DO FIRMS TIME THE EQUITY MARKET IN A NON-LINEAR MANNER? EVIDENCE FROM THE UK

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ABSTRACT

We provide an empirically motivated study to test the market timing theory of capital structure. The objective is to understand how managers in the United Kingdom finance their deficit. In line with the extant literature, we find that managers place greater reliance equity issues to finance deficit during periods of overvaluation and correspondingly increase debt issues when equities are undervalued. We further find that managers time the equity market in a surprisingly unique manner. Managers attempt to time issues in a non-linear manner whereby the increase in reliance on equity issues is only evident when the extent of overvaluation is not excessive. In addition, firms finance deficits with higher proportions of debt when equity prices are acutely suppressed. Our findings raise some important questions, which lead to serious implications on equity market-timing as a viable explanation for capital structure decisions. Furthermore, it poses serious implications questioning the debt-equity ratio preference of managers when resorting to external financing.

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INTRODUCTION

Market timing is a main competing theory to explain capital structure. Market timing argues that firms increase equity issues during periods of overvaluation and raise debt levels when equities are undervalued. The main issue of this theory is that given managers are working in the interest of shareholders, if managers were able to identify windows of opportunity to time the equity market value they could create a lowering cost of capital. Several studies have tested the theory and found contrasting findings. For instance, Baker and Wurgler (2002) as well as Doukas, Guo and Zhou (2011) provide empirical support for the theory. On the other hand, (Hovakimian, 2006, Butler et al 2011) provide empirical evidence to contrast the theory.

Given the contrasting findings, we examine the theory and find that firms in the United Kingdom increase reliance on equity to fund deficits during periods of overvaluation. On the other hand, a relatively larger portion of debt finances the deficit during periods of undervaluation. Looking further at this behavior, which is the main theme of the paper, we find that managers tend to behave in a distinct pattern when reacting to differing levels of undervaluation and overvaluation. To the best of our knowledge, this is the first paper that shows equity market timing works in a non-linear manner. To dissect the issue at hand, we split our sample into firm-year observations that are overvalued and undervalued. We find that manager do indeed exhibit non-linear timing behavior.

The results show that managers only increase levels of equity issues to finance deficits when overvaluation of equities does not severely deviate from fair values. Interestingly, the evidence indicates that firms do not significantly increase reliance on equity issues when the level of overvaluation is excessive. A plausible reason for this would be that managers do not believe prices will remain at that level if they make an equity issue announcement due to the signaling effect. Undervalued firms on the other hand, relatively increased reliance on leverage levels only if equity prices are moderately or severely undervalued. Our results suggest a market-oriented pecking order where the cost of equity could be too high as share prices are deflated,

given the cost of debt capital is constant. Firms could avoid the commitment brought about by interest payments which are necessary in the event of debt issues unless necessary (when equity prices are severely undervalued) and at the same time could be sending a signal to the market to indicate that shares are undervalued.

Our paper has the following structure. In the next section, we provide a brief review of the relevant literature to motivate our study. Following that, we provide a description of the date, define the variables, discuss equity mispricing valuation model used and quantify the basic model to test our hypothesis. Next, we test our model empirically and consider the non-linear behavior. The last section concludes the paper.

LITERATURE REVIEW

We review the relevant literature in this section by examining whether equity prices influences financing behavior. In a recent study, Baker and Wurgler (2002) empirically test Initial Public Offering (IPO) decisions and conclude the existing financing mix of any firm is a direct outcome of cumulative historical timing attempts. The authors assume that managers are able to identify 'windows of opportunity' to time the equity market and thus lower the cost of capital thereby increasing firm value. In their study, they find strong support for the equity market timing theory of capital structure.

The Deficit Function and Equity Prices

In a seminal study, Shyam-Sunder and Myers (1999) study the link between changes in net debt issues and the deficit function. The authors argue that if the pecking order hypothesis holds, a one-to-one relationship should be observed. The results support their hypothesis, as the deficit coefficient better explains changes in net debt issues as well as changes in leverage ratios relative to the target adjustment coefficient. Following their study, Frank and Goyal (2003) find that net equity issues tracks the deficit function better, indicating that debt issues are not preferred over equity issues as the main source of external financing. Huang and Ritter (2009) provide further find the pecking order coefficient is not able to explain their results given the slope is insignificant in some years.

