980 onwards. We do not use negative market-to-book in this study.

Within each industry classification, and for the full sample, firms are ranked according to the leverage that is available from annual reports with year-end dates of December 31st or before, every year. We use the capital gearing definition (DataStream code: WC08221) to represent the leverage of companies in the sample. It represents the total debt to total financing of the firm.

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We also take into account industry concentration and interest rates as explanatory variables. The interest rate variable [1] is represented by the average monthly Bank of England (BoE) rate that we observe over a year. Tax is the effective corporate tax rate for year *t*. We measure industry concentration using the Herfindahl Index, which is defined as:

$$\text{Herfindahl}_j = \sum_{i=1}^{I} s^2 ij \qquad \textbf{(1)}$$

Where s_{ij} is the market share of firm *i* in industry *j*. We perform the above calculations for each industry and then average 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, 2008). 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.

2.1 Returns Estimation Model

We use three models that are commonly employed in the literature to estimate abnormal returns for each stock; capital asset pricing model (CAPM), Fama-French three factor model and Fama-French plus Carhart four factor models.

We calculate the stock returns for each company monthly, using the percentage change in consecutive closing prices adjusted for dividends, splits and rights issues (Fama, Fisher, Jensen and Roll, 1969). We then estimate abnormal returns in excess of the risk-free rate using three different asset pricing models, namely, Sharpe (1964)'s Capital Asset Pricing Model, Fama-French (1993) model

[1] Datastream code: LCBBASE

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and Carhart (1997) model. For CAPM, we estimate the intercept term by performing the regression:

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

When we arrange the equation (2), we define abnormal return as:

$$\alpha_{CAPM} = R_t\text{-}r_{ft} - \beta_1 Exrm \qquad \textbf{(3)}$$

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; α_{CAPM} is the intercept which indicates an abnormal return, β_1 is the slope coefficient from the CAPM regression, Exrm[2] is the excess return of the market (proxied by the FTSE All Share Index) over the 1 month UK Treasury discount bill and ε_t is an error term. For the Fama-French three factor model, we estimate the intercept as follows:

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

When we arrange the equation (4), we define abnormal return as:

$$\alpha_{FF} = R_t\text{-}r_{ft}\text{-}\beta_1 SMB\text{-} \beta_2 HML\text{-}\beta_3 Exrm \qquad \textbf{(5)}$$

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; α_{FF} is the intercept which indicates an abnormal return; $\beta_{1,}$ $\beta_{2,}$ β_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. Where SMB[3] is the size mimicking portfolio, HML[4] is the market-to-book mimicking portfolio.

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[2] Refer Appendix 2

[3] Refer Appendix 2

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Finally, we determine if abnormal returns can be earned after including a fourth factor, using Carhart's four factor model,

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

When we arrange the equation (4), we define abnormal return as:

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

Where α_{FF+C} is the intercept which indicates an abnormal return; MOMENTS[5] is the momentum mimicking portfolio; β_1, β_2, β_3 and β_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 α indicates an abnormal return. To estimate the abnormal returns in the models (3), (5) to (7), for firm *i* at month *t* we use 60 monthly excess returns prior to month *t* for each firm.

Our next step is to determine whether returns at the firm level can be explained by the leverage of the firms, and to examine the effect of a number of idiosyncratic risk factors in the cross-section; we include interest rate to control for changes in the cost of capital within the environment of the time series; effective corporate tax rate as well as the Herfindahl Index which is a measure of the industry concentration. First, we run regression (5) on the full sample.

$$R_{it} = \delta + \lambda\ Leverage + \varepsilon_t \qquad \textbf{(8)}$$

$$R_{it} = \delta + \lambda_1 Leverage + \lambda_2 Interest + \lambda_3 Herfindahl\text{-}Index + \lambda_4 Taxrate + \varepsilon_t \qquad \textbf{(9)}$$

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[4] Refer Appendix 2

[5] Refer Appendix 2

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In (8) and (9), R_{it} are the abnormal returns found for each asset pricing model as in (3), (5) and (7), where δ stands for constant and leverage is measured as the ratio of total debt to total equity plus debt Further, in (9) we examine the impact of a macroeconomic variable on stock returns; we include interest rate, since this is the most appropriate macroeconomic variable for examining the effect of leverage on stock returns; tax rate is the effective tax rate paid by companies and finally we also add a measure of industry concentration as denoted by the Herfindhal Index and ε is the error term. We estimate (8) - (9) using panel least square and fixed effects for firms[6]. Following Flannery and Rangan (2006) we use 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).

