Why do some firms follow zero leverage policy?

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Abstract

Analysing zero leverage (ZL) phenomenon by focusing on different channels of supply effects, we report that ZL firms face different supply conditions. They are generally restricted to issuing debt following a downgrade in their credit rating and/or underinvestment problems. In contrast, optimistic investors create good stock supply conditions (overvalued equity) to rely more on equity financing. Additionally, it appears that ZL firms which deviate significantly from their optimal leverage are more likely to have an upgrade in their credit rating. Finally, controlling for endogeneity, we report that firms employing overconfident CEOs are more likely to adopt ZL policy.

Keywords: leverage; financial constraints; equity mispricing; underinvestment; managerial overconfidence

JEL Classification: G32, G34

1. Introduction

Since Modigliani and Miller's (1958) seminal work, the relationship between firms' debt level and its value has been one of the hottest debates in corporate finance literature. Alleviating the underlying assumptions of their irrelevance proposition led to the development of widespread accepted capital structure theories (i.e. trade-off and pecking order theories). Even though predictions of these theories vary in the presence of market frictions, they all advocate an association between firm value and leverage due to tax benefits, bankruptcy and asymmetric information cost. Given this theoretical relationship between debt level and firm value with market frictions, none of these theories can explain the persistent puzzle that of a significant number of firms employing no debt leverage policy for a few years (e.g. Google and Apple). These very low leverage firms leave substantial money on the table which forbids them from optimizing on the tax benefit of debt. To address this issue, this study investigates whether shifts in demand for, or supply of, capital is the key driving force behind such extreme financing policies.

Recent empirical studies (e.g. Devos *et al.* 2012, Bessler *et al.* 2013) document a significant number (with an increasing trend) of firms adopting conservative leverage policy over the last two decades: the proportion of firms with zero leverage is 10.2%, and almost 22% of them have less than 5% debt ratio over the period from 1982 to 2003. By examining conservative financing behaviour, Minton and Wruck (2001) document how these firms follow pecking order theory, and stock pile their debt capacity for future investments. Marchica and Mura (2010) also arrive at similar conclusions for United Kingdom listed firms that have persistently deviated from their optimal leverage for three consecutive years. However, these deviations might also be attributed to the fact that financially constrained

firms, which are typically younger and smaller, are more likely to go debt free than their counterparts (Devos *et al.* 2012). Adoption of such leverage policy might also be positively influenced by euphoric market conditions such as IPO waves and assets volatility (Bessler *et al.* 2013). On the downside, firms adopting such policy on average leave 7.6% of their market value on the table, and surprisingly many of these firms also pay dividends (Strebulaev and Yang 2013). Their motivation behind paying dividends might be either to substitute leverage in order to mitigate agency problems, or to build reputation in the stock market (Strebulaev and Yang 2013). This puzzle of ZL firms that also pay dividends is examined by Korteweg (2010), who reports that the average net benefit of debt is about 5% of a firm's value, and even for zero leverage firms with higher issuance costs in terms of financial constraints, there is approximately 1.8% potential gain in issuing debt.

This paper contributes to the growing empirical studies that have recently examined the conservative debt policy by considering the extreme financing policy of U.S firms during the period between 1980 and 2012. However, the set of our hypotheses and approaches are different from our predecessors in a number of ways. First, our paper contributes to existing literature by focusing on both demand and supply effects on the probability of adopting ZL policy. Recent studies (e.g. Faulkender and Petersen 2006, Baker 2009, Bolton *et al.* 2013) state that supply conditions are imperfect and highlight the need to consider the role of supply effects in firms' financing decisions. Our general approach to identifying the supply of capital is influenced by the study/review of Baker (2009) and Bakera and Wurglerb (2013). Baker (2009) states that three channels can lead to the possibility of supply effects in corporate finance; investor taste, limited financial intermediation, and corporate managerial traits. Investor tastes drive the supply condition in any situation where preference (possibly irrational) or expectation of the investors leads security prices to move in a way that is

unrelated to corporate fundamentals. Limited financial intermediation indicates that banks or other capital suppliers are not always well capitalised, competitive or efficient (partly due to asymmetric information) enough to offer the security price at the fundamental value; thus, capital is not always available when it is needed[1]. While investor taste or imperfect competitive intermediates can lead the firm's securities to move away from the fundamental value, managers' responses to these changes can also create apparent supply effects, as they issue their preference securities according to their beliefs. A further survey conducted by Bakera and Wurglerb (2013) complements this notion, arguing that understanding financing and investing patterns, including some that are difficult to reconcile with existing theory, requires understanding of the beliefs and preferences of mangers and investors. Motivated by the above statements, this study attempts to investigate the impact of supply effects driven by investor and managerial tastes, along with the demand side effects on determinants of ZL policy.

Due to the complexity and information asymmetry of the financial market, credit rating has become a widely accepted measure of firms' creditworthiness when facilitating access to the credit market. Leary (2009) lends support to the role of credit supply and argues that observed debt ratio may not reflect a firm's credit demand. Kisgen (2006) states that different credit rating levels are associated with different interest rates on firms borrowing. Kisgen (2009) finds that firms reduce leverage following a credit rating downgrade. In order to test whether ZL firms are primarily driven by limited access to the debt market, we employ two proxies as indications of credit supply effects: (i) change in credit rating probability (Lemmon and Zender 2010) and (ii) change in SA-index (Hadlock and Pierce 2010). Our

[1] Investors' tastes will not move security value away from fundamental value if there are well capitalised and rational intermediates engaged in competitive arbitrage.

results show whopping increases (31%) in transformations from non-ZL to ZL, following a downgrade in credit rating probability.

Our second contribution is that, while the common theme of the extant literature in terms of supply effects focuses only on the impact of availability of debt financing for such firms, no study has considered the impact of other sources of capital in explaining this phenomenon. In particular, our study complements Bessler *et al.* (2013), who focus on the credit supply side of ZL. We extend it further and argue that when market frictions create a wedge between costs of external debt with external equity, managers attempt to time the market by considering the current condition of debt and equity resources, and issue or repurchase the type of securities with more favourable conditions (Baker 2009, Bakera and Wurglerb 2013). In this study, we examine whether low costs of equity resource (overvalued equity) created by optimistic investors can possibly explain firms' adoption of ZL policy. We find strong evidence that this is the case for the United States firms.

To examine the effect of equity mispricing, we sort firms into different mispricing quintiles. As expected, the greatest portion of ZL firms belongs to the most overvalued group, implying that these firms enjoy the cheap source of equity financing. Our analysis also suggests that the level of a ZL firm's investment depends strongly on its stock valuation, as the only group of ZL which does not exhibit underinvestment belongs to the overvalued group, and the more severe underinvestment problem is related to the most undervalued group. We also document how the degree of mispricing drives firms to adopt ZL policy. We observe that the capital structure of ZL is the cumulative result of past attempts to issue more equity in the response to higher favourable valuation by the market (see Figure 1). It appears that, while on average these firms gradually deviate from their target debt ratio for several

years prior to ending up with no debt, at the same time overvaluation induces these firms to raise cheap capital by issuing more equity.

To test whether overvalued equity intensifies the probability of ZL policy, we perform logit analyses (conditional fixed effects) that include further controls for other possible determinants of ZL policy. In particular, we control for future growth options in our model, as our valuation model might be criticized for perhaps capturing the effects of growth prospective rather than mispricing effects. Overall, test results suggest that managers of overvalued firms find that the benefit of issuing overvalued equity outweighs the tax advantage and bankruptcy cost of debt. Further, our results reveal that the economic significance of mispricing is also sizeable when we account for growth opportunities; indeed the impact of mispricing is about 32% of the impact of growth options on probability of ZL policy. Furthermore, the positive association between stock overvaluation and following of ZL gets higher for firms with higher demand of capital; high growth firms, firms with positive financing deficit, and financially constrained firms.

While downgrading in the credit market (Kisgen 2006), or underinvestment problems (Myers 1977) lead firms to face difficulty in raising money in debt markets and ultimately ending up with ZL, our third contribution is related to two alternative explanations, which argue that firms voluntarily follow ZL to mitigate the above problems. The first argues that, if managers are concerned about maintaining higher credit rating, then they deliberately reduce their firm's leverage to improve or regain their credit rating (Kisgen 2006, 2009). The second argument contends that firms reserve their borrowing power for future use (DeAngelo *et al.* 2011). Based on these assertions, when managers recognize the value of future investment distortions and higher credit rating outweighs the current tax benefits, then they prefer to maintain substantial reserves of untapped borrowing power to ensure financing of future

projects at the lower cost. From both perspectives, firms are reluctant to borrow and have some unused debt capacity. However, by distinguishing between debt free firms in the optimal and non-optimal zone, we empirically show that this statement is only applicable for those debt free firms that deliberately deviate from target leverage. We estimate the deviation from target leverage and classify our ZL sample into two groups based on the median value (-3.5%) of this deviation; namely ZL in optimal zone and non-optimal zone. Since adopting ZL is a strategic decision in response to future demand, the role of ZL policy becomes questionable, unless enabling these companies to obtain better access to debt market is possible in order to undertake their valuable investment. Indeed *we find good things comes to those who wait*; after adopting ZL policy for some time, ZL firms which are located in the non-optimal zone (greater deviation from target leverage) achieve a considerable increase in their probability of credit rating, are less dependent on internal funds, and more be able to mitigate their deviation from optimal investment compared with their ZL counterpart in the optimal zone.

Another strand of this paper explores CEO overconfidence. Managerial tastes can also create apparent supply effects. Notably, overconfident managers imagine that the cost of capital varies independently of corporate fundamentals, when in fact, it does not. This study also contributes to the behavioural finance literature, both theoretically and methodologically. The existing literature considers the influence of overconfident managers on capital structure. However, to the best of our knowledge, the influence of overconfident managers in determining ZL policy has not been analysed, and this is the first attempt to examine this relationship[2]. Furthermore, since the overconfidence proxy is an option-based measure, there

[2] With the exception of a study by Malmendier *et al.* (2011) which examines the effect of overconfident managers on conservative debt user firms based on the kink variable of Graham (2000).

might be a concern that this proxy is correlated with other omitted variables. In contrast with the prior literature (e.g. Malmendier and Tate 2005, Hirshleifer *et al.* 2012) we treat this proxy as an endogenous variable. The results reveal that firms with overconfident CEOs give rise to a higher probability of employing ZL policy.

The rest of this paper is organized as follows. In Section 2 we develop a set of testable hypotheses in line with the related literature; Section 3 discusses the construction of the key variables; Section 4 explains the dataset and provides descriptive statistics of variables; Section 5 reports the findings of univariate and multivariate analyses and discusses their implications. Finally, Section 6 concludes the paper.

2. Literature Review and Hypothesis

This paper contributes to the existing strand of literature by focusing on the impact of both demand and supply sides on the probability of firms adopting ZL policy. The implicit assumption behind focusing on the demand side is that the equilibrium supply of capital is fully competitive, flexible and available at a correct price as assumed by Modigliani and Miller (1958), based on the assumption then debt levels are solely determined by the demand side. However, recent studies (e.g. Faulkender and Petersen 2006, Baker 2009, Bolton *et al.* 2013) criticize this assumption and state that supply conditions are imperfect, highlighting the need to consider the role of the supply side in firms' financing decision. Considering that firms always seek to reduce their cost of capital, we emphasize how ZL can be related to the shifts in the credit and equity market conditions.

2.1. Credit Supply Side Effects

Empirical studies suggest that debt segmentation may put some constraints on the ability of firms to borrow, and that the observed debt ratio may not reflect a firm's demand

for debt capital. For instance, Faulkender and Petersen (2006) present evidence as to how having a credit rating can influence the cost of capital for two identical firms with similar projects. Debt ratings primarily have a positive impact on reducing informational frictions (Sufi 2009) and different credit rating levels are generally associated with different interest rates on firms' borrowing (Kisgen 2006). Kisgen (2009) argues that change in credit rating affects capital structure decisions, as firms in their sample reduce leverage following credit rating downgrade. Therefore, we examine whether downgrades in credit rating, which impose a higher cost of debt financing, is associated with subsequent ZL policy.

H_1: Firms affected by credit rating downgrading are more likely to adopt ZL policy.

2.2. Stock Market Supply Side Effects

Empirical studies (e.g. Baker and Wurgler 2002, Baker 2009) report that stock supply conditions can influence equity issuance, which in turn may affect firms in different ways including deviation from optimal capital structure. The idea that managers take advantage of misvaluation of their firms' securities has been proposed by several empirical studies to justify several empirical facts which are not easy to reconcile with existing theories. For instance, in Graham and Harvey's (2001) survey, two-thirds of CFOs state that the degree of over- or undervaluation of their stocks is the most important consideration in issuing equity. Elliott *et al.* (2007) test the market timing theory, and find the degree of overvaluation of equity is positively associated with a firm's proportion of financing deficit that is funded by equity.

Furthermore, as an accounting identity, the observed capital structure for any firm is the cumulative result of a long series of incremental financing decisions, in response to the

financial needs of some investments. To some extent, market timing has a direct impact on these incremental financing decisions, in particular if the impact of market timing on financing decisions is not rebalanced away shortly (Warr *et al.* 2012). Thus, it is expected that a firm which raises external financing when its share price is relatively higher than fundamental value ends up as a firm with ZL. Also, firms with cheap access to the equity market use less debt, as greater overvaluation should cause substitution away from debt and towards equity issuance overtime. In sum, all of the above studies suggest that firms are more willing to issue equity when the market is optimistic about the firm's value. Therefore, we expect ZL firms are those firms that make greater attempts to take advantage of their stock overvaluation for several periods.

H_{2a}: The probability of a firm having ZL policy increases with the presence of stock overvaluation.

H_{2b}: The probability of a firm having ZL policy increases as the duration of stock overvaluation increases.