Hovakimian (2006) examined Seasoned Equity Offerings (SEOs) in the United States and found a strong a strong correlation between equity issues and equity prices. This lends support to Baker and Wurgler's (2002) conclusion where managers opt for equity issues rather than debt when share valuations are higher. In another study, Hirshleifer, Hou and Teoh (2012) find that equities may be mispriced as investors do not fully incorporate information into decision making and thus rejecting the notion of rational risk explanation of investor behavior. Their findings indicate the possibility of windows of opportunity for managers to exploit to time equity issues. Looking at managers' own trades, Jenter (2005) finds that individual trading levels are in line with firm levels, indicating that timing attempts are not restricted to the firm level. Managers do indeed time their own trades in line with firm level issues.

The literature however suggests the equity market timing explanation of capital structure could also struggle to explain financing decisions. In a recent empirical study, Alti (2006) shows that managers may be inclined to time IPOs. However, the effect is reversed within 2 years and firms revert to pre-issue leverage levels. Flannery and Rangan (2006) find that 50% of changes in capital structure can be explained by targeting behavior and less than a tenth is explained by either market timing attempts or pecking order considerations. Furthermore, Hovakimian (2006) shows the negative correlation found between debt and the market-to-book (MTB) ratio is due to growth opportunities rather than market timing. Thus, the literature provides no clear distinction on the ability of the market timing theory to explain capital structure. Our paper attempts to fill this gap by providing additional insight to allow a better understanding of what drives capital structure decisions of firms in the UK.

Based on the literature discussed above, we find there is contention among the empirical work thus far. Our paper attempts to provide an explanation for this contention by looking at timing behavior as a non-linear function. Byoun (2008) who shows that speed of adjustment tend to be faster for firms that are over-levered relative to under-levered firms, provides an initial indication of non-linearity. In addition, the author finds further distinction when firms are operating in a surplus vs. a deficit. Firms tend to adjust faster to target levels when they are in a surplus (deficit) as well as above (under) their target levels. Warr et al (2012) further shows that equity mispricing also influences speed of adjustment. The author's show that firms adjust faster to target levels when firms are over-levered and equities are overvalued (relative to when equities are undervalued). For firms below their target levels, the reverse holds, where speed of adjustment is faster when equities are undervalued compared to when equities are overvalued. Thus, the likelihood of issuing or repurchasing securities is higher when firms are in a position to gain more (or the cost of not issuing or not repurchasing is too high). Given the findings in the literature, we conjecture that firms' finance their deficit via an issuing behavior that is a function of equity mispricing, conditioned to the level of mispricing.

VARIABLES AND METHODOLOGY

Variables Definition and Descriptive Statistics

To maximize the number of firm year observations, we start our sample by including all UK firms available from the Datastream Thomson Reuters database. Our period ranges from 1992 – 2011. Our sample selection is guided by data availability and the objective of measuring equity mispricing. We avoid selection and survivorship bias by including dead firms in our sample. Drawing from the literature of similar studies of UK firms, we exclude all financial firms. Similar to the literature of capital structure studies, all observations are based on the financial year-end of each individual firm.

The use of unbalanced panel data in our study allows for better inference of model parameters, more accurate capturing of firms' issuing behavior due to econometric efficiency and limiting the impact of omitted variables that allow the control of missing or unobservable variables. The use of variables to explain our model is based on the literature and defined accordingly. We define net debt issues, (Δd) as the net change in total book debt scaled by total assets. Net equity issues (Δe) is the net change in book equity minus the change in retained earnings divided by total assets. Firms' SIZE is the natural logarithm of net sales in millions of 1992 pounds. TANG, asset tangibility is net plant, property and equipment over total assets. Profitability (PROF) is measured by earnings before interest, taxes, depreciation and amortization divided by total assets. Furthermore, we proxy for growth opportunities using R&D (research and development) expenses and CAPEX (capital expenditure). Both variables are scaled by total assets.

Guided by the literature on capital structure, we eliminate outliers by eliminating observations where net equity issues, book value of debt and net debt issues are over 100%. Furthermore, we drop firm-year observations with missing data. Our final sample comprises of 1,642 firms with 18,062 firm-year observations. We report the summary statistics of the variables used in the study in Table 1.