3. Findings

3.1 Returns and Leverage

Table 1 report the cross-sectional regression results of equations (8)-(9) when returns are estimated as in equations (3),(5) and (7) of all firms with leverage ratios ranging from zero percent to ninety-nine percent. The three columns present the results of the cross-sectional regressions of leverage and stock returns when the returns are estimated using the different asset pricing models. It also reports the results when other risk factors such as tax-rate, interest rates and industry concentration are added. For the overall sample, when returns are estimated as in equation (3), our cross-sectional regressions indicate a negative and significant

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[6] Alternative estimations were made using OLS and GMM. Conclusions do not change and are hence not reported. Results are available upon request

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relation between leverage and returns when leverage is the sole explanatory variable. Returns decline in leverage[7].

A one percent increase in leverage is associated with a 0.04 percent decline in returns. Next when returns are estimated as in equation (5), our results indicate a negative and significant relation between leverage and returns when leverage is the sole explanatory variable[8]. A one percent increase in leverage is associated with a 0.01 percent decline in returns.

Finally when we estimate returns as in equation (7) we find that a negative and significant relation between leverage and returns[9]. A one percent increase in leverage is associated with a 0.01 percent decline in returns.

Next we report the results of our cross-sectional regression when we add interest rates, tax-rates and industry concentration as additional explanatory variables. Leverage remains negative and significant when returns are estimated as in equation (3). For tax rate and interest-rate the coefficient is positive and for industry concentration the coefficient is negative.

In the second column, where returns are estimated using equation (5), we find that for every one percent increase in leverage, returns will be fall by 0.01 percent. The coefficient for tax rate is positive and that of interest rate is negative.

Finally when we estimate returns as in equation (7), we find that the co-efficient estimate for leverage remains negative and significant. For every one percent increase

[7] Alternative estimations were made using cumulative abnormal returns. Conclusions do not change and are hence not reported. Results are available upon request

[8] Alternative estimations were made using cumulative abnormal returns. Conclusions do not change and are hence not reported. Results are available upon request

[9] Alternative estimations were made using cumulative abnormal returns. Conclusions do not change and are hence not reported. Results are available upon request

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in leverage, returns will fall by 0.03 percent. The coefficient estimate for tax rate and industry concentration is negative and for interest rate positive.

[Insert Table 1 here]

3.2 Firms with Leverage Greater than Zero.

Table 2 presents the cross-sectional regression results of equations (8)-(9) on firms whose leverage is greater than zero. We estimate returns as in equations (3), (5) and (7). For the overall sample, when returns are estimated as in equation (3), our cross-sectional regressions indicate a negative and significant relation between leverage and returns when leverage is the sole explanatory variable. Returns decline in leverage. A one percent increase in leverage is associated with a 0.04 percent decline in returns.

Next when abnormal returns are estimated as in equation (5), our results indicate a negative and significant relation between leverage and returns when leverage is the sole explanatory variable. A one percent increase in leverage is associated with a 0.01 percent decline in returns.

Finally when we estimate returns as in equation (7) we find that a negative and significant relation between leverage and returns when leverage is the sole explanatory variable. A one percent increase in leverage is associated with a 0.01 percent decline in returns.

Next we report the results of our cross-sectional regression when we add interest rates, tax-rates and industry concentration as additional explanatory variables. Leverage remains negative and significant when returns are estimated as in equation

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(3). For tax rate, the coefficient is positive and for industry concentration and industry concentration the coefficient is negative.

In the second column, where returns are estimated using equation (5), we find that for every one percent increase in leverage, returns will be fall by 0.01 percent. The coefficient for tax rate is positive and that of interest rate is negative.

Finally when we estimate returns as in equation (7), we find that the co-efficient estimate for leverage remains negative and significant. For every one percent increase in leverage, returns will fall by 0.01 percent. The coefficient estimate for interest rate is and that of tax-rate and industry concentration it is positive.

[Insert Table 2 here]

3.3 High Leverage versus Low Leverage Firms

Table 3 reports the cross-sectional regression results of (8) and (9) when returns are estimated as in equations (3),(5) and (7) and where the firms are classified into firms that have zero leverage and firms that leverage that are greater than zero. In the first column where returns are estimated as in equation (3), we find that coefficient estimate for tax-rate and interest rate is positive and for industry concentration, the coefficient is negative.

The second column presents the results when returns are estimated using equation (5). We find that the coefficient for interest-rate is negative and that of tax-rate and industry concentration is positive.

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Finally when we repeat the estimations for returns estimated as in equation (7), we find that the coefficient estimate for tax-rate remains positive and that of industry concentration negative.

[Insert Table 3 here]

3.4 Tax Effects

Table 4 reports the cross-sectional regression results of (8) and (9) when returns are estimated as in equations (3),(5) and(7) and where the firms are classified into firms that pay a tax-rate equal to zero and firms that pay a tax rate greater than zero. In the first column where returns are estimated as in equation (3), we find that coefficient estimate for leverage is significant and negative. A one percent increase in leverage is associated with a 0.04 percent decline in returns for firms whose tax-rate is equal to zero and greater than zero. The coefficient estimate for interest rate is positive and that of industry concentration, it is negative.