However, not all firms have the same level of ability to be opportunistic in the stock markets. We further hypothesize that if a firm is mispriced and its market value exceeds its true value, catering to overpricing should be stronger when firms are pressured to raise capital (i.e. firms with higher demand for capital). Lemmon and Zender (2010) argue that, for agency reasons, high growth firms typically have a lower debt capacity and are forced to raise funds through the equity markets. Hence, overvalued firms with potential growth opportunities may be particularly prone to raising equity capital to finance their investment when investors are overoptimistic. Stulz (1990) and McConnell and Servaes (1995) further argue that these growth options constitute a large proportion of firms' value, and keeping

leverage low is one way to protect this value. Therefore, firms prefer to capitalise their growth options through equity issuance rather than debt issuance in order to avoid a debt overhang problem or bankruptcy costs. Returning to prior discussion of firms' access to the capital markets, financially constrained firms face higher costs of external financing. When equity is overvalued, a firm's cost of equity is relatively decreased. Thus, for financially constrained firms whose investment opportunities need to be financed, overvalued equity can be a strong motivation to raise capital, enabling constrained firms to gain a high benefit from this opportunity and make a prompt response to any overvaluation in the market by issuing more equity. To sum up, investigating the joint impact of financial constraints, growth opportunities, and overvaluation on the probability of conservative debt policy, suggests that such firms in particular could take advantage of these opportunities, issue more equity, and end up with very low or even zero leverage over time.

H_{2c}: The positive association between stock overvaluation and probability of ZL gets higher for firms with higher demand for external funds.

2.3. Demand Side Effects

DeAngelo *et al.* (2011) argue that forward looking financing decisions involve consideration of the opportunity costs of the consequent future inability to borrow. Based on this strategy, firms wish to build their borrowing power for the future in case of significant need of capital. Graham and Harvey (2001) report that CFOs focus on credit rating as a guide for debt financing. Further, Kisgen (2009) finds that firms reduce their leverage to avoid downgrades and achieve upgrades in their credit rating.

According to the demand and supply of capital, we expect firms with high growth opportunities to be in greater need of funds. Thus, to undertake positive investment

opportunities, those firms should accumulate more debt over time. However, a firm's investment opportunity set may also have some implication for its capital structure. As presented by Myers (1977), a firm's value consists of two elements: the value of assets in place, and the present value of future investments. In essence, Myers terms the latter as the real option (or call option), and this value is determined by the exercising of this option. He also emphasizes that this option may eventually create agency conflicts between shareholders and debtholders. Therefore, despite the conventional wisdom that the value of tax benefit is far higher than the expected distress cost of debt (Graham 2000), the observation of many firms with very low leverage should not be surprising when one recognizes that a firm must sacrifice the value of its option to capture the tax benefit of debt. Broadly speaking, if managers recognise that the value of future investment distortions outweighs the current tax benefits, then the value of this investment distortion acts in the same way as financial distress cost does: both restrain a firm from issuing more debt. A study by Gilson and Warner (1998) explains this argument in more detail. They show that firms are willing to forgo tax savings of a few cents on the dollar to preserve debt capacity, in order to meet unpredicted funding demand. In this view, firms save their debt capacity today to have better access to the debt market tomorrow (DeAngelo *et al.* 2011). Thus:

H_{3a}: Firms follow ZL policy in order to reduce future investment distortion either exposed from equity holders (underinvestment problem) or debt holder (higher cost of debt).

Further, a firm might not undertake any positive NPV investment because the payoff of investment would go to debt holders. Thus, optimal investment cannot be attained; such a

loss is higher for firms which are more likely to have profitable future growth opportunities. One possible solution to this underinvestment is to reduce the risky debt overhang. Therefore, firms in this situation issue no debt, to mitigate the underinvestment problem. Thus:

H_{3b}: Firms with an underinvestment problem are more likely to adopt ZL policy.

2.4. CEO Overconfidence

A growing body of literature indicates that significant numbers of ordinary people tend to be overconfident in their predictions, and this phenomenon is more observable among managers. One of the most important roles of managers is to evaluate future events and plan the corporate policies based on these anticipations. This task will be more complicated for overconfident managers, as they overestimate their ability to forecast the future. Therefore, variation in managers' personality traits may drive different financing decision outcomes, which helps to explain a residual variation that is difficult to reconcile with traditional capital structure theories (Malmendier *et al.* 2011). A survey by Graham and Harvey (2001) shows the direct role of biased managerial belief in the context of financing choices. For instance, prior to the end of the technology bubble in 1999, 70% of managers believed that their stocks were under-priced, and this mispricing was an important factor in their decision for the issuance of securities.

Heaton (1998) explores the implication of managerial irrationality in a simple model. According to this approach, overestimation of future cash flows by overconfident managers leads to a reluctance towards external financing, especially equity financing, as such security is more subject to mispricing relative to debt financing. Accordingly, this managerial optimism model suggests a pecking order structure preference, even in the absence of considerable asymmetric information, because overconfident managers perceive their

companies to be undervalued by the market. In contrast, Hackbarth's (2008) model predicts that both standard and reverse pecking order approaches for a firm are subject to managerial overconfidence definitions, namely growth perception bias and risk perception bias. When managers are subject to a risk perception bias (i.e. underestimate the risk of earnings) they trust equity as overvalued and debt as undervalued securities in the market, and hence they see a great benefit to issuing equity rather than debt. This may lead to an adverse preference of pecking order theory.

Furthermore, Malmendier *et al.* (2011) define overconfidence as the overestimation of mean return on investments. They state that, subjected to availability of sufficient internal funds or access to riskless debt financing, this overestimation leads overconfident managers to overinvest. However, in the absence of internal funds or riskless debt they may even underinvest. The reason is that overconfidence also implies the misjudgement of the cost of external financing; hence, rational investors demand higher compensation for providing funds than the managers deem appropriate. Therefore, overconfident managers only raise external financing if they believe the returns on the investment are relatively larger than the perceived financing cost. If however this is not the case, and overconfident managers believe the cost of external financing exceeds the investment return, they only invest up to the level of riskless debt financing (potentially underinvestment). Thus, overconfident managers might preserve debt capacity, and generate more internal funds in anticipation of future investment. Malmendier *et al.* (2011) examine the effect of overconfident managers on conservative debt user firms (based on the kink variable suggested by Graham (2000)) and find that managers of such firms rely heavily on internal funds and are also conservative in issuing equity. To test empirically the influence of managerial overconfidence on the probability of ZL policy, we put forward the following hypothesis:

H_4: Firms with an overconfident manager are more likely to adopt ZL policy.

3. Construction of Variables

3.1. Credit Supply Side Variables

In order to determine if firms are financially constrained, we estimate two proxies as an indication of credit supply effects: (i) SA Index based on firm size and age (Hadlock and Pierce 2010), and (ii) the probability of having a credit rating (Lemmon and Zender 2010). Hadlock and Pierce (2010) argue that their method is appropriate, as it relies on factors which are more exogenous than most of the alternatives.

Quantifying debt capacity is necessary to examine how much debt a firm can bear, and this is the point at which an increase in use of additional debt reduces the total value of a firm. However, measuring debt capacity is difficult, since it is not observable. Lemmon and Zender (2010) address this problem, and state that the primary indicator of debt capacity is whether the firm has, based on its characteristics, a high likelihood of being able to access the bond markets. Firms that can access the debt markets must be stable with sufficient cash flows, high level of collateral, and sufficient information transparency, which allows them to access a large amount of arm's length debt with a lower interest rate. Lemmon and Zender (2010) further argue that, while the presence (or absence) of credit rating influences the cost of borrowing, and hence indicates the level of debt capacity, the use of *observed* debt rating as a proxy for debt capacity might pose a problem. This is because some firms with no debt rating might deliberately choose to rely on equity financing, despite having the capacity to issue public debt. Thus, a concern arises that the non-existence of a bond rating captures unobservable differences in demand. Therefore, identifying such firms as being constrained might lead to biased results. To address this concern, following Bessler *et al.* (2013), we

employ a predictive model based on observable firm characteristics to find out the likelihood that a firm can access the public debt market in a given year[3]. To further differentiate our study, we use change in credit rating in our model, considering the fact that rating downgrades motivate firms to reduce debt level into their capital structure (Kisgen 2009). Furthermore, utilising change in credit rating in the model is more precise, as there is a high correlation between the probability of having credit rating with firm size and age. We took the difference [*t*–(*t*–1)] of the likelihood that a firm can access the public debt market in a given year as an indication of access to debt markets.

3.2. Stock Market Supply Side Variable

While some studies employ market to book ratio as a proxy of stock valuation, other (e.g. Dong *et al.* 2012, Warr *et al.* 2012) argue that book to market ratio is a weak proxy for misevaluation, as this proxy is more likely to capture growth option and debt overhang problems rather than valuation. We use the residual income model (RIM) that was originally developed in the accounting literature (Ohlson 1995) and adopted in the finance literature[4].

The residual income model is based on the ratio of intrinsic value to the market value of the firm (Lee *et al.* 1999, Elliott *et al.* 2007). The intrinsic value is book value plus the discounted value of all expected future residual income, which is formulated as below.

$$V(t) = B_t + \sum_{t=1}^{\infty} \left(\frac{E(t+1) - (rt * Bt-1)}{(1+r)^t} \right) + \frac{TV}{(1+rt)^n * r} \qquad (1)$$

The above infinite sum needs to be replaced by a finite series of *T*–1 periods, plus the terminal value (*TV*) beyond period *T* as estimated as follows:

[3] See Table A2 for details. By adopting this approach, we can also extend our sample back to 1980 rather than 1986 (when credit ratings were first reported in Compustat).

[4] For instance, Dong *et al.* (2012) found that misvaluation measured by RIM is an important driver of the takeover market. Lee *et al.* (1999) demonstrated that RIM is able to predict the return of the Dow 30 stocks.

$$TV = \left(\frac{E - (r \times Bt - 1) + (E(t+1) - (r \times Bt)}{2} \right) \quad (2)$$

In this setting, *V(t)* is the intrinsic value of the stock at the time *t*, *B(t)* is the book value; *E* is the return on equity, and *n* equals 2 years. *r* is the cost of equity based on CAPM and the three-factor model proposed by Fama and French (1993) for any firm-year observation.[5] *TV* is the average of the last two years of the finite series and restricted to be non-negative. Similar to D'mello and Shroff (2000), we use the perfect foresight version of RIM that uses realized earnings.

We then use the ratio $VP(t) = V(t)/MV(t)$ as a misvaluation proxy, where $MV(t)$ represents market value of the firm at time *t* (Compustat: CSHO×PRCC_F). A perfect capital market implies that there is no misvaluation and $VP = 1$. However, this is not the case in reality for all stocks. In our sample, the mean value of *VP* is significantly less than 1, similar to Bonaimé *et al.* (2014). This is not a concern because the model is based on the rolling historical risk premium, which is time varying[6]. In order to examine if favourable stock valuation drives a firm to use no debt, we need to apply one single measure of misvaluation. However, the challenge is to identify a precise benchmark for comparison. First, following Dong *et al.* (2012) we use a continous measure of misvaluation (i.e. *VP*) that captures the deviation between fundamental and market value, which could serve our purpose. Second, following Bonaimé *et al.* (2014), we also construct a dummy variable of overvaluation based on the median value of misvaluation which captures the misvaluation of one stock to another, assuming that the market provided fair valuation over the sample of period.

[5] See Table A3 for more details.

[6] The equity premium is the 60-month rolling average of the difference between the return on the market and the long-term T-bond.

3.3. Demand Side Variables

3.3.1. Future Investment Oportunities

It is argued that future investment opportunities can influence current capital structure decisions, and flexibility is crucial for allowing firms to access capital markets and undertake these investments in the future. Based on this argument we expect that, in the presence of market frictions, firms with greater growth opportunities will adopt ZL policy in order to avoid any investment distortion. Following Bates *et al.* (2009), growth opportunities are proxied by *Tobin's Q*. We also construct a variable that shows if a firm has relatively high cash levels compared to its peers in the same industry (*Excess Cash*). See Table A1 for the definitions.

3.3.2. Underinvestment Problem

To focus on the agency-based explanation regarding the conflict between debtholders and shareholders, and its relation to ZL, we expect an increase in the employment of ZL when firms face an underinvestment problem (*Underinvestment*). This study follows the accounting-based framework developed by Richardson (2006) to build the investment expectation model. See Table A4 for the details.

3.3.3. CEO Overconfidence

The literature employs a number of different approaches in estimating overconfidence, including surveys and psychometric tests (Ben-David *et al.* 2013, Graham *et al.* 2013), stock option holding and exercising decision, CEO's net stock purchase and investment level (Hall and Murphy 2002, Campbell *et al.* 2011). To construct a measure of overconfidence of managers, this study exploits the overexposure of individual managers to the idiosyncratic

risk in their own firms. Managers receive a large quantity of stocks and options as compensation. They cannot trade these options until a specific date, and hence the value of their human capital is timely and tightly linked to the firm's performance. Because of this under-diversification, it is expected that risk averse managers will exercise their options early if they are *rational* expected utility maximisers. However, if the manager is optimistic about future performance he might persistently postpone exercise of the vested options even when the option is sufficiently in the money. Malmendier and Tate (2005) classify a CEO as overconfident when he fails to exercise the option 67% in the money (i.e. when the stock price exceeds the exercise price by more than 67%). Following these authors, we adopt this cut-off point in our paper. Overconfidence is known to be a persistent trait. Hence, once a manager is classified as overconfident, he will remain so for the rest of the sample period unless he appears to be non-overconfident (see Malmendier and Tate 2005)[7].