The Deficit Function and Equity Mispricing

In line with Elliott, Koeter-Kant and Warr, 2007, we define the deficit (DEF) function as specified in Equation 1. Furthermore, our paper similarly expands the model from Shyam-Sunder and Myers (1999) by interacting the deficit function with the mispricing variable. The model regresses net debt issues for firm *i* in year *t* against the deficit function DEF_{it} for firm *i* in year *t* as:

$$DEF_{it} = DIV_{it} + I_{it} + \Delta W_{it} - C_{it} \equiv \Delta d_{it} + \Delta e_{it} \quad (1)$$

where DIV_{it} is cash dividends, I_{it} is net investments, ΔW_{it} is net working capital, C_{it} is cash flow after interest and taxes. The deficit function can also be defined as the sum of net equity issued and net debt issued as it measures the external financing requirement for a firm in any given year. The shortfall of cash is measured as cash outflows reduced by the cash flow after internal interest and taxes.

Table 1: Descriptive Statistics of the Sample

Variable	Mean	Median	Standard Deviation
Δd	0.012	0.002	0.1334
Δe	0.038	0.014	0.172
DEF	0.05	0.012	0.196
ΔSIZE	0.0976	0.0575	0.492
ΔTANG	-0.0021	-0.0007	0.082
ΔR&D	0.0002	0.0001	0.044
ΔCAPEX	-0.0044	-0.0008	0.062
ΔPROF	-0.0058	-0.0007	0.2727

This table provides summary statistics of the variables used in the study. Δd, net debt issues is the net change in total book debt scaled by total assets. Δe, net equity issues is defined as the net change in book equity minus the change in retained earnings divided by total assets. SIZE is the natural logarithm of net sales in millions of 1992 pounds. TANG, asset tangibility is net plant, property and equipment over total assets. PROF is measured by earnings before interest, taxes, depreciation and amortization divided by total assets. R&D (research and development expenses) and CAPEX (capital expenditure) are scaled by total assets.

We utilize the residual income model to measure equity mispricing as similar studies in the literature (Elliott, Koeter-Kant and Warr 2007, 2008 and Warr et al 2012). We define the mispricing (MISP) variable as a ratio intrinsic value of equity to the current market value of shares. The interested reader is referred to D'Mello and Shroff, 2000 for a retailed review of the residual income model. Our approach draws from Rhodes-Kropf, Robinson and Viswanathan (2000) who decompose the market-to-book ratio into two components: a measure for growth as well as a separate measure for valuation to avoid potential ambiguity problems. In their paper, the authors reason that the first component (value-to-market) measures equity mispricing while the second component (book-to-value) measures growth opportunities. Thus, we define the intrinsic value of a given equity based on Elliott, Koeter-Kant and Warr (2007, 2008) as:

$$IV_0 = BE_0 + \sum_{t=1}^{T}(1+k)^{-t}EE_0[I_t - k] \times BE_{t-1} + \frac{(1+k)^{-T}}{k}TV \quad (2)$$

Furthermore, we calculate the terminal value, TV as follows:

$$TV = EE_{i0}[(I_T - k \times BE_{T-1}) + (I_{T+1} - k \times BE_T)]/2 \quad (3)$$

where IV_0 is the intrinsic value of the firm's equity at time 0, BE_0 is the book value of equity at time 0, k is the cost of equity, and $EE_0(I_i)$ is the expected earnings for period t at time 0. We define time 0 as the previous fiscal year and set T to equal 2 years. Further drawing from Elliott, Koeter-Kant and Warr (2007, 2008) we incorporate 3 years of future growth earnings. The authors reason that given that the residual income model does not capitalize raw earnings but employs abnormal earnings (similar to the Economic Value Added approach), 3 years is a sufficient time period to capture all future potential growth opportunities of a given firm. We utilize a similar approach to theirs by using a perfect foresight version of the residual income model (see D'Mello and Shroff, 2000). Thus our definition of BE is the book value of equity and I*i* is defined as income before extraordinary items.