Next when returns are estimated as in equation (5) as presented in the second column, our results indicate a negative and significant relation between leverage and returns. A one percent increase in leverage is associated with a 0.01 percent decline in returns. The coefficient estimate for interest-rate and industry concentration is negative.

Finally when we estimate returns as in equation (7) as reported in the third column, we find that a negative and significant relation between leverage and returns. A one percent increase in leverage is associated with a 0.01 percent decline in returns. The co-efficient estimate for interest rate and industry concentration is negative.

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[Insert Table 4 here]

3.5 Industry Concentration

Table 5 reports the cross-sectional regression results of (8) and (9) when returns are estimated as in equations (3),(5) and(7) and where the firms are classified into the degree of industry concentration. Firms whose concentration range from 0-1800 are classified as low concentration and firms with a concentration greater than 1800 denotes firms in high industry concentration. In the first column where returns are estimated as in equation (3), we find that coefficient estimate for leverage is significant and negative for both firms in low and high degree of concentration. A one percent increase in leverage is associated with a 0.03 percent decline in returns for low concentration firms and -0.07 percent for firms belonging to high concentration. The coefficient estimate for interest rate and tax rate is positive and that of industry concentration, it is negative.

Next when returns are estimated as in equation (5), our results indicate a negative and significant relation between leverage and returns. A one percent increase in leverage is associated with a 0.01 percent decline in returns in low concentration industries and leverage has a coefficient estimate of -0.0.2 in firms with high concentration. The coefficient estimate for interest-rate and industry concentration is negative and that of tax rate is negative.

Finally when we estimate returns as in equation (7) as reported in the third column, we find that a negative and significant relation between leverage and returns. A one percent increase in leverage is associated with a 0.01 percent decline in returns for firms belonging to both low and high concentration industries. The co-efficient

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estimate for interest rate and industry concentration is negative and that of tax rate is positive.

[Insert Table 5 here]

4. Conclusion

The aim of this study is to investigate the effect of leverage on stock returns. We use a more robust estimation of abnormal returns in examining this relation. We estimate abnormal returns using three different asset pricing models, namely, Sharpe's Capital Asset Pricing Model (1964), Fama-French (1993) model and Carhart (1997) model. We define the intercepts obtained in these regressions as the abnormal returns. For leverage, we use book values as the use of book values for debt and equity has the additional advantage of using the market value of equity neither to define the change in value nor in concurrent capital structure.

Capital structure theory indicates that the financing risk imposed by leverage should be rewarded with higher returns. In contrast, our results indicate that returns have a negative relation with leverage in the CAPM, Fama-French and Fama-French plus Carhart models. We find that returns decrease in leverage. Our results are robust to other risk factors. Our empirical evidence suggests a need for asset pricing models to incorporate leverage as a determinant in returns. We also argue that mispricing of leverage by the market may be a possible explanation.

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Table 1 Returns and Leverage

This table reports our cross-sectional regression results on returns, leverage, tax-rate. interest rates and Herfindhal Index. We have a total of 6852 year-end observations for a sample of 665 companies for the period 1980-2008. We calculate the CAARs for the sample of 665 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 leverage from Datastream (Datastream code WC08221). Leverage represents the total debt to the total financing of the firms. We rank the leverage of each company from low to high. We obtain interest rates from Datatream (Datastream code LCBBASE). The interest rates are as of the beginning of May of year *t* to the end of April of year *t+1* and are averaged over the 12-month period. 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.

*** represents significance at 1%, **represents significance at 5% and * represents significance at 10%

	CAPM	Fama-French	Fama-French + Carhart
C	1.26***	0.42***	0.52***
Leverage	-0.04***	-0.01***	-0.01***
C	3.36***	0.84***	0.75***
Leverage	-0.04***	-0.01***	-0.03***
Tax rate	6.20***	1.095***	1.48***
Interest rate	0.26***	-0.09***	-0.12***
HI	-0.01***	0***	0***

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Table 2 Returns and Leverage greater than zero

This table reports our cross-sectional regression results on abnormal returns, leverage, tax-rate interest rates and Herfindhal Index. We have a total of 6852 year-end observations for a sample of 665 companies for the period 1980-2008. We calculate the returns for the sample of 665 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 leverage from Datastream (Datastream code WC08221). Leverage represents the total debt to the total financing of the firms. We rank the leverage of each company from low to high. We obtain interest rates from Datatream (Datastream code LCBBASE). The interest rates are as of the beginning of May of year *t* to the end of April of year *t+1* and are averaged over the 12-month period. 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. *** represents significance at 1%, **represents significance at 5% and * represents significance at 10%