We do not have detailed data of managers' options holding and exercise prices, so we adopt the method used by Campbell *et al.* (2011) in calculating the average exercise price of the managers option portfolio in a given year. See Table A1 for the details provided for the variables *Option Moneyness* and *Overconfidence.*

4. Data and Descriptive Statistics

To construct the sample, we start with all available data of North America industrial firms from the annual Compustat dataset over the period 1980 to 2012. This study selects a relatively long period of 33 years in order to draw sound statistical estimations for any potential associations among the variables. To avoid any survivorship bias, our sample

[7] If the later years have missing data on moneyness with the same CEO the dummy variable is assumed to be equal to what was in the previous year. Applying this requirement increases observations from 22,541 to 26,294. However, the results are qualitatively the same if we do not replace the missing value. Similarly, Campbell *et al.* (2011) require the CEO to exhibit the option holding behaviour at least twice during the sample period. However, they state their result is not different if they only require that the CEO exhibit the behaviour once.

employs both active and inactive publicly traded firms. First, we restrict our sample to those companies with an FIC code equal to USA, which indicates that the company's headquarters is located in the USA. This gives us 239,367 firm-year observations. Following previous studies we also exclude financial firms with SIC codes in the range of 6000-6799, and regulated utilities with SIC codes in the range of 4900-4949, from our sample. Further, we eliminate firms with total assets less than US$10 million (in year 2000 dollars), and also require firms to have positive value of stock price, number of outstanding shares, common equity and sales. This gives us 168,342 (67,613 active and 100,729 inactive) firm-year observations that meet these criteria. Following Frank and Goyal (2009), all missing values for R&D expenditure and deferred tax have been replaced by zero. In order to reduce the effect of outliers, all variables apart from leverage related variables are winsorized at their 1st and 99th percentile values. Following this treatment, the mean value and median are fairly distributed.

In order to construct a measure for managerial overconfidence, merging a sample of ExecuComp[8] to financial accounting data from Compustat reduces our sample substantially. First, to identify CEOs as overconfident, we require firms to have options holding data available for CEOs, and drop those CEOs for whom there is no options data. This criterion gives us 35,520 firm-year observations. This data set also covers several variables including chairman independence, CEO ownership, CEO age and tenure. Second, to obtain the final sample, we merge this data with firm level control variables computed from Compustat fiscal year end (our main sample), and we end up with 23,224 firm-year observations consisting of

[8] According to WRDS, Execucomp contains over 2,872 companies, both active and inactive. The universe of firms covers the S&P 1500 plus companies that were once part of the 1500 and companies removed from the index that are still trading. Data collection on the S&P 1500 began in 1994. However, while there is data back to 1992 it is not the entire S&P 1500 – it is mostly for the S&P 500.

2,466 individual firms over 1992-2012. Table A1 provides an overview of all variables used in our empirical analyses.

The descriptive statistics of CEO traits in Table 1 report almost 45% and 36% (for cut points of 67% and 100% in the money) of firm-years have an overconfident and highly overconfident CEO respectively. This finding is similar to the earlier studies by Campbell *et al.* (2011) who use a similar measure of overconfidence constructed using Execucomp data from 1992-2005, and find 34% of their sample to have a highly overconfident CEO. Other studies by Hirshleifer *et al.* (2012) and Malmendier and Tate (2005) for the 67% cut point also claim that 61% and 51% of their sample can be classified as having overconfident managers, respectively.

[Insert Table 1 here]

The percentage of ZL firms appears to be almost 15% of the full sample. The mean value of leverage is 0.23. Other variables such as firm characteristics, financing variables, and probability of debt rating are also similar to a previous study by Bessler *et al.* (2013). Furthermore, the mean value of *misvaluation* (0.627) is similar to the result of Dong *et al.* (2012).

5. Data analysis

5.1. Zero Leverage and Credit Markets

Table 2 compares the mean characteristics of constrained and unconstrained ZL firms relative to other constrained and unconstrained non-ZL firms (classification based on their probability of having a credit rating[9]). For each variable, the mean values of three groups of (i)

[9] We also classify firms based on SA-index and find both measures of constrained credit report the same conclusions; hence we only report the results of the probability of having a credit rating.

constrained and unconstrained firms, (ii) constrained and unconstrained ZL firms, and (iii) constrained and unconstrained non-ZL firms, are computed. To identify the degree of financial constraints of any firm, we then classify firms into five separate groups according to their mean value of a constraint measure over the period. For the debt capacity measure, firms with the highest probability of credit rating, which belong to quintiles 5 and 4, are unconstrained, while firms with the lowest probability of credit rating in quintiles 1 and 2 are categorised as constrained. The reverse order is adopted for the alternative measure of constraint, SA Index (higher value indicates higher constraint).

[Insert Table 2 here]

The number of ZL firms is considerably higher in constrained subsamples; those firms which are classified as debt constrained tend to be smaller and younger, with higher growth opportunities. 48% of ZL firms are classified in the high constrained group compared to 21% for the non-constrained group. This finding confirms that a large proportion of the ZL firms have no access to debt market, and hence a ZL policy cannot be a deliberate strategy for such firms. However, there is a group of unconstrained firms with higher access to the debt market (17%) relative to the constrained group (0.03%). This implies that some unconstrained firms are not willing to issue debt at all. Some examples of this group are Apple and Google, which have good access to the debt market but are reluctant to exploit this opportunity.

The unwillingness to issue debt for this subsample can be justified by the high level of their profitability (even higher than non-ZL firms in the unconstrained group). However, these unconstrained ZL firms may lose substantial money by not levering up, as evidenced by a tax benefit of 32%, which is considerably higher than the 22% for the constrained group. Furthermore, many of the unconstrained ZL firms (50% of observations) are dividend payers

with a high pay-out ratio (22%). The higher agency cost of free cash flow can be the main rationale to pay out dividends for unconstrained highly profitable ZL groups.

Several studies document that the level of cash holding increases with financial constraint (Opler *et al.* 1999, Almeida *et al.* 2011). This notion implies that constrained firms are concerned about future investment, and hence accumulate more cash to avoid expensive external financing in the event of positive NPV projects. This argument is supported by the observation of the highest level of cash holding for constrained ZL firms in the sample, despite having average negative profitability. In contrast, the greater negative deviation from optimal investment for unconstrained ZL firms implies that these firms face a higher underinvestment problem than their constrained ZL peers, which might also result from a free cash flow problem between shareholders and managers.

Furthermore, the constrained group of ZL firms are the most active equity issuers in the sample. In contrast, unconstrained ZL firms exhibit the lowest equity issuance among all firms in our sample. Given the high profitability of this subsample, they simply have no need to raise external financing.

5.2. Stock Market Conditions

To confirm our hypothesis related to misvaluation, and to further explore whether the degree of misvaluation affects firms' financing policy, we stratify the sample in different ways and analyse the variable of interest as follows.

5.2.1. Misvaluation and financing activities over time

Table 3 reports yearly descriptive statistics of misvaluation and financing behaviour of ZL and non-ZL firms during the period 1980 to 2012. The results provide an interesting new picture of the financing pattern for both subsamples. While internally generated funds (using

profitability as internal financing) seems to be higher than total issuance (combined net issuance of debt and equity) prior to 1984 for non-ZL group, total issuance exceeds the internal funds for ZL firms in every successive year. ZL firms exhibit a positive mean value of internal funds only before 1983, and in 1992. However, after 1984, firms in both samples rely more on external financing.

[Insert Table 3 here]

There is a strong time trend in valuation in the sample. Stock valuation is very low in the early part of the sample period and increases steadily over time, particularly between 1992 and 1999 and most notably from 2003 to 2007. Accordingly, equity issuance is exceptionally high during these periods, relative to the early part of the sample. These patterns potentially confirm the aggregate market timing for the whole sample, where firms issue equity when valuations are high.

Turning back to examine the main hypothesis related to ZL policy and overvaluation, we observe that ZL firms exhibit significantly higher stock valuation, relative to non-ZL firms, for every year except those between 1986 and 1989. Furthermore, while the equity issuance is higher for both subsamples of firms relative to debt issuance, ZL firms rely significantly more on equity to finance their needs. Given the exceptionally high stock valuation and negative value of debt issuance for this group, this finding confirms that greater overvaluation causes substitution away from debt and towards equity issuance for ZL firms.

5.2.2. Degree of Misvaluation and Leverage

Table 3 reveals that ZL firms exhibited higher stock valuation over the sample period. In order to gain a preliminary understanding of the relationship between misvaluation and ZL, we next split the sample based on their degree of misvaluation into five quintiles. To do this in each year, firms are grouped into a quintile portfolio according to their stock valuation, e.g.

residual income model. In consideration of time series swing in the market valuation and equity issuance observed in the previous table, we construct the valuation portfolio annually to ensure that any effect is cross sectional[10].

Table 4 reports the mean value of variables related to stock valuation, financing, and the number of ZL and non-ZL firms for each of the valuation quintiles. As expected, the greatest numbers of ZL firms belong to the most overvalued quintile, falling consistently and rising slightly for the last quintile (least undervalued quintile). This finding confirms that a large proportion of ZL firms (47%) belong to the overvalued quintiles (Q1 and Q2). ZL firms appear to have significantly higher stock valuation relative to the non- ZL group across all valuation quintiles.

[Insert Table 4 here]

The deviation from target leverage for different valuation quintiles varies, suggesting that capital structure is influenced by stock misvaluation. ZL firms have the greatest deviation from their target leverage when they are either in the most overvalued or undervalued quintile with deviation of 5% to 6%.[11] However, non-ZL firms maintain almost their target leverage in all quintiles with deviation of no more than 0.05%. This huge gap between target leverage and actual leverage for overvalued ZL firms supports Alti's (2006) findings that attractive stock market conditions may cause substitution away from debt toward equity issuance. Warr *et al.* (2012) also document that under-levered firms adjust more slowly toward their target when the cost of equity is low (overvalued), as managers exploit this opportunity to the benefit of existing shareholders by issuing more equity. The financing behaviour of

[10] We also divided our sample to prior to 1991, between 1991-2001 and after 2001, and reach the same conclusion regarding the association of misvaluation and probability of ZL. However, the magnitude of coefficient prior to 1991 is smaller.
[11] See Table A5 for estimation of target leverage

overvalued firms in Table 4 shows that overvalued ZL firms issue significantly more equity than undervalued ZL firms. The effect of issuance is strongest in the high overvaluation quintile. For instance, a move from the first quintile (most overvalued) to the second quintile is associated with a dramatic fall in the level of net equity issuance, from 30% to 2% for ZL firms and 18% to 2% for non- ZL firms.

While this finding could already confirm the positive association between ZL policy and stock overvaluation, the observation of ZL firms in the undervalued quintile is rather surprising. To distinguish between undervalued and overvalued ZL firms, we look at the other characteristics of these two groups. The first quintile of overvalued ZL firms, which accounts for the greatest portion of ZL, are those firms with highest growth opportunities, greatest R&D expenses, and are very young and small with the highest ranking in the stock market. On the other hand, the last quintile exhibits lower growth opportunities, relatively lower R&D expenses, and are smaller but more mature, with negative deficit. Thus, this subsample of ZL firms on average does not meet external financing and instead relies on their cash resources and high liquidity (8.32) for their investment. This finding also suggests that the level of firm investment is strongly dependent on the degree of stock valuation, as the only group of ZL which does not exhibit underinvestment belongs to the first quintile of stock valuation, and the more severe underinvestment problem is related to the last quintile (the most undervalued).

We now test how the degree of misvaluation drives firms to adopt a ZL policy. In order to test whether the observed capital structure of ZL is the cumulative result of a long series of past incremental financing decisions, we examine the evaluation of financial pattern in the dynamic framework around the event year (time zero), when the firm first developed a ZL policy. We require firms to have three years of data prior to and after the event year. Figure 1

provides an interesting new picture regarding the financial pattern of ZL before and after adopting this policy. It appears that, while firms on average gradually deviate from their target debt ratio for several years before adopting ZL policy, they continue to reduce this gap and lever up shortly in year +1. In contrast, several years prior to the event year, equity issuance is greater for these firms as a result of high stock valuation. It also presents that, on average, such firms decide to lever up and cut down their equity issuance after turning to ZL. Overall, the evidence so far is consistent with the hypothesis that a ZL policy is the result of issuing more equity in response to a more favourable equity valuation by the market.

5.3. Factors affecting ZL policy

In this section we employ a multivariate logit regression approach for the entire sample in order to investigate which factors drive the adoption of ZL policy (binary variable with 1 equals adoption of ZL, and 0 otherwise). Since our panel data consists of a very large number of firms (i) with significantly smaller number of years (t), using pooled logit may yield inconsistent estimates of the parameter. Therefore, to obtain consistent estimates we employ conditional fixed effects, as suggested by Chamberlain (1980). To formally test our hypotheses, we employ the different variants of the following comprehensive regression model:

$$\textit{Zero Leverage}_{it} = \beta_0 + \beta_1 \textit{Credit Rating change}_{it-1} + \beta_2 \textit{Overvaluation}_{it-1} \textit{ (or Misvaluation}_{i_{t-1}}) + \beta_3 \textit{Underinvestment}_{it-1} + \beta_4 \textit{Excess Cash}_{it-1} + \beta_5 \textit{Tax}_{it-1} + \beta_6 \textit{Volatility}_{it-1} + \beta_7 \textit{Financial Distress}_{it-1} + \beta_8 \textit{Size}_{it-1} + \beta_9 \textit{Age}_{it-1} + \beta_{10} \textit{Profitability}_{it-1} + \beta_{11} \textit{Tobin's Q}_{it-1} + \beta_{12} \textit{Tangibility}_{it-1} + \beta_{13} \textit{Dividend Payer}_{it-1} + \lambda_i + \varepsilon_{it} \quad (3)$$

where β's are estimable parameters, λ_i represents panel fixed effects and ε_{it} is the error term. Table A1 provides the definition of all variables.

Column (1) of Table 5 presents the effect of baseline conventional leverage variables (tax, volatility, financial distress, growth, size, firm age, profitability, tangibility and dividend

paying dummy) in which the expected signs are observed. We employ these variables as the control variables through all columns (1) to (7). Given that the estimated cofficients from the conditional logit fixed effects model are difficult to interpret, the average marginal effects of the full model in equation (3) are reported in column (7).

[Insert Table 5 here]

As discussed before, we consider two proxies for credit supply constrained as the indication of availability of debt financing: (i) change in SA Index and (ii) change in credit rating as indications of accessing the debt market. Considering the framework of the fixed effects model, where there are only firms that have changed from one status to another, and since that credit rating has an important impact on cost of debt, this finding suggests that the likelihood of firms changing from non-ZL to ZL increases by 0.31 for a one standard deviation decrease in access to debt market.