Our paper further adopts a similar approach by using the ex-post realization of earnings, which leads to a larger sample size but may suffer from several issues, most notably endogeneity. However, the endogeneity

would bias against our study finding evidence of market timing, given that debt issues would cause a further reduction in future earnings due to interest payment commitments. Our model uses the Fama and French (1997) three factor model to estimate the industry cost of equity capital, k. The results are not affected when using a single factor model. Short-term treasury bills proxy for the risk free rate. The terminal value is calculated as the average value of the last 2 years of the finite series. We restrict our sample to positive values, as using negative values would imply that managers are continuously investing in negative NPV projects. Similar to their study, we use future realized earnings by assuming perfect and unbiased foresight by managers to proxy for managers more informed expectations. This approach can be justified as the mispricing variable is used to measure the extent of deviation from the fundamental value of equity rather than creating a trading based rule. To confirm our results, we test for robustness using analyst forecasted earnings (consensus) data, obtained from Bloomberg at the beginning of the fiscal year. This is in line with the literature (see Elliott, Koeter-Kant and Warr, 2007, D'Mello and Shroff, 2000, and Lee, Myers and Swaminathan, 1999). This approach however reduces the sample size.

To measure the extent of deviation of market prices from fundamental equity value (measured by intrinsic value), we interact the ratio given above (the MISP variable) with the deficit term in our regression. Overvalued firms would have a MISP measure of greater than one and for undervalued firms the value would be less than one. Our basic model is as follows:

$$\Delta d_{it} = \alpha + \beta_1 DEF_{it} + \beta_2 (MISP \times DEF)_{it} + \varepsilon_{it} \quad (4)$$

$$\Delta d_{it} = \alpha + \beta_1 DEF_{it} + \beta_2 (MISP \times DEF)_{it} + \beta_3 \Delta SIZE_{it} + \beta_4 \Delta TANG_{it} + \beta_5 \Delta R\&D_{it} + \beta_6 \Delta PROF_{it} + \beta_7 \Delta CAPEX_{it} + \varepsilon_{it} \quad (5)$$

All our regressions control for firm fixed effects, report the coefficients and p-values, based on standard errors clustered by firm and year to avoid correlation of observations across time for a given firm and correlation across firms for a given year (see Peterson, 2009). This is to avoid biased standard errors in our unbalanced panel dataset regressions. Our results are robust to using White (1980) standard errors, although White standard errors are generally smaller and would yield 'more' significant results i.e. smaller p-values. Drawing from similar studies in the literature, we predict the deficit coefficient to be positive and the interaction term to be positive and significant as well. In the event the interaction term is not significant, market timing considerations do not have a direct influence on the financing of firm deficits. Our study assumes the cost of debt remains constant. To provide additional controls and increase robustness of our results, we include known determinants in equation (5). The SIZE variable is expected to be positive given that larger firms would be able to afford more debt in their balance sheet while tangibility is also expected to have a similar coefficient as tangible assets serve as debt collateral. Growth is proxied by including research and development expenditures as well as capital expenditures. The correlation for profitability remains fuzzy as profitable firms would want to reduce the amount of taxes paid by increasing debt issues (as interest payments are tax deductible). But increasing cash flows would also reduce the reliance on external sources of financing. We test for multicollinearity for our regressions and find the variance inflation factor (VIF) is less than 10 indicating the absence of multicollinearity issues.

RESULTS AND DISCUSSION

Our results are reported and discussed in this section. We provide the results for regressing the model in equation (4) in Table 2. Our regressions control for firm fixed effects the remove omitted time invariant firm factors that may lead to a spurious correlation between net debt issues and equity prices while controlling for firm specific differences, which are time invariant such as specific customer characteristics, talented management and economic shocks. All regressions include 15 industry dummies [0, 1] variables

to control for industry group effects (see Appendix A). Our classifications are similar to Antoniou, Guney and Paudyal (2008).

Looking at Table 2, the first column reports the regression that the deficit function has a positive coefficient as expected. The value is 0.4122, allowing us to conclude that debt issues finance about 41% of the deficit. To satisfy our objective, the next column reports the regression results for the interaction term. This allows us to capture how equity mispricing influences the financing of the deficit. The results report the interaction term to be positive and significant (0.2026) thus validating our notion that firms whose equities are undervalued (when the MISP measure is greater than 1) would increase debt issues and vice-versa. Our results are also economically significant, as the coefficient of the deficit has been reduced.