	CAPM	Fama-French	Fama-French + Carhart
C	1.29***	0.42***	0.50***
Leverage	-0.04***	-0.01***	-0.01***
C	-0.44***	0.83***	1.04***
Leverage	-0.01***	-0.01***	-0.01***
Tax rate	8.715***	1.07***	0.79***
Interest rate	-0.2467***	-0.09***	-0.10***
HI	0***	0***	0***

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Table 3 High leverage versus Low leverage Firms

This table reports our cross-sectional regression results on abnormal returns, leverage, tax rate, interest rates and Herfindhal Index. We have a total of 6852 year-end observations for a sample of 665 companies for the period 1980-2008. We calculate the returns for the sample of 665 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 leverage from Datastream (Datastream code WC08221). Leverage represents the total debt to the total financing of the firms. We rank the leverage of each company from low to high. We obtain interest rates from Datatream (Datastream code LCBBASE). The interest rates are as of the beginning of May of year *t* to the end of April of year *t+1* and are averaged over the 12-month period. 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.

*** represents significance at 1%, **represents significance at 5% and * represents significance at 10%

	CAPM		Fama-French		Fama-French plus Carhart	
	Leverage=0	Leverage>0	Leverage=0	Leverage>0	Leverage=0	Leverage>0
C	4.56***	1.99***	1.44***	0.56***	1.65***	0.75***
Tax rate	5.37***	6.32***	1.02***	1.10***	0.80***	0.83***
Interest rate	0.09***	0.28***	-0.15***	-0.09***	-0.19***	-0.10***
HI	-0.01***	-0.01***	0***	0***	0***	0***

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Table 4 Returns, Leverage and Tax Effects

This table reports our cross-sectional regression results on abnormal returns,leverage , interest rates and Herfindhal Index. We have a total of 6852 year-end observations for a sample of 665 companies for the period 1980-2008. We calculate the returns for the sample of 665 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 leverage from Datastream (Datastream code WC08221). Leverage represents the total debt to the total financing of the firms. We rank the leverage of each company from low to high. We obtain interest rates from Datatream (Datastream code LCBBASE). The interest rates are as of the beginning of May of year *t* to the end of April of year *t+1* and are averaged over the 12-month period. 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.

*** represents significance at 1%, **represents significance at 5% and * represents significance at 10%

	CAPM		Fama-French		Fama-French plus Carhart	
	Tax rate=0	Tax rate>0	Tax rate=0	Tax rate>0	Tax rate=0	Tax rate>0
C	7.84***	4.79***	2.18***	1.12***	2.50***	1.21***
Leverage	-0.04***	-0.04***	-0.01***	-0.01***	-0.01**	-0.01***
Interest rate	0.50***	0.29***	-0.11***	-0.09***	-0.04***	-0.10***
HI	-0.01***	-0.01***	-0.01***	0***	-0.01***	0***

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Table 5 Returns, Leverage and Industry Concentration

This table reports our cross-sectional regression results on abnormal returns (CAARs),leverage, tax-rate interest rates and Herfindhal Index. We have a total of 6852 year-end observations for a sample of 665 companies for the period 1980-2008. We calculate the returns for the sample of 665 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 leverage from Datastream (Datastream code WC08221). Leverage represents the total debt to the total financing of the firms. We rank the leverage of each company from low to high. We obtain interest rates from Datatream (Datastream code LCBBASE). The interest rates are as of the beginning of May of year *t* to the end of April of year *t+1* and are averaged over the 12-month period. 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.

*** represents significance at 1%, **represents significance at 5% and * represents significance at 10%

	CAPM		Fama-French		Fama-French plus Carhart	
	HI<1800	HI>1800	HI<1800	HI>1800	HI<1800	HI>1800
C	7.73***	4.93***	1.90***	-1.19***	2.14***	-0.79***
Leverage	-0.03***	-0.07***	-0.01***	-0.02***	-0.01***	-0.01***
Tax rate	6.11***	7.20***	1.09***	1.00***	0.90***	0.41***
Interest rate	0.62***	0.68***	-0.06***	0.04***	-0.06***	0.01***
HI	-0.02***	-0.03***	-0.02***	0***	-0.02***	0***

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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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Appendix 2

a) Size Factor (SMB)

The portfolio SMB (small minus big) is meant to mimic the risk factor in returns related to size (FF 1993). 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.

b) Market-to-Book Factor (HML)

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.

c) Momentum Factor (MOMENTS)

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.

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d) Market Risk Factor (Exrm)

Finally, following FF (1993), Exrm is the proxy for the market factor in stock returns which is the excess market return over the one month UK treasury discount bill.