Consistent with the univariate results, overvaluation appears to be a strong determinant of ZL policy. Controlling for other factors, all coefficients on the misvaluation variable are negative and significant at the 1% significance level[12]. These results confirm that favourable stock supply conditions, or in another words, optimistic investors, can motivate a firm to capitalize on temporary misvaluation. This is achieved via substitution of debt financing with equity financing, as overvaluation increases or undervaluation decreases. Furthermore, in column (2), when we substitute misvaluation with the duration of overvaluation, we reach the same conclusion. These findings are in line with the results of Warr *et al.* (2012), that attractive stock market conditions (overvalued equity) leads to equity being increasingly preferred over debt financing. Managers time the market by trading the tax advantage and bankruptcy costs of debt with the benefit of issuing overvalued equity. Thus, shifting from

[12] In unreported results, alternative proxy of mispricing (book to market ratio) also yields similar conclusions.

levered to unlevered can be a consequence of several attempts by managers to time the market.

The misvaluation proxy can be correlated with growth prospects (Q), and hence our valuation model may be criticised as this proxy could capture the effects of growth prospects rather than misvaluation effects. A comparison of columns (1) and (3) indicates that this is not the case since the coefficient of growth (Q) is greater when the misvaluation variable is added to the model, indicating that the growth effects have not been explained by the ability of misvaluation in predicting ZL. Furthermore, comparing the pseudo R^2 of columns (1) and (3) (0.116 vs 0.126) indicates that misvaluation still has incremental explanatory power after controlling for growth prospects.

For comparison purposes, we also examine the economic significance of misvaluation and growth prospect (Q) on the probability of a ZL policy. The standard deviation of misvaluation and Q and ZL from Table 1 are 0.538, 2.962 and 0.354, respectively. According to the specification in column (6), a one standard deviation decrease in misvaluation implies an increase of 3.2% (0.168×0.538×0.354) in the ability of a firm to adopt a zero leverage policy. This compares with a 10% (0.101×2.962×0.354) increase in adopting ZL policy by one standard deviation shift in Q, implying the impact of misvaluation is about 32% of the impact of Q on the probability of ZL.

Several variables are used in this study to test whether a ZL policy is driven by demand side effects; excess cash, growth opportunity, and underinvestment problem. The change in probability of ZL decisions associated with excess cash is fairly large, at 0.22. We use *Tobin's Q* as a proxy of growth prospects, consistent with our prediction; *Tobin's Q* has a significant and positive impact on transition from non-ZL to ZL status. Taken together with

the above result for excess cash, this suggests that these firms recognise their growth prospects and conserve cash heavily to provide flexibility in financing future investment.

Furthermore, holding other variables constant at their mean, the probability of change from non-ZL to ZL policy increases by 0.052 when asymmetric information and contracting problems lead firms to forgo investment. To further assess our predication in unreported results, we examine whether switching to ZL policy can mitigate investment distortion (underinvestment problem) in the future. Our findings corroborate this hypothesis when we substitute future investment with and underinvestment dummy as a robustness check. The change in probability associated with future investment has a dramatic impact on the adoption of different financing policies. The results are no different if we change the number of years to define the future investment variable (for example two or four years instead of three years)[13].

Regarding other firm characteristics, tax-bankruptcy theory predicts that firms follow ZL policy if they attach to either high expected cost of financial distress or low tax benefits in using debt financing. To examine this prediction, we employ two proxies for potential risk (volatility and probability of bankruptcy) and firm's marginal tax rates[14] constructed by Blouin *et al.* (2010). This study finds contradictory evidence in support of the tax- bankruptcy theory.

The observation of a positive relation between marginal tax and probability of ZL policy is surprising according to trade off theory, but not so when we refer to the finding of Graham (2000) that a typical firm could double its tax benefit by issuing more debt before its

[13] We define future investment as ((Deviation from optimal investment$_{t+1}$ + Deviation from optimal investment$_{t+2}$ + Deviation from optimal investment$_{t+3}$)/3 - Deviation from optimal investment$_t$). It is worth emphasizing that the estimated parameter in our model comes with firm and year fixed effects, and hence all other unobserved factors are taken into consideration.

[14] The Marginal Tax Rates database was created by Jennifer Blouin, John Core and Wayne Guay using Capital IQ Compustat data. Following Graham *et al.* (1998), we use marginal tax rate before interest deduction to avoid any endogeneity with leverage.

marginal tax rate starts to decline. This finding rather indicates that increases in marginal tax rate encourages firms to change their status from non-ZL to ZL, which also might be as a result of higher profitability and greater cash holding for such firms.

As mentioned earlier, we used two proxies for potential risk. The first is an indicator variable of whether a firm will experience financial distress[15]. The second risk variable is volatility. According to the findings of bankruptcy literature, a firm with higher stock volatility is perceived as riskier with a higher likelihood of experiencing financial distress. Again, our risk variables provide no support for trade-off theory, which argue that the high potential risk should discourage firms from issuing debt. The coefficient of probability of financial distress is significant and negative, indicating that ZL firms are less likely to encounter financial distress. However, this finding may be driven by the fact that zero levered firms have higher cash ratios on their balance sheet. In contrast with our expectation, ZL firms appear to be less risky than the control group as far as stock volatility is concerned, although the effect is negligible in magnitude (.001).

According to a variety of theoretical and empirical literature, the collateral is an important factor in borrowing decisions (Byoun and Xu 2013). Holding other variables at their mean, a one standard deviation decrease from mean in tangibility is associated with the highest increase (0.77) in a decision to shift from a levered to unlevered firm in our model. The effect of dividend policy on conservative debt user firms has been intensively investigated; our finding is also in line with existing related literature (e.g. Strebulaev and Yang 2013). The coefficient of dividend paying firms appears to be positive and significant, which indicates the efforts of zero levered firms to mitigate shareholders' concerns over cash

[15] We use Altman (1968)'s modified *Z*-score, which is also adopted by MacKie-Mason (1990) and Graham (1999).

flow and increases their ability to access the stock market. Furthermore, considering the earlier results regarding higher valuation of stocks for ZL firms, such firms choose to pay dividends as repurchasing overvalued stocks is not logical.

[Insert Table 6 here]

To test the predictions in hypotheses 2b and 3a, the same model (i.e. regression equation (3)) has been employed for different subsample groups. Column (1) of Table 6 reports the results for the full sample as the reference point. In order to be more precise in understanding the relation between stock valuation and probability of ZL policy, the misvaluation variable is substituted with the dummy variable of overvaluation. According to hypothesis 2b, the positive association between stock overvaluation and probability of ZL gets higher for firms with higher demand for funds. We assume that firms with high growth opportunities, firms with positive financing deficit, firms with negative retained earnings, and financially constrained firms, are more likely to demand external financing. Consistent with our hypotheses, the magnitude of coefficient for the overvaluation dummy is greater in the subsample of firms when firms have higher growth opportunities (0.211, *p*-value 0.000), positive retained earnings (0.11, p-value 0.06), and positive deficit (0.146, *p*-value 0.02). However, we could not find any support for firms with a low probability of credit rating. These findings are consistent with McLean and Zhao (2014); share issuance increases with *Tobin's Q* and decreases with cash flow. Therefore, because catering to inefficient overpricing is indeed stronger when firms are pressured to raise capital, the positive relationship between overvaluation and ZL gets higher for these subsamples.

5.4. Demand for Future Supply of Capital

Since adopting ZL in terms of flexibility refers to a firm's ability to respond in a timely and value maximizing manner, then preserving debt capacity internally without external availability of funds has no value. Therefore, the role of ZL policy becomes questionable from a flexibility point of view, and has no true value unless it enables these companies to raise more easily external funds at lower costs and to pursue valuable investment in the future. Therefore, we examine whether adopting a ZL policy can mitigate investment distortion, either exposed from equity holders (underinvestment problem) or debtholders (credit rating). Since the underinvestment and financial flexibility hypotheses of ZL phenomenon are dynamic in nature, we define "*t"* as the event year; it is the last year during which a firm maintains ZL before dropping this policy. Then, we analyse the pattern of their behaviour, in particular deviation from optimal investment and their power of borrowing before and after this event year.

[Insert Table 7 here]

Myers and Majluf (1984) also argue that reserving borrowing power enables firms with valuable growth opportunities to raise external funds at low cost and to invest more in the following years. However, as we observed in our previous analysis, not every ZL policy has spare borrowing power. Therefore, to distinguish ZL firms with spare debt capacity and without, we first predict the target leverage for the ZL sample (see Table A5). We find the median value of deviation from target leverage of ZL sample is -3.5%. We use this value as the threshold to divide ZL firms into two groups; ZL in optimal zone and non-optimal zone. We present our results for different subsample groups in Table 7[16].

[16] Our finding are consistent when we consider the probability of having credit rating instead of target leverage.

Table 7 displays major differences between the mean values of firm's characteristic before and after dropping ZL. We observe a sharp increase in debt issuance (0.17) after firms drop their ZL policy, which corresponds to turn the deviation from target leverage to positive value. In contrast, equity issuance and cash ratio drop by -0.05 and -0.10 respectively. These findings indicate that ZL firms use their liquid assets (i.e. cash) and equity against their investment. However, when they drop this policy they rely less on cash and equity financing, as they have a better source of funding - the debt market. An average increase of their access to debt market value from 0.003 to 0.008 for the full sample confirms this argument. In particular, we see past ZL firms in the non-optimal zone (substantial deviation from target leverage) can achieve a very significant increase in their access to debt market; from 0.004 in time t-1 to 0.013 in t+1, or by around 225%. This trend is not significant and substantial when past ZL policy was an optimal leverage. In other words, when firms adopt ZL policy with greater deviation from target leverage, they are rewarded considerably more by the debt market than ZL firms in the optimal target zone. This finding is in line with that of Kisgen (2009), that firms reduce their leverage to avoid downgrade and achieve upgrade in their credit rating.

We also expect that after a period of ZL policy, a firm's ability to invest would be increased. It can be seen that all variables related to investment demonstrate a sharp and statistically significant increase after dropping ZL. In particular, we find ZL firms in the non-optimal target zone overshot their net investment from 0.074 in t-1 to 0.141 in t+1, which results in mitigating the deviation from optimal investment by 272% between t-1 and t+1. Finally, ZL firms located close to optimal leverage maintain greater periods of time than those which are substantially deviated from optimal leverage (0.70 vs 0.51) before they eventually raise debt.

5.5. Investment and ZL Policy

In this sub-section we examine if current ZL is a strategy decision for shift in future demand of capital. We expect to see that, following a period of adoption of this strategy, firms achieved a financially flexible status. Gamba and Triantis (2008) define financial flexibility as the ability of a firm to access external funds at lower cost when profitable opportunities arise. Therefore, we expect to observe an increase in investment after dropping ZL policy and should also observe that, when firms decide to lever up after adopting this strategy, they have better access to debt financing at lower cost and therefore rely less on internal funds.

Dropping ZL may be endogenous to investment level (see Marchica and Mura 2010). Therefore, to address this concern, the dynamic model of investment below is estimated using Blundell and Bond's (1998) system-GMM technique .

$$\textit{New Investment} = \beta_0 + \beta_1 \textit{New Investment}_{it-1} + \beta_2 \textit{Profitability}_{it-1} + \beta_3 \textit{Tobin's } Q_{it-1} + \beta_4 \textit{Dropping ZL}_{it} + \beta_5 (\textit{Profitability}_{it-1} \times \textit{Dropping ZL}_{it}) + \eta_i + \eta_t + \upsilon_{it} \quad (4)$$

where *Dropping ZL* is a dummy variable which is equal to 1 if ZL firm becomes non-ZL, and 0 otherwise. See Table A1 for the definition of other variables. η_i and η_t are the panel and time fixed effects, respectively; υ_{it} is the disturbance term assumed to be independent for each firm and year. If a firm has achieved a financially flexible status after dropping ZL policy, then we expect that dropping this policy will have a positive impact on investment. Furthermore, as a financially flexible firm has better access to the debt market, the interaction of this dummy variable with cash flow should decrease the sensitivity of investment to internal funds.

[Insert Table 8 here]

Table 8 reports results of different specifications of the investment model. The lag levels of t-2 through t-7 of both dependent and explanatory variables are assumed as instruments. We also use marginal tax benefits as an instrumental variable. The idea is that the potential tax benefits are expected to encourage firms to issue debt and drop ZL policy, but are not expected to have any strong impact on the level of investments. The validity of this method depends on an assumption regarding the serial correlation of residuals and the validity of instruments. In all cases correlation tests confirm the validity of assumption regarding serial uncorrelated errors. Hansen tests also confirm the validity of lagged levels and marginal tax benefit as instruments. Columns (1) and (2) report the results for the full sample. In line with other literature, growth opportunities (Q) appear to have a positive impact on investment decisions. The positive and significant coefficient of cash flow implies that, in the presence of market imperfection, firms rely more on internal finance to fund their growth opportunities (Gatchev *et al.* 2010). The dummy indicator of dropping the ZL policy exerts a positive impact on investment, implying that former ZL firms are able to raise sufficient funds through debt market to enhance their investment.

In columns (3) and (4) we redo the investment model for two subsamples of optimal and non-optimal ZL firms. Unlike optimal ZL firms, the non-optimal ZL group, which has a greater deviation from target leverage, sacrifices their borrowing power today to build up their power to access external funds at lower cost when profitable opportunities arise. The magnitude of cash flow on investment in column (3) is greater than the counterpart in column (4) non-optimal zone (0.282 vs 0.165). This finding implies that the former optimal ZL group relies more on internal funds to finance their investments even after dropping ZL policy. Furthermore, the magnitude of Q turns out to be not significant for this subsample of optimal ZL, indicating that on average they are not able to invest their growth opportunities as much

as possible. As expected, the magnitude of coefficient of Dropping ZL policy in the subsample of non-optimal group is greater (0.100 vs. 0.053) compared to the other group.

More importantly, the interaction term of cash flow and Dropping ZL which represent the investment sensitivity to cash flow is only negative and significant (-0.140) when former ZL firms are located in the non-optimal zone of target debt ratio. This may reflect the fact that, following a period of debt free policy, only former ZL firms which had reserved their borrowing power have achieved a financial flexible status. Thus, ZL policy was a wise decision for this group, as they are now less exposed to capital market imperfection and hence they can raise sufficient funds to enhance their investment while relying significantly less on internal funds, unlike former optimal ZL firms. In this vein, the option to issue debt is valuable, which is not taken into account with classical trade off target leverage.