Table 2: Equity Market Timing in the UK

	1	2	3
CONSTANT	-0.016	-0.0331**	-0.0314**
	(0.18)	(0.04)	(0.02)
DEF	0.4122***	0.2466***	0.2457***
	(<0.01)	(<0.01)	(<0.01)
MISP x DEF	-	0.2026***	0.1987***
	-	(<0.01)	(<0.01)
ΔSIZE	-	-	0.014***
	-	-	(<0.01)
ΔT	-	-	0.0945***
	-	-	(<0.01)
ΔRD	-	-	0.079***
	-	-	(<0.01)
ΔEBITDA	-	-	-0.0117***
	-	-	(<0.01)
ΔCAPEX	-	-	0.039***
	-	-	(<0.01)
R^2	0.4966	0.5872	0.595
Adjusted R^2	0.4023	0.5136	0.5243
Wald (p-values)	0	0	0
Observations	18,062	18,062	18,062
Period	1992 – 2011	1992 – 2011	1992 – 2011

*This table provides the results for our initial analysis. ***, ** and * indicates significance at 1%, 5% and 10% respectively. The dependent variable, Δd, net debt issues is the net change in total book debt scaled by total assets. DEF is the sum of dividends, net investment and net working capital less cash flow after interest and taxes. MISP is the ratio of intrinsic value to market value of equities. SIZE is the natural logarithm of net sales in millions of 1992 pounds. TANG, asset tangibility is net plant, property and equipment over total assets. PROF is measured by earnings before interest, taxes, depreciation and amortization divided by total assets. R&D (research and development expenses) and CAPEX (capital expenditure) are scaled by total assets.*

Our results allow us to infer that market timing considerations are not only statistically but also economically significant in explaining capital structure decisions i.e. net debt issues. Furthermore, the adjusted R^2 improves when the interaction term is included, suggesting the inclusion allows an increase in power of explanation. The last column reports the results of the regression when the known determinants discussed in equation (5) are included into the estimation. Size, tangibility and growth proxies all have positive and significant coefficients. Profitability however has a negative and significant coefficient.

To examine the main purpose of the paper, we further split the sample into two portions (undervalued firm-years i.e. MISP > 1 and overvalued firm-years i.e. MISP < 1). The results are reported in Table 3. The first

column shows the interaction term remains positive and significant as expected. The next two columns report the expanded model by including a quadratic and cubic term to test the non-linear issuing behavior. The second column shows the second order term is significant and positive while the first order term is now insignificant; indicating that firms are only inclined to increase debt issues to finance the deficit in the face of severe undervaluation. Managers are reluctant to increase reliance on debt issues in the event of lower levels of undervaluation.

Table 3: Non-linearity in Equity Market Timing

	1	2	3	4	5	6
	Undervalued firms (MISP > 1)			**Overvalued firms (MISP < 1)**		
CONSTANT	-0.0182**	-0.018**	-0.0202***	-0.0146**	-0.016**	-0.017**
	(0.03)	(0.03)	(<0.01)	(0.04)	(0.03)	(0.02)
DEF	0.2874***	0.2766***	0.276***	0.213***	0.2099***	0.2067***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
MISP x DEF	0.2744***	0.0034	0.0086	0.1022***	0.1128***	0.1224***
	(<0.01)	(0.19)	(0.22)	(<0.01)	(<0.01)	(<0.01)
$MISP^2$ x DEF	-	0.2636***	0.0357*	-	0.004	0.0577**
	-	(<0.01)	(0.05)	-	(0.26)	(0.03)
$MISP^3$ x DEF	-	-	0.2344***	-	-	0.0026
	-	-	(<0.01)	-	-	(0.22)
ΔSIZE	0.0133***	0.0136***	0.0138***	0.0151***	0.0149***	0.0147***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
ΔT	0.098***	0.0981***	0.0981**	0.0922***	0.0926***	0.0927***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
ΔRD	0.0663**	0.0650**	0.0647*	0.0994***	0.0989***	0.0984***
	(0.03)	(0.04)	(0.08)	(<0.01)	(<0.01)	(<0.01)
ΔEBITDA	-0.0124**	-0.0123**	-0.0119**	-0.0109**	-0.0108*	-0.0097
	(0.03)	(0.03)	(0.03)	(0.03)	(0.07)	(0.12)
ΔCAPEX	0.0422***	0.0421***	0.0421***	0.0356***	0.0357***	0.0355***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
R^2	0.634	0.6314	0.6292	0.6641	0.6545	0.6423
Adjusted R^2	0.5831	0.579	0.5773	0.5955	0.5879	0.5822
Wald (p-values)	0	0	0	0	0	0
Observations	8,454	8,454	8,454	8,605	8,605	8,605
Period	1992 – 2011	1992 – 2011	1992 – 2011	1992 – 2011	1992 – 2011	1992 – 2011