5.6. Overconfident Managers and ZL Policy

5.6.1. Univariate analysis

Table 9 classifies the sample according to the 67% cut off point in the money of option exercise[17] (a dummy variable equal to 1 for all years after a CEO holds options that are at least 67% in the money, unless she/he appears as non-overconfident during her/his tenure and zero otherwise), for three groups of (1) full sample, (2) ZL firms and (3) non-ZL firms. The difference in mean between firm-years with and without overconfident managers is typically statistically significant across all groups. A lower debt ratio of 0.18 vs. 0.22 for firms with an overconfident CEO differs from the evidence of a study by Ben-David *et al.* (2007), but it is similar to the findings of Hirshleifer *et al.* (2012) and Huang *et al.* (2016). Consistent with our hypothesis, there is a positive relationship between *Overconfidence* and ZL policy; as

[17] A similar result is obtained when we use the 100% cut-off point.

reported in the middle column of Table 9, significant numbers of ZL firms (almost 50%) have overconfident CEOs.

In all three groups, firms with overconfident CEOs have better access to equity markets according to related variables such as stock ranking, stock return and misvaluation (residual income and book to price ratio). On the other hand, they have lower access to debt markets based on the credit rating probability and SA index, which is consistent with Huang *et al.* (2016).

All groups of firms with an overconfident CEO have a significantly higher mean value of profitability than their non-overconfident counterparts. In particular, ZL firms with an overconfident CEO make twice as much profit as the group of ZL firms with a non-overconfident CEO (0.18 vs. 0.09). Furthermore firms with an overconfident CEO tend to generate more cash (0.16 vs 0.14) in the sample, and this mean value is highest for the ZL firms with an overconfident CEO (0.37), supporting the notion that overconfident CEOs rely heavily on internal financing, which might result in using lower debt financing (Malmendier *et al.* 2007). Firms with an overconfident CEO also have significantly higher growth opportunities and consequently invest more than their counterpart non-overconfident CEOs, as presented by net investment (0.097 vs. 0.066).

Overall, it appears overconfident CEOs manage smaller and younger firms with significantly higher growth opportunities and profitability, and generate considerably more cash. Firms with overconfident managers also have better access to the equity market than the debt market. The observation of higher equity issuance in the presence of an overconfident CEO is not as the literature suggests (Heaton 1998). Overconfident managers believe the market underestimates their securities and are reluctant to issue external financing, especially equity financing. However, our findings rather show that the proxy of overconfidence is more

related to perception bias behaviour, which suggests that these managers believe there is greater benefit in issuing equity than debt, which may lead to inverse preference of pecking order theory and a lower level of debt financing.

[Insert Table 9 here]

5.6.2. Multivariate analysis

To formally test the relation between CEO characteristics (in particular, managerial overconfidence) and ZL policy, we employ the following logit[18] model:

$$\textit{Zero Leverage}_{it} = \beta_0 + \beta_1 \textit{Overconfidence}_{it-1} + \beta_2 \textit{CEO Ownership}_{it-1} + \beta_3 \textit{CEO Age}_{it-1} + \beta_4 \textit{CEO Tenure}_{it-1} + \beta_5 \textit{CEO Director}_{it-1} + \beta_6 \textit{Credit Rating}_{it-1} + \beta_7 \textit{Overvaluation}_{it-1} + \beta_8 \textit{Underinvestment}_{it-1} + \beta_9 \textit{Excess Cash}_{it-1} + \beta_{10} \textit{Tax}_{it-1} + \beta_{11} \textit{Volatility}_{it-1} + \beta_{12} \textit{Financial Distress}_{it-1} + \beta_{13} \textit{Size}_{it-1} + \beta_{14} \textit{Age}_{it-1} + \beta_{15} \textit{Profitability}_{it-1} + \beta_{16} \textit{Tobin's Q}_{it-1} + \beta_{17} \textit{Tangibility}_{it-1} + \beta_{18} \textit{Dividend Payer}_{it-1} + \varepsilon_{it} \quad (5)$$

where ε_{it} is the error term. See Table A1 for the definition of all variables.

Since our proxy for managerial overconfidence is an option-based measure, there might be a concern that this proxy is correlated with other omitted variables and hence any delayed decision of exercising options by the CEO might be driven by other unobserved factors. Huang *et al.* (2016) find this proxy remarkably robust to different estimation methods and alternative explanations. Nevertheless, to mitigate this concern, we conduct an omitted variable version of Hausman's (1978) specification to test for any endogeneity of the overconfidence proxy by regressing *Overconfidence* on the explanatory variables, as reported

[18]We do not estimate the model by fixed effects because first we would lose 1,565 firms (9741 firm-year observations), which means that these firms were either always in the ZL or non-ZL category during the sample period. Considering we only have 2,466 unique firms in our sample, losing 1,565 firms might have a substantial effect on our conclusion. Second, since overconfidence is a persistent trait, and fixed effect estimates only within individual differences across time, then we only examine the relation between overconfidence and debt policy in those firms with multiple short-tenure CEOs in the sample. In other words, in order to draw a robust inference from fixed effects estimations, we need to have observations with overconfident and non-overconfident CEOs in the same firm (Malmendier and Tate 2005). Having said this, our logit model includes industry fixed effects to control for time invariant industry level determinants. We also include year fixed effects to control for any change in macroeconomic factors.

in model (1) of Table 10, using the logit regression technique. We then generate two new variables: *Overconfidence-Residual* and *Overconfidence-Fitted*. The former is the residual values of this model and the latter is the fitted values for *Overconfidence* in the same model. Next, we test whether the coefficient estimate on *Overconfidence-Residual* is significant. If it is, we reject the null hypothesis that *Overconfidence* is exogenous and substitute the fitted values of this proxy for the actual values in our models (3) to (5) in Table 10 as an instrumental variable based on the setting in equation (5)[19].

The Hausman test ($\chi 2$ = 9.68 and the corresponding *p*-value is 0.001) reveals that *Overconfidence-Residual*'s coefficient is statistically different from zero; hence, *Overconfidence* is indeed endogenous. Consistent with our hypothesis, the coefficient on *Overconfidence*, after controlling for endogeneity problem, is positive and significant (2.14) at the 1% level, suggesting overconfident CEOs are more inclined to use no debt in their capital structure. This finding supports Malmendier *et al.* (2011), who propose that overconfidence might lead firms to be more conservative in debt issuance, as overconfident CEOs prefer internal financing to external financing and hence forego the tax benefits associated with debt financing. Another explanation of this finding is provided by Hackbarth's (2008) model, in which managers rely more on equity (debt) issuance as they believe these securities are more overvalued (undervalued) by the market. The coefficients of other variables are generally consistent with the main model regression in Table 5.

[Insert Table 10 here]

[19] We cannot use an endogenous probit/logit model because *Overconfidence* in the main regression is a binary variable. This approach has been used in the finance literature to deal with endogenous binary variables (Andriosopoulos *et al.* 2013).

In model (4) we exclude *Overconfidence* and the results show that CEO characteristics do affect capital structure decisions. In line with managerial preference explanations, ZL policy is more likely to be employed when CEO equity shareholdings increase. This finding is in line with Lewellen (2006), who finds that managers with greater stock ownership whose wealth is not diversified well will prefer to follow low leverage, so that bankruptcy risk could be eliminated and financial distress by excess interest could be reduced. The impact of CEO ownership on ZL policy is also economically sizeable. Indeed, controlling for other factors, one standard deviation shift (0.06) of *CEO Ownership* leads to increase the probability of ZL policy by 3% (1.42×0.06×0.342).

In model (5), the coefficient on *Overconfidence-Fitted* increases to 2.27 from 2.14 in model (3). As for the average marginal effects in the last column, the probability of employing ZL is 16% higher for a firm with an overconfident CEO than a firm with a non-overconfident CEO.

The coefficient of *CEO Ownership* turns out to be insignificant in model (5). One may therefore argue that our measure of managerial overconfidence captures the effect of managerial ownership in ZL firms. A possible explanation of delay of the exercise option might be related to the pressure imposed by the board of directors, who require managers to hold onto a 'deeply in-the-money option' to keep incentives high when there are no debtholders to monitor them. Since *CEO Ownership* also indicates a manager's incentive, both variables in the same model capture the incentive level. Furthermore, as reported in model (1), *CEO Ownership* and *Tobin's Q* have significant effects on the probability of managers to be overconfident (or rather delaying option exercise). Taking into account the prior results related to high valuation of stock for ZL firms, it can be argued that when firms have high growth opportunities and high valuation, managers with a high level of stock

ownership might prefer not to exercise the options, as it sends a negative signal to the market and might ruin the overvaluation and, more importantly, managers' wealth.

6. Conclusion

This study investigates the reasons why firms in the United States follow ZL policy. We investigate the impact of both supply and demand side variables with particular focus on the different channels of supply effects driven by investors' taste and managerial taste.

The results of this study reveal that the investors belief about firms' securities in both equity and credit markets contribute to ZL policy. In terms of credit supply side, we predict the probability of credit rating for every firm-year observation and find that, following a downgrade in firms' credit rating, the likelihood of changing from non-ZL to ZL increases significantly. In contrast, we find that greater overvaluation predicts a higher probability that a firm becomes debt-free, suggesting that managers of overvalued firms believe the gain from issuing overvalued equity can outweigh the tax benefit of debt. Therefore, the observation of ZL is the cumulative result of past attempts of managers to issue more equity in response to highly optimistic investors. However, our results in this section clearly indicate the need for future studies to investigate whether the decision of issuing overvalued equity is more valuable than the potential gain in issuing debt.

Our results in terms of credit constrained indicate that a downgrade in credit rating or underinvestment problems might be a driving force for firms to become ZL. We hypothesize that only ZL firms that deliberately deviate from optimal leverage to mitigate these problems by obtaining some financial flexibility. By categorising ZL firms into two groups of optimal and non-optimal zone, indeed we find good things come to those who wait; after adopting a zero leverage policy for some time, zero leverage firms located in the non-optimal zone

(greater deviation from target leverage) achieve an upgrade in their probability of credit rating, compared to their counterparts in the optimal zone. This finding is in line with prior studies, which find that financial flexibility is a very important factor in capital structure decisions, but it is still not clear if the decision to postpone debt issuance is value maximising. Thus, a natural extension of our analysis would be to investigate whether a firm is better off delaying its debt issuance or benefiting from the existing tax advantages.

Finally, we investigate the channel of supply effect through the role of managerial beliefs/preference as a determinant of ZL policy. We show that when CEOs are confident, they are more inclined to adopt ZL policy. Following prior studies, a tendency to hold deep in the money stock options is used as a proxy for CEO overconfidence. In particular, for the first time we econometrically show that CEOs' delayed decision to exercise options might be driven by other unobserved factors, and to mitigate this problem, two-stage logit regressions were conducted to deal with this issue. Therefore, our results are robust and are not driven by the endogeneity issue. However, concern regarding the validity of the option-based proxy used for overconfidence might be worthy of further investigation.

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Figure 1. Firm Financing Behaviour over Time

These figures present an analysis of zero leverage firms in a dynamic frame work around the event year. Event year is dummy equal to 1 when firm first developed zero leverage policy and zero otherwise. We then plot firm's characteristic of interest before and after this time (from three years before and after of event year).

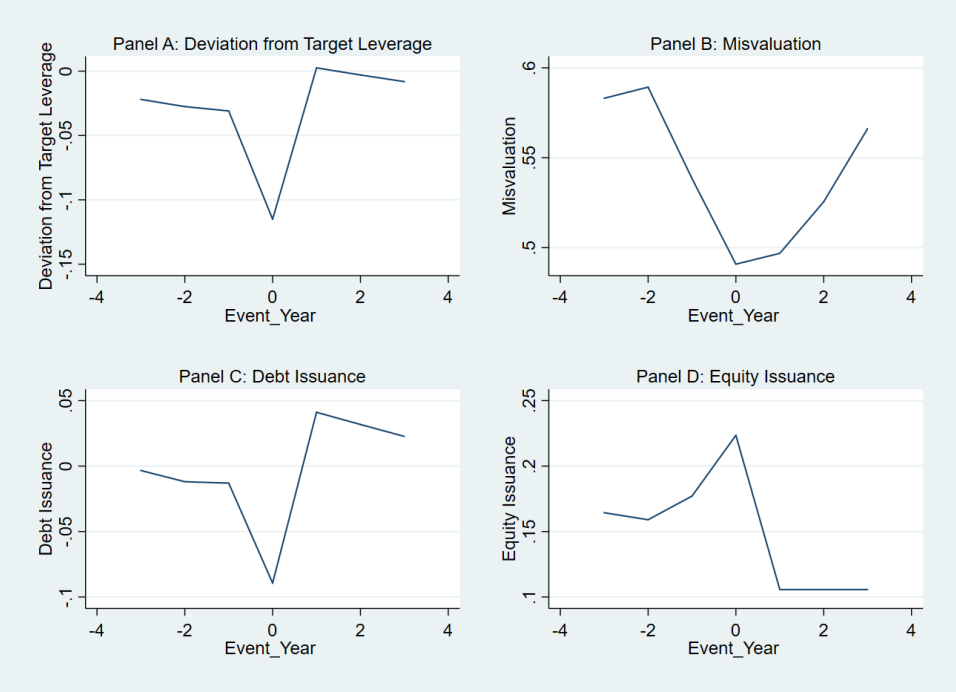

Table 1: Descriptive Statistics						
	N	Mean	SD	p50	Min	Max
Leverage	168,337	0.232	0.214	0.194	0.000	1.000
Zero Leverage	168,337	0.149	0.356	0.000	0.000	1.000
Deviation Leverage	128,405	0.000	0.113	0.020	-0.976	0.939
Supply Side:						
SA Index	147,857	-2.662	1.120	-2.773	-4.637	7.103
Credit Rating	117,182	0.133	0.230	0.024	0.000	0.999
Misvaluation	98,600	0.627	0.538	0.553	0.090	3.800
Overvaluation	98,600	0.500	0.500	0.000	0.000	1.000
Overvaluation Duration	98,600	2.534	3.945	0.000	0.000	29.00
Stock Ranking	168,337	1.089	1.605	0.000	0.000	7.000
Demand Side:						
Profitability	168,337	0.029	0.321	0.107	-1.770	0.430
Cash	168,322	0.185	0.238	0.084	0.000	0.950
Excess Cash	168,322	0.498	0.500	0.000	0.000	1.000
Tobin's Q	147,517	2.297	2.962	1.399	0.510	22.27
Capital Expenditure	165,595	0.071	0.092	0.043	0.000	0.460
New Investment	158,554	0.084	0.152	0.043	-0.211	0.786
Deviation Investment	104,983	0.000	0.105	-0.011	-0.250	0.390
Underinvestment	104,983	0.580	0.493	1.000	0.000	1.000
Firm Characteristics:						
Z-Score	141,661	0.612	3.685	1.710	-17.125	5.754
Financial Distress	141,661	0.531	0.491	1.000	0.000	1.000
Volatility	130,894	19.267	24.988	14.177	1.020	99.600
Tangibility	167,974	0.284	0.244	0.214	0.000	0.914
Liquidity	163,086	3.044	3.740	1.985	0.100	26.405
Size	162,520	4.247	2.654	4.352	-2.92	9.880
Age	147,857	12.218	10.534	9.000	1.000	54.000
Tax Benefit	137,038	0.287	0.122	0.328	0.000	0.510
Dividends	165,294	0.121	0.410	0.000	0.000	0.731
Dividend Payer	168,337	0.359	0.480	0.000	0.000	1.000
Financing Activity:						
Equity Issuance	163,968	0.091	0.211	0.003	0.000	0.890
Equity Repurchases	168,337	0.010	0.030	0.000	0.000	0.190
Net Equity Issuance	163,968	0.081	0.214	0.001	-0.155	0.890
Debt Issuance	147,311	0.017	0.135	0.000	-0.470	0.810
Total Issuance	153,813	0.093	0.229	0.005	-0.285	0.890
CEO Traits:						
Option Moneyness	26,294	0.980	1.738	0.454	0.000	11.07
Overconfidence	26,294	0.451	0.497	0.000	0.000	1.000
CEO Ownership	25,310	0.029	0.061	0.004	0.000	0.343
CEO Tenure	25,310	6.867	7.854	6.000	1.000	63.000
CEO Age	25,030	3.370	0.821	3.000	1.000	7.000
CEO Director	26,282	0.970	0.150	1.000	0.000	1.000

Notes: This table provides an overview and detailed descriptions of all variables used in this study. The sample consists of 168,342 firm-year observations for the period 1980-2012. Apart from leverage related variables and age, all variables are winsorized at the upper and lower one percentile. The definitions of these variables are provided in Table A1 of Appendix.

Table 2. Characteristics of ZL and NZL Firms with Different Level of Constraints

	Panel A. All Firms			Panel B. ZL Firms			Panel C. NZL Firms		
	Constrained	Unconstrained		Constrained	Unconstrained		Constrained	Unconstrained	
	N = 46876	N = 46876		N = 12087	N = 4620		N = 36595	N = 43731	
	Mean	**Mean**	***t*-stat.**	**Mean**	**Mean**	***t*-stat.**	**Mean**	**Mean**	***t*-stat.**
Leverage	0.190	0.246	52.2***	0.000	0.000	0.00	0.236	0.268	49.2***
Deviation Leverage	0.001	-0.001	-2.12**	-0.054	-0.044	1.41	0.015	0.002	-17.1***
Supply Side:									
SA Index	-2.092	-3.588	-430.20***	-1.974	-3.630	-110.00***	-1.911	-3.741	-378.00***
KZ Index	-7.463	-3.223	39.7***	-21.599	-11.060	15.08***	-4.392	-2.403	36.70***
Credit Rating	0.007	0.260	244.70***	0.003	0.176	110.44***	0.004	0.327	241.70***
Misvaluation	0.628	0.659	9.1***	0.563	0.548	-1.16	0.611	0.648	7.42***
Overvaluation	0.560	0.469	-15.10***	0.501	0.541	-11.30	0.591	0.482	-14.10***
Overvaluation Duration	3.015	2.802	26.50***	3.666	4.471	18.20***	2.971	2.761	14.30***
Stock Ranking	0.772	1.939	134.12***	0.901	2.507	57.91***	0.648	2.092	123.30***
Demand Side:									
Profitability	-0.031	0.141	124.20***	-0.100	0.165	35.89***	-0.055	0.144	121.28***
Cash	0.244	0.097	-110.00***	0.458	0.262	-30.99***	0.197	0.085	-93.50***
Excess Cash	0.580	0.425	-48.82***	0.841	0.763	-36.54***	0.503	0.371	-37.10***
Tobin's Q	2.402	1.529	-73.90***	3.236	2.106	-16.90***	2.425	1.485	-67.06***
Capital Expenditure	0.062	0.068	14.90***	0.045	0.058	9.19***	0.065	0.069	11.93***
New Investment	0.095	0.065	-42.22***	0.129	0.069	-20.81***	0.092	0.058	-48.64***
Deviation Investment	-0.004	0.003	10.30***	-0.017	-0.024	-3.06***	-0.001	0.005	7.36***
Underinvestment	0.591	0.570	-4.88***	0.672	0.745	7.14***	0.581	0.540	-8.01***
Firm Characteristics:									
Z-Score	-0.732	2.732	130.10***	-1.170	2.921	41.21***	-0.601	2.925	124.10***
Financial Distress	0.681	0.401	-93.12***	0.651	0.181	-50.12***	0.693	0.367	-95.01***
Tangibility	0.234	0.336	82.80***	0.132	0.234	29.20***	0.252	0.355	79.81***
Liquidity	3.624	2.253	-77.30***	6.858	3.57	-28.40***	2.942	2.028	-54.63***
Volatility	22.169	12.083	-110.5***	22.599	11.749	-28.70***	24.063	11.453	-100.00***
Size	2.745	6.449	431.90***	2.109	6.24	107.20***	2.404	6.861	428.09***
Age	8.221	19.250	228.00***	8.510	20.865	80.90***	7.406	21.109	225.04***
Tax Benefit	0.236	0.340	184.40***	0.204	0.322	48.00***	0.224	0.346	181.46***
Dividends	0.036	0.224	71.51***	0.060	0.217	21.00***	0.029	0.225	68.51***
Dividend Payer	0.193	0.567	157.93***	0.166	0.505	40.90***	0.175	0.630	154.93***
Financing Activity:									
Equity Repurchases	0.009	0.017	29.20***	0.014	0.035	12.10***	0.007	0.017	32.64***
Equity Issuance	0.101	0.017	-74.00***	0.141	0.016	-20.60***	0.111	0.015	-69.87***
Net Equity Issuance	0.092	0.000	-79.20***	0.127	-0.018	-23.10***	0.104	-0.002	-71.23***
Debt Issuance	0.009	0.013	4.50***	-0.006	-0.006	-0.51	0.013	0.014	-3.42***
Total Issuance	0.101	0.013	-76.83***	0.120	-0.025	-22.60***	0.117	0.012	-72.73***
CEO Traits:									
Option Moneyness	1.601	0.831	-6.461***	2.034	0.874	-12.14***	2.200	0.801	-26.35***
Overconfidence	0.510	0.350	-11.20***	0.520	0.340	-6.20***	0.510	0.320	-10.01***

CEO Ownership	0.040	0.020	-10.20***	0.040	0.040	1.01	0.040	0.020	-8.21***
CEO Tenure	4.300	8.215	5.16***	7.280	9.811	6.04***	7.847	8.021	0.64
CEO Age	2.700	3.150	4.98***	2.670	3.110	9.66***	2.660	3.160	12.66***
CEO Director	0.951	0.970	1.84**	0.951	0.974	2.67**	0.960	0.984	3.24***

Notes: This table compares the characteristic of constrained and unconstrained ZL firms relative to other constrained and unconstrained non-ZL firms. The *t*-statistics show that if the difference in mean values of the variable is statistically different from zero between sub-samples. (*), (**) and (***) indicate significance level at 10%, 5% and 1%, respectively. The definitions of all variables are provided in Table A1 of Appendix.

Table 3. Time pattern in valuation and issuance across years for NZL/ ZL firms and the trend in ZL frequency

Year	N	Proportion$_{ZL}$	Misvaluation	Profitability	Equity Issuance	Debt Issuance	Total issuance
1980	4,362/321	6.85	-/-	0.130/0.127	0.050/0.149	0.019/-0.007	0.069/0.142
1981	4,340/371	7.88	0.950/0.703	0.116/0.074	0.073/0.161	0.015/-0.006	0.089/0.155
1982	4,500/383	7.84	0.916/0.814	0.093/0.023	0.049/0.089	0.019/-0.006	0.068/0.084
1983	4,677/425	8.33	0.660/0.626	0.084/0.042	0.117/0.240	0.011/-0.010	0.128/0.230
1984	4,690/401	7.88	0.755/0.678	0.075/-0.009	0.070/0.164	0.024/-0.006	0.093/0.158
1985	4,866/443	8.34	0.680/0.664	0.052/-0.031	0.082/0.155	0.021/-0.009	0.103/0.146
1986	4,963/520	9.48	0.631/0.673	0.054/-0.016	0.107/0.236	0.022/-0.008	0.129/0.229
1987	4,891/541	9.96	0.713/0.714	0.056/-0.048	0.106/0.208	0.018/-0.010	0.124/0.198
1988	4,696/517	9.92	0.690/0.698	0.061/-0.048	0.057/0.124	0.013/-0.005	0.070/0.119
1989	4,513/511	10.17	0.659/0.727	0.062/-0.033	0.064/0.144	0.015/-0.007	0.079/0.137
1990	4,435/535	10.76	0.863/0.831	0.069/-0.039	0.057/0.145	0.007/-0.008	0.064/0.137
1991	4,480/586	11.57	0.739/0.669	0.073/-0.017	0.086/0.188	-0.009/-0.008	0.078/0.180
1992	4,695/661	12.34	0.663/0.611	0.073/0.027	0.098/0.200	-0.005/-0.012	0.093/0.188
1993	4,950/781	13.63	0.555/0.536	0.072/-0.002	0.109/0.194	0.000/-0.009	0.109/0.184
1994	5,177/829	13.80	0.586/0.525	0.063/-0.014	0.094/0.188	0.012/-0.008	0.106/0.180
1995	5,659/926	14.06	0.551/0.488	0.057/-0.007	0.113/0.218	0.022/-0.007	0.135/0.210
1996	5,793/1,011	14.86	0.522/0.508	0.056/-0.031	0.140/0.278	0.022/-0.008	0.163/0.271
1997	5,530/1,007	15.40	0.481/0.479	0.041/-0.034	0.109/0.187	0.029/-0.010	0.138/0.176
1998	5,295/1,020	16.15	0.621/0.585	0.022/-0.084	0.104/0.160	0.037/-0.004	0.141/0.156
1999	5,282/1,025	16.25	0.673/0.523	-0.003/-0.118	0.147/0.270	0.027/-0.005	0.173/0.265
2000	5,018/1,022	16.92	0.832/0.606	-0.028/-0.152	0.153/0.265	0.015/-0.005	0.168/0.260
2001	4,403/992	18.39	0.765/0.634	-0.033/-0.193	0.086/0.147	0.005/-0.005	0.091/0.142
2002	4,010/977	19.59	0.842/0.783	-0.009/-0.165	0.067/0.123	-0.001/-0.007	0.066/0.116
2003	3,832/999	20.68	0.519/0.443	0.008/-0.103	0.086/0.187	0.009/-0.007	0.095/0.180
2004	3,699/1,044	22.01	0.429/0.376	0.008/-0.115	0.119/0.229	0.017/-0.005	0.136/0.224
2005	3,538/1,033	22.60	0.441/0.366	0.028/-0.097	0.095/0.226	0.018/-0.005	0.114/0.221
2006	3,399/1,015	23.00	0.417/0.354	0.025/-0.110	0.106/0.205	0.024/-0.006	0.130/0.199
2007	3,316/992	23.03	0.467/0.418	0.018/-0.099	0.092/0.221	0.030/-0.005	0.122/0.216
2008	3,049/864	22.08	0.957/0.784	0.012/-0.123	0.061/0.089	0.018/-0.003	0.079/0.086
2009	2,921/877	23.09	0.641/0.588	0.028/-0.077	0.060/0.102	-0.012/-0.005	0.049/0.097
2010	2,893/884	23.40	0.569/0.488	0.039/-0.063	0.078/0.175	0.006/-0.003	0.084/0.172
2011	2,771/865	23.79	0.690/0.545	0.028/-0.117	0.088/0.227	0.021/-0.004	0.109/0.222
2012	2,591/730	21.98	-/-	0.022/-0.091	0.079/0.187	0.026/-0.003	0.105/0.184
Total	168,337/25,180	14.91	0.660/0.559	0.046/-0.069	0.093/0.190	0.015/-0.006	0.109/0.184

Notes. This table report the mean value of misvaluation based on RIM, security issuance and profitability of zero leverage (ZL) and non-zero leverage (NZL) firms. The definitions of all variables are provided in Table A1 of Appendix. Proportion $_{ZL}$ is the percentage of firms with no debt.