*This table provides the results for non-linear timing behavior. ***, ** and * indicates significance at 1%, 5% and 10% respectively. The dependent variable, Δd, net debt issues is the net change in total book debt scaled by total assets. DEF is the sum of dividends, net investment and net working capital less cash flow after interest and taxes. MISP is the ratio of intrinsic value to market value of equities. SIZE is the natural logarithm of net sales in millions of 1992 pounds. TANG, asset tangibility is net plant, property and equipment over total assets. PROF is measured by earnings before interest, taxes, depreciation and amortization divided by total assets. R&D (research and development expenses) and CAPEX (capital expenditure) are scaled by total assets.*

One possible explanation would be that managers are willing to forgo the benefit that may be gained by relying on a cheaper source of financing to protect future growth prospects as increasing leverage levels may limit firms' financial flexibility. Another plausible explanation would be that managers are not willing to invite more scrutiny into their actions brought about by debt issues unless necessary and are concerned about the disciplining element of interest payments (i.e. information asymmetry and agency implications). The third possible explanation would be that managers may be concerned with the extent of mispricing and to protect shareholders' interests, would be keen on issuing debt as a signal to the market that equities are

undervalued. It could be that lower levels of undervaluation do not prompt such a reaction from managers, as the cost of such actions would outweigh the potential benefit. We observe a similar pattern confirming our results in the third column. The third order term has a higher coefficient and is statistically significant as well.

The fourth column shows the interaction term remains positive and significant. The fifth column shows the quadratic term interaction is insignificant suggesting that mangers prefer not to increase reliance on equities when prices are not severely overvalued and only increase equity issues when levels of overvaluation are lower. This further validates our notion of non-linear issuing behavior. A plausible explanation would be that managers would be keen on detecting irrational overvaluation and attempt to increase equity issues sooner than later if prices keep increasing. In a scenario of a share price rally, if prices keep increasing over longer periods, the market may tend to interpret an equity issue announcement as a signal for overvaluation and thus managers would inclined to issue during the periods when prices are just increasing. Another possible explanation would be that managers do not believe severely inflated prices would hold up for them to make use of the window of opportunity. The introduction of the cubic term in the model in the last column further confirms our results as the coefficient for the first order term remains larger than the second order term while the third order term is insignificant.

To validate the robustness of our results, we report the results for similar regressions using analyst forecast data in Table 4. Columns 1–3 report the results for undervalued firms. Interaction between the mispricing variable (MISP) and the deficit function in column 2 is insignificant while the interaction involving the quadratic term is positive and significant as expected. The inclusion of a cubic term in column 3 provides similar results. Thus, managers only increase reliance on debt issues to finance the deficit in the event of severe equity undervaluation.

Columns 4–6 in Table 4 report the results for overvalued firms. The fifth column shows the linear interaction term is positive and significant while the quadratic interaction term is insignificant. This indicates that mangers increase equity issues during periods of lower levels of overvaluation rather than severe levels of overvaluation. Inclusion of the cubic term in column 6 further confirms the findings. The findings from the results in Table 4 mirror our findings from the results in Table 3 suggesting that market timing does indeed work in a non-linear manner, as managers are keenly aware of windows of opportunity. This however indicates that the market timing explanation of capital structure works within a complex framework of other considerations that affect firms issuing patterns.

CONCLUSION

Our paper uses unbalanced UK panel data to empirically test the equity market timing theory of capital structure. The main notion of the paper is to show that managers time the equity market in a non-linear manner. Drawing from the literature, we regress net debt issues against the financing deficit, which is interacted with a mispricing measure. The initial results confirm previous studies that equity mispricing is able to explain the ratio of debt vs. equity issues in financing the deficit. Our findings are economically as well as statistically significant. In line with our objective, we extend the argument by testing for non-linear issuing behavior and provide evidence that managers are acutely aware of windows of opportunity and time the market discriminately.