Table 4. Characteristics of ZL and NZL Firms with Different Degrees of Misvaluation

	(1)				(2)				(3)			
	All	**ZL**	**N-ZL**	**t-stat**	**All**	**ZL**	**N-ZL**	**t-stat**	**All**	**ZL**	**N-ZL**	**t-stat**
N	20,635	4,450	16,185		20,635	3,097	17,538		20,635	2,586	18,049	
Misvaluation	0.09	0.09	0.09	4.84***	0.29	0.28	0.29	6.61***	0.48	0.47	0.48	0.71
Overvaluation Duration	4.90	5.80	4.90	-5.32***	5.34	5.78	5.16	-5.47***	2.32	2.907	2.32	3.14***
Leverage	0.20	0.00	0.26	75.11***	0.2	0	0.23	73.94***	0.21	0.00	0.24	72.70***
Deviation Leverage	0.01	-0.05	0.00	27.47***	0.01	-0.04	0	26.32***	0.01	-0.04	0.00	26.50***
Tobin's Q	4.62	6.58	4.08	-36.80***	2.05	2.57	1.96	-52.89***	1.44	1.69	1.41	-43.20***
Size	3.30	2.54	3.47	6.20***	5.27	4.22	5.45	4.18***	5.43	4.02	5.62	4.14***
Age	10.19	9.19	10.44	4.12***	14.81	11.62	15.36	5.17***	16.41	13.11	16.87	6.48***
Deviation Investment	0.01	0.00	0.02	5.89***	0.01	-0.02	0.01	13.39***	0.00	-0.02	0.00	14.01***
KZ Index	-9.10	-23.37	-5.34	38.93***	-5.81	-17.32	-3.81	41.55***	-4.63	-16.53	-2.96	42.25***
Credit Rating	0.07	0.02	0.08	18.10***	0.18	0.05	0.2	28.54***	0.20	0.06	0.22	27.29***
Stock Ranking	0.88	0.86	0.88	2.42**	1.72	1.64	1.73	7.68***	1.88	1.74	1.90	4.14***
Liquidity	3.46	6.30	2.72	-2.82***	2.83	5.1	2.42	-9.49***	2.73	5.39	2.36	-12.41***
Net Equity Issuance	0.21	0.30	0.18	-17.54***	0.02	0.02	0.02	0.64***	0.00	0.00	0.00	5.64***
Debt Issuance	0.02	-0.02	0.02	19.50***	0.02	-0.01	0.02	13.59***	0.01	0.00	0.01	10.10***
Total Issuance	0.23	0.29	0.21	-12.43***	0.03	0.01	0.04	10.56***	0.01	-0.01	0.02	11.76***
	(4)				**(5)**							
	All	**ZL**	**NZL**	**t-stat**	**All**	**ZL**	**NZL**	**t-stat**				
N	20,635	2,563	18,072		20,635	2,606	18,029					
Misvaluation	0.74	0.75	0.74	-0.59	1.63	1.6	1.63	2.09**				
Overvaluation Duration	0.00	0.00	0.00		0.00	0.00	0.00					
Leverage	0.22	0.00	0.25	76.21***	0.23	0.00	0.27	76.96***				
Deviation Leverage	0.00	-0.05	0.00	32.23***	0.00	-0.06	0.00	36.93***				
Tobin's Q	1.10	1.18	1.09	-28.76***	0.81	0.78	0.82	7.77***				
Size	5.11	3.81	5.3	6.12***	4.28	2.75	4.51	6.87***				
Age	16.29	14.29	16.59	4.82***	14.78	14.35	14.85	1.90*				
Deviation Investment	-0.01	-0.03	0.00	15.86***	-0.01	-0.04	-0.01	19.90***				
Credit Rating	0.17	0.05	0.18	24.79***	0.10	0.03	0.11	20.05***				
Stock Ranking	1.669	1.53	1.70	2.27**	1.233	1.17	1.235	0.01				
Liquidity	2.94	6.25	2.44	-9.52***	3.28	8.13	2.51	-9.79***				
Net Equity Issuance	0.00	-0.01	0.00	7.08***	-0.01	-0.02	0.00	7.99***				
Debt Issuance	0.01	0.00	0.01	7.45***	0.00	-0.01	0.00	2.44*				
Total Issuance	0.00	-0.01	0.01	10.43***	-0.01	-0.02	-0.01	5.49***				

Notes. This table reports the mean value of selected variables for the full sample, and the ZL and non-ZL samples. Firms are grouped into quintiles based on their degree of mispricing. Group 1 is the most overvalued and group 5 is the least undervalued subsample. N is the number of firm-year observations. We report the *t* statistics and *p*-value for difference in mean of selected variables. *, **, and *** shows statistical significance at the 10%, 5%, and 1% level, respectively. The definitions of all variables are provided in Table A1 of Appendix.

Table 5. Conditional Logit Regressions for the Effects of Firm Characteristics on ZL Policy							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Credit Rating Change		-2.692***			-2.634**	-2.437**	-0.311***
		(1.021)			(1.107)	(1.188)	(0.110)
Overvaluation Duration			0.026**				
			(0.011)				
Misvaluation				-0.158***	-0.164***	-0.168***	-0.032***
				(0.036)	(0.043)	(0.046)	(-0.007)
Underinvestment						0.236***	0.052***
						(0.047)	(-0.007)
Excess Cash						1.240***	0.220***
						(0.059)	(-0.008)
Tax Benefit	1.255***	1.509***	1.231***	1.248***	1.588***	1.520***	0.129**
	(0.253)	(0.312)	(0.253)	(0.290)	(0.353)	(0.375)	(-0.063)
Volatility	-0.004***	-0.006***	-0.004***	-0.003**	-0.004*	-0.002	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Financial Distress	-0.993***	-1.008***	-0.996***	-0.999***	-1.029***	-0.910***	-0.165***
	(0.054)	(0.066)	(0.054)	(0.061)	(0.074)	(0.079)	(-0.012)
Size	-0.522***	-0.576***	-0.529***	-0.580***	-0.661***	-0.599***	-0.092***
	(0.021)	(0.029)	(0.021)	(0.025)	(0.035)	(0.037)	(-0.005)
Age	0.238***	0.223**	0.245***	0.388***	0.380***	0.370***	0.084***
	(0.055)	(0.106)	(0.056)	(0.064)	(0.118)	(0.126)	(-0.014)
Profitability	0.279***	0.280***	0.287***	0.209**	0.226*	0.135	0.067***
	(0.073)	(0.103)	(0.073)	(0.091)	(0.125)	(0.132)	(-0.017)
Tobin's Q	0.069***	0.107***	0.069***	0.080***	0.118***	0.101***	0.008***
	(0.007)	(0.011)	(0.007)	(0.009)	(0.012)	(0.013)	(-0.002)
Tangibility	-5.306***	-5.583***	-5.310***	-5.620***	-5.708***	-4.726***	-0.776***
	(0.184)	(0.237)	(0.184)	(0.214)	(0.268)	(0.282)	(-0.038)
Dividends	0.273***	0.402***	0.269***	0.373***	0.472***	0.447***	0.057***
	(0.052)	(0.064)	(0.052)	(0.059)	(0.071)	(0.076)	(-0.011)
N	33,768	23,165	33,768	27,297	19,249	17,955	17,956
$\chi 2$	3506	3676	2610	3516	2694	3171	.
Pseudo R^2	0.116	0.123	0.121	0.126	0.128	0.166	.

Notes: This table reports the regression results for the determinants of ZL policy. The dependent variable is *Zero Leverage*. Columns 1 to 6 report the coefficient estimates and column 7 reports the average marginal effects. The marginal effects measures the change in probability resulting from a one standard deviation change around the mean of a continuous explanatory variable, holding all other variables at their means; for dummy variables, the marginal effect is the change in probability associated with a switch from 0 to 1. *, **, and *** shows statistical significance at the 10%, 5%, and 1% level, respectively. Year and industry dummies are included in all models. The definitions of the variables are provided in Table A1 of Appendix.

Table 6: Conditional Logit Regressions for the Effects of Firm Characteristics on ZL Policy: Subsample Analysis

	Full Sample	Q>median	Q<median	Retain earning>0	Retain earning<0	Deficit>0	Deficit<0	Non-Constrained	Constrained
	(1)	**(2)**	**(3)**	(4)	(5)	**(4)**	**(5)**	**(6)**	**(7)**
Credit Rating Change	-2.379**	-2.943**	0.206	-2.951	-2.411*	-5.963***	-0.646	-2.107	-2.711*
	(1.187)	(1.387)	(2.722)	(2.440)	(1.375)	(2.043)	(1.895)	(2.440)	(1.475)
Overvaluation	0.096*	0.211***	-0.128	0.01	0.11*	0.146**	-0.062	0.034	0.091
	(0.052)	(0.063)	(0.127)	(0.062)	(0.057)	(0.069)	(0.093)	(0.101)	(0.054)
Underinvestment	0.245***	0.231***	0.216***	0.35***	0.23***	0.371***	0.014	0.265***	0.212***
	(0.047)	(0.057)	(0.103)	(0.052)	(0.053)	(0.068)	(0.089)	(0.094)	(0.061)
Excess Cash	1.242***	1.147***	1.517***	1.34***	1.10***	1.218***	1.107***	1.220***	1.171***
	(0.059)	(0.073)	(0.130)	(0.066)	(0.068)	(0.087)	(0.113)	(0.137)	(0.074)
Tax Benefit	1.555***	1.290**	2.198***	1.26**	0.68*	0.899	3.032***	-0.263	1.754***
	(0.374)	(0.510)	(0.695)	(0.541)	(0.410)	(0.574)	(0.764)	(0.816)	(0.482)
Volatility	-0.002	-0.007**	0.003	-0.01***	-0.00	0.002	-0.009	-0.006	-0.002
	(0.002)	(0.003)	(0.004)	(0.004)	(0.001)	(0.003)	(0.006)	(0.005)	(0.002)
Financial Distress	-0.903***	-0.861***	-1.101***	-1.07***	-0.49***	-0.842***	-1.129***	-0.962***	-0.976***
	(0.079)	(0.101)	(0.169)	(0.090)	(0.117)	(0.119)	(0.149)	(0.166)	(0.103)
Size	-0.594***	-0.478***	-0.973***	-0.76***	-0.36***	-0.427***	-0.811***	-0.502***	-0.674***
	(0.037)	(0.046)	(0.096)	(0.053)	(0.026)	(0.050)	(0.092)	(0.075)	(0.051)
Age	0.364***	0.352**	-0.017	0.79***	0.37***	0.102	0.896***	0.055	0.408**
	(0.126)	(0.157)	(0.288)	(0.119)	(0.140)	(0.194)	(0.254)	(0.243)	(0.177)
Profitability	0.152	0.069	-0.053	1.50***	0.18**	-0.144	1.257***	0.182	-0.005
	(0.132)	(0.149)	(0.417)	(0.266)	(0.084)	(0.167)	(0.418)	(0.270)	(0.175)
Tobin's Q	0.103***	0.111***	-0.377	0.15***	0.02*	0.096***	0.263***	0.092***	0.099***
	(0.013)	(0.014)	(0.277)	(0.022)	(0.009)	(0.015)	(0.047)	(0.024)	(0.017)
Tangibility	-4.695***	-3.972***	-6.077***	-5.59***	-3.55***	-3.950***	-5.617***	-5.240***	-3.746***

	(0.281)	(0.363)	(0.592)	(0.338)	(0.268)	(0.443)	(0.584)	(1.042)	(0.321)
Dividend Payer	0.451***	0.434***	0.449***	0.42***	-0.17*	0.073	0.607***	0.289*	0.278**
	(0.076)	(0.092)	(0.167)	(0.082)	(0.095)	(0.114)	(0.139)	(0.154)	(0.114)
N	17,955	10,908	4,378	15,541	11,692	7,312	5,598	4,586	10,476
χ2	1302	870	1247	0.185	0.136	481.6	376.2	1302	1271
Pseudo R^2	0.166	0.140	0.250	2309	1178	0.170	0.206	0.102	0.164

Notes: This table reports the regression results of ZL determinants for different samples. The dependent variable is *Zero Leverage*. Column (1) is for the full sample; columns (2)-(3) are for the high growth and low growth subsamples; columns (4)-(5) are for the positive and negative deficit subsamples; columns (6)-(7) are for the constrained and non-constrained subsamples. *, **, and *** shows significance at the 10%, 5%, and 1% level, respectively. Year and industry dummies are included in all models. The definitions of the variables are provided in Table A1 of Appendix.

Table 7. Firm Behaviour Before and After Dropping ZL Policy

	Panel A. All ZL Firms				Panel B. ZL in Optimal Zone				Panel C. ZL in Non-Optimal Zone			
	t-1	t	t+1	Change in mean [(t+1) -(t-1)]	t-1	t	t+1	Change in mean [(t+1)-(t-1)]	t-1	t	t+1	Change in mean [(t+1) -(t-1)]
Debt Issuance												
N	3376	4089	5010		1497	1982	2903		1879	2107	2107	
Mean	-0.02	-0.03	0.15	0.17***	-0.02	-0.03	0.16	0.18***	-0.02	0.00	0.17	0.15***
Deviation Leverage												
N	2899	3433	4288		1196	1326	2202		1703	2107	2086	
Mean	-0.05	-0.07	0.11	0.16***	-0.03	-0.03	0.11	0.14***	-0.08	-0.09	0.10	0.19***
Cash												
N	4088	5010	5010		1981	2903	2903		1170	1170	1170	
Mean	0.36	0.37	0.26	-0.10***	0.40	0.41	0.31	-0.09***	0.31	0.30	0.20	-0.11***
Equity Issuance												
N	3962	4833	4908		1537	1563	1567		1144	1150	1151	
Mean	0.15	0.16	0.10	-0.05***	0.15	0.16	0.10	-0.05***	0.14	0.14	0.08	-0.06***
Credit Rating												
N	2193	2522	2928		707	819	1001		838	946	1015	
Mean	0.003	0.005	0.008	0.005**	0.002	0.004	0.004	0.002	0.004	0.006	0.013	0.010***
Capital Expenditure												
N	4008	4867	4945		1913	2787	2870		1160	1156	1159	
Mean	0.062	0.069	0.088	0.026***	0.060	0.064	0.082	0.022***	0.064	0.068	0.090	0.026***
Deviation Investment												
N	2369	2761	3200		981	1110	1308		1388	1651	1892	
Mean	-0.017	-0.006	0.044	0.061***	-0.015	0.005	0.043	0.058***	-0.025	-0.011	0.044	0.069***
New Investment												
N	3878	4689	4634		1488	1524	1492		951	1098	1048	
Mean	0.111	0.121	0.175	0.064***	0.142	0.154	0.194	0.052***	0.074	0.085	0.141	0.067***

Notes: This table presents an analysis of some firm characteristics in a dynamic framework around the event year *t*, the year *t* refers to the last year before a firm drops ZL policy. It also shows the change in mean value and t test on the equality of mean from **[(t+1) to (t-1)]**. Panel A is for the results for all ZL firms. Panel B and C present the results for two groups of ZL firms based on the median threshold value (-3.5%) of the variable lagged *Deviation Leverage*; namely ZL in optimal zone and ZL in non-optimal zone. *, **, and *** shows significance at the 10%, 5%, and 1% level, respectively. The definitions of all variables are provided in Table A1 of Appendix.