Table 4: Robustness of Results

	1	2	3	4	5	6
	Undervalued firms (MISP > 1)			**Overvalued firms (MISP < 1)**		
CONSTANT	-0.0219***	-0.0245***	-0.028***	-0.0243***	-0.0266***	-0.0287***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
DEF	0.362***	0.3585***	0.3548***	0.2936***	0.2873***	0.2766***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
MISP x DEF	0.3344***	0.0108	0.0022	0.1624***	0.1466***	0.1236**
	(<0.1)	(0.17)	(0.45)	(<0.01)	(<0.01)	(0.02)
$MISP^2$ x DEF	-	0.3199***	0.0119*	-	0.0101	0.0304*
	-	(<0.01)	(0.09)	-	(0.13)	(0.08)
$MISP^3$ x DEF	-	-	0.2944***	-	-	0.0064
	-	-	(<0.01)	-	-	(0.18)
ΔSIZE	0.0126***	0.0125***	0.0125***	0.016***	0.0158***	0.0155***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
ΔT	0.1122***	0.1118***	0.1117**	0.1238***	0.1236***	0.1233***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
ΔRD	0.054*	0.0533*	0.0521	0.042*	0.0408	0.0407
	(0.09)	(0.09)	(0.1)	(0.08)	(0.1)	(0.11)
ΔEBITDA	-0.0138***	-0.0141***	-0.0142***	-0.0126***	-0.0124***	-0.012***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
ΔCAPEX	0.053***	0.0528***	0.0527***	0.0424***	0.0418***	0.0417***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
R^2	0.7224	0.7196	0.6864	0.7844	0.7764	0.7653
Adjusted R^2	0.6463	0.6208	0.5973	0.6227	0.6135	0.5964
Wald (p-values)	0	0	0	0	0	0
Observations	3,457	3,457	3,457	3,136	3,136	3,136
Period	1992 – 2011	1992 – 2011	1992 – 2011	1992 – 2011	1992 – 2011	1992 – 2011

*This table provides the robustness of results for non-linear timing behavior using analyst forecasted earnings. ***, ** and * indicates significance at 1%, 5% and 10% respectively. The dependent variable, Δd, net debt issues is the net change in total book debt scaled by total assets. DEF is the sum of dividends, net investment and net working capital less cash flow after interest and taxes. MISP is the ratio of intrinsic value to market value of equities. SIZE is the natural logarithm of net sales in millions of 1992 pounds. TANG, asset tangibility is net plant, property and equipment over total assets. PROF is measured by earnings before interest, taxes, depreciation and amortization divided by total assets. R&D (research and development expenses) and CAPEX (capital expenditure) are scaled by total assets.*

Our findings point out increased reliance on debt during periods of undervaluation as predicted by the market timing theory is only evident if the extent of mispricing is large. This could be due to interplay between protecting financial flexibility (slack), information asymmetry as well as agency considerations. Conversely, managers only increase equity issues to fund deficits during periods of lower levels of overvaluation rather than during periods of higher levels of overvaluation. This result suggests that managers would be keen to lower cost of capital by issuing equity. Our findings are an indication of signaling effects as well as managerial expectations of equity prices affecting timing inclination of managers. Given the aim of our paper, our empirical analysis is limited to measuring the extent of timing given different levels of mispricing and doesn't capture the effect of interplaying factors as discussed above, which may influence timing behavior. Our empirical findings provide interesting implications which raise some compelling questions and provide room for further research to examine the market timing theory as

a plausible explanation of capital structure decisions. We delegate to future research, how the market timing theory holds as a standalone theory as well as how the extent of mispricing interacts with other factors (e.g. ownership structure, the interplay between cost of debt and cost of equity in timing the markets as well as the signaling indications that arise from timing attempts) that affect capital structure decisions.

APPENDIX

Appendix A: Industry Classifications

No	Industry Name
1	Automotive, Aviation and transportation
2	Beverages, Tobacco
3	Building and Construction
4	Chemicals, Healthcare, Pharmaceuticals
5	Computer, Electrical and electronic equipment
6	Diversified industry
7	Engineering, Mining, Metallurgy, Oil and gas exploration
8	Food producer and processors, Farming and fishing
9	Leisure, Hotels, restaurants and pubs
10	Other business
11	Paper, Forestry, Packaging, Printing and publishing, Photography
12	Retailers, Wholesalers and distributors
13	Services
14	Textile, Leather, Clothing, Footwear and furniture
15	Utilities

Source: Datastream Thomson Reuters

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