Table 8. Investment sensitivity to cash flow and dropping ZL policy

	Panel A. All ZL Firms		Panel B. ZL is Optimal Range	Panel C. ZL is Non-optimal Range
	(1)	(2)	(3)	(4)
New Investment$_{t-1}$	0.345***	0.355***	0.417***	0.267***
	(0.021)	(0.021)	(0.025)	(0.030)
Profitability$_{t-1}$	0.207***	0.212***	0.282***	0.165***
	(0.012)	(0.013)	(0.019)	(0.017)
Tobin's Q$_{t-1}$	0.011***	0.009***	0.002	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)
Dropping ZL	0.080***	0.085***	0.053***	0.100***
	(0.007)	(0.015)	(0.025)	(0.015)
Profitability$_{t-1}$×Dropping ZL		-0.015	-0.010	-0.140***
		(0.045)	(0.06)	(0.054)
Constant	-0.052***	-0.048***	-0.061***	-0.021*
	(0.009)	(0.009)	(0.015)	(0.011)
N	20,470	20,448	9,096	7,689
Number of firms	4,468	4,463	2,869	2,678
F-statistics	23.5***	22.81***	20.23***	8.94***
Correlation 1 (*p*-value)	(0.00)	(0.00)	(0.00)	(0.00)
Correlation 2 (*p*-value)	(0.136)	(0.142)	(0.114)	(0.681)
Hansen test of overidentification (*p*-value)	22.34 (0.616)	23.14 (0.511)	29.86 (0.190)	17.25 (0.838)
Difference-in-Hansen test of exogeneity (*p*-value)	19.01 (0.585)	19.33 (0.500)	22.93 (0.292)	16.50 (0.685)

Notes: This table reports the regression results of Q-model of investment using the system GMM method. The dependent variable is *New Investment* measured at time t. *Dropping ZL* is a dummy variable that is equal to 1 if the ZL firm becomes a NZL firm, and 0, otherwise. Columns (1) and (2) present the results for all firms following ZL policy. The last two columns present the results for two groups based on the median threshold value (-3.5%) of lagged *Deviation Leverage*; column (3) is based on "0≥ lagged *Deviation Leverage* ≥-3.5%" representing ZL policy being optimal and column (4) is based on "-3.5%> lagged *Deviation Leverage* ≥-99.9%" representing ZL policy being non-optimal. Correlation 1 and Correlation 2 are the tests of first and second order of autocorrelation of residuals, respectively; under the null of no serial correlation. Hansen tests for the null hypothesis of validity of instruments (overidentification restriction). The Difference-in-Hansen tests for the null hypothesis of exogeneity of instruments used for the equations in levels. In all models, Tax Benefit is used as an instrument and the unreported Difference-in-Hansen tests for this instrument do not reject the null hypothesis. Year and industry dummies are included in all models. The standard errors are robust to heteroscedasticity and clustered at firm level. The definitions of all variables are provided in Table A1 of Appendix.

Table 9. Characteristics of firms with overconfident and non-overconfident CEOs

	Panel A. All Firms			Panel B. ZL Firms			Panel C. NZL Firms		
	Overconfident	Non-overconfident		Overconfident	Non-overconfident		Overconfident	Non-overconfident	
	N = 11,112	N = 15,154		N = 1,740	N = 1,795		N = 7,109	N = 13,689	
	Mean	**Mean**	**t-stat**	**Mean**	**Mean**	**t-stat**	**Mean**	**Mean**	**t-stat**
Leverage	0.188	0.222	14.473***	0.000	0.000		0.220	0.251	13.101***
Deviation Leverage	0.007	0.000	-6.166***	0.038	0.039	1.005***	0.001	-0.005	-5.455***
Misvaluation	0.306	0.574	47.572***	0.237	0.542	22.470***	0.317	0.578	42.443***
Overvaluation	0.704	0.487	-31.010***	0.801	0.684	-10.211***	0.684	0.471	-8.247***
Stock Ranking	2.725	2.533	-2.140**	2.396	2.193	-3.341***	2.781	2.578	-6.969***
Profitability	0.171	0.126	-14.250***	0.185	0.096	-12.901***	0.169	0.130	-25.687***
Cash	0.167	0.142	-10.210***	0.371	0.350	-8.120***	0.133	0.114	-8.253***
Tobin's Q	2.628	1.663	-47.25***	3.961	2.148	-21.458***	2.403	1.599	-42.327***
Deviation Investment	0.005	-0.004	-7.22***	-0.020	-0.020	0.095	0.010	-0.001	-7.398***
Financial Distress	0.371	0.475	16.080***	0.254	0.421	18.120***	0.400	0.481	12.14***
Tangibility	0.272	0.286	-4.470***	0.176	0.162	-2.326**	0.289	0.302	2.048**
Size	6.991	7.169	7.777***	5.813	5.712	-1.833*	7.190	7.359	8.245***
Age	18.698	23.602	27.144***	12.961	17.162	11.290***	19.667	24.447	24.575***
Tax Benefit	0.328	0.314	-14.941	0.313	0.277	-9.635***	0.331	0.318	-11.925***
Volatility	12.176	12.337	1.322	15.094	14.476	-2.100**	11.670	12.045	2.834***
Dividends	0.108	0.202	16.131***	0.075	0.121	3.273***	0.114	0.213	13.144***
Equity Issuance	0.036	0.018	-18.296***	0.061	0.032	-7.197***	0.032	0.016	-14.551***
Equity Repurchases	0.026	0.024	-2.805***	0.036	0.039	1.425	0.024	0.022	-0.666
Net Equity Issuance	0.010	-0.006	-16.140***	0.025	-0.007	-6.890***	0.008	-0.006	-11.757***
Debt Issuance	0.016	0.008	-10.250***	-0.009	-0.012	-1.576	0.030	0.013	-10.783***
Total Issuance	0.023	0.001	-15.480***	0.014	-0.007	-6.288***	0.021	0.007	-14.261***
Option Moneyness	2.225	0.197	-110.00***	2.681	0.176	-39.514***	2.148	0.200	-110.00***
CEO Ownership	0.025	0.019	-9.020***	0.039	0.028	-4.400***	0.023	0.018	-20.196***
CEO Age	3.210	3.120	-0.244	2.900	2.870	0.103	3.100	3.147	-0.403
CEO Tenure	8.945	7.676	-4.450***	8.322	10.379	-8.450***	8.654	7.210	-4.550***

Notes: This table compares the mean characteristic of full sample as well as ZL and non-ZL firms with both overconfident and non-overconfident CEOs. The t-statistics test for the difference between the mean value of variables for the firms with overconfident and non-overconfident CEOs. *, **, and *** indicates statistical significance at the 10%, 5%, and 1% level, respectively. The definitions of all variables are provided in Table A1 of Appendix.

Table 10. Managerial overconfidence and ZL policy						
	(1)	(2)	(3)	(4)	(5)	(6)
Overconfidence		3.190***				
		(0.400)				
Overconfidence-Residual		-3.259***				
		(0.408)				
Overconfidence-Fitted			2.140***		2.270***	0.160***
			(0.283)		(0.416)	(0.023)
CEO Ownership	3.800***	1.530***		1.420***	0.621	0.003
	(0.365)	(0.446)		(0.441)	(0.526)	(0.028)
CEO Age	0.060**	-0.150***		-0.150***	-0.190***	-0.010***
	(0.025)	(0.039)		(0.039)	(0.039)	(0.002)
CEO Tenure	0.010***	0.020***		0.020***	0.010	0.000
	(0.003)	(0.004)		(0.004)	(0.004)	(0.000)
CEO Director	-0.460***	0.040		0.050	0.340	0.020
	(0.176)	(0.250)		(0.249)	(0.255)	(0.014)
Credit Rating Change	0.913	-0.196	-0.194	-0.201	-0.189	-0.001
	(0.601)	(1.191)	(1.191)	(1.195)	(1.195)	(0.021)
$Overvaluation_{t-1}$	-0.190***	0.200**	0.198**	0.215**	0.199**	0.02**
	(0.053)	(0.078)	(0.078)	(0.079)	(0.077)	(0.005)
Underinvestment	-0.220***	0.320***	0.430***	0.330***	0.460***	0.030***
	(0.037)	(0.062)	(0.063)	(0.062)	(0.065)	(0.004)
Excess Cash	0.000	1.220***	1.210***	1.220***	1.200***	0.060***
	(0.039)	(0.064)	(0.064)	(0.064)	(0.065)	(0.004)
Tax Benefit	2.860***	0.080	-1.310**	-0.010	-1.450***	-0.080**
	(0.433)	(0.530)	(0.550)	(0.529)	(0.564)	(0.031)
Volatility	0.000	0.000	-0.000	0.000	-0.000	-0.000
	(0.003)	(0.005)	(0.005)	(0.005)	(0.006)	(0.000)
Financial Distress	-0.230***	-0.710***	-0.540***	-0.710***	-0.510***	-0.030***
	(0.044)	(0.080)	(0.083)	(0.080)	(0.085)	(0.005)
Size	0.050***	-0.710***	-0.720***	-0.710***	-0.730***	-0.040***
	(0.015)	(0.030)	(0.029)	(0.030)	(0.030)	(0.002)
Age	-0.350***	-0.070	0.110**	-0.060	0.180***	0.010***
	(0.032)	(0.050)	(0.055)	(0.050)	(0.061)	(0.003)
$Profitability_{t-1}$	0.600**	1.600***	1.250***	1.610***	1.120***	0.060***
	(0.253)	(0.306)	(0.308)	(0.306)	(0.314)	(0.017)
Tobin's Q	0.550***	0.230***	0.020	0.210***	-0.020	-0.000
	(0.034)	(0.023)	(0.027)	(0.021)	(0.035)	(0.002)
Tangibility	0.040	-2.320***	-2.360***	-2.320***	-2.340***	-0.130***
	(0.110)	(0.209)	(0.209)	(0.208)	(0.210)	(0.011)
Dividend Payer	-0.200***	0.100	0.170**	0.100	0.220***	0.010***
	(0.046)	(0.067)	(0.067)	(0.067)	(0.069)	(0.004)
Constant	-1.300***	0.250	-0.790	0.240	-0.940	

	(0.454)	(0.760)	(0.740)	(0.762)	(0.787)	
N	14,831	14,831	14,828	14,835	14,836	14,837
$\chi 2$	1304	2447	2489	2452	2492	-
Pseudo R^2	0.132	0.321	0.323	0.320	0.326	-

Notes: This table reports the results of logit regressions by focusing on factors related to managerial attributes as ZL policy determinants. Model (1) reports the determinants of managerial overconfidence where *Overconfidence* is the dependent variable; then, the fitted value of this regression model is used in model (2) in order to test for the endogeneity of managerial overconfidence. Hausman test indicates that ($\chi 2$ = 9.68; *p*-value =0.001) *Overconfidence* is endogenous, hence the fitted value of model (1) is used as CEO overconfidence proxy in models (3) to (5) in which the dependent variable is *Zero Leverage*. Model (6) reports the average marginal effects that measure the change in probability resulting from a one standard deviation change around the mean of a continuous explanatory variable, holding all other variables at their means. For dummy variables, the marginal change is the change in probability associated with a switch from zero to one. The standard errors are robust to heteroscedasticity and clustered at firm level. Time and industry dummies are included in all models. *, **, and *** indicates statistical significance at the 10%, 5%, and 1% level, respectively. The definitions of all variables are provided in Table A1 of Appendix.

Appendix

Table A1: Definitions of variables and Compustat Data Items	
Leverage	Ratio of total debt to total assets. {(DLTT+DLC)/AT}
Zero Leverage	Dummy variable: 1 if total debt is zero for the current year; 0 otherwise
Deviation Leverage	It measures the deviation from the target leverage, which is the difference between actual leverage and fitted leverage of the model below: $Leverage_{it} = \beta_0 + \beta_1 Leverage_{it-1} + \beta_2 Profitability_{it} + \beta_3 Tobin's Q_{it} + \beta_4 Depreciation_{it} + \beta_5 Size_{it} + \beta_6 R\&D_{it} + \beta_7 RDD_{it} + \beta_8 IndusLev_{it} + \varepsilon_t$ (A1) where Depreciation is depreciation expenses over total assets; R&D is R&D expenses over total sales; RDD is a dummy variable which is 1 when R&D data is not available and 0 otherwise; IndusLev is the median value of industry leverage. We chose commonly used factors in the literature as leverage determinants (see e.g., Frank and Goyal (2009)) with year dummies and the estimation method is dynamic fixed effects as the system-GMM specification failed to pass the diagnostic tests.
SA Index	It is measured as: SA= -0.737(Size) + 0.043(Size)^2 – 0.040(Age) where *Size* is the logarithm of inflation–adjusted total assets and *Age* is the number of years that the firm has been listed with no missing share price in Compustat. Size and age of firms are capped to $4.5 billion and 37 years, respectively.
Credit Rating Change	The probability of having credit rating derived from the fitted value of the predictive logit model below (see Lemmon and Zender 2010) $Rating_{it} = \beta_0 + \beta_1 Tangibility_{it-1} + \beta_2 Age_{it-1} + \beta_3 Tobin's\ Q_{it-1} + \beta_4 Size_{it-1} + \beta_5 Profitability_{it-1} + \beta_6 Volatility_{it-1} + \varepsilon_t$ (A2) where Rating is a dummy variable which is 1 if the firm has debt rating and 0 otherwise. The model also includes industry dummies. We use the difference [t-(t-1)] of the estimated fitted value of this model as an indication of access to debt market.
Stock Ranking	Standard & Poor's uses a computerized scoring system for common stocks to compute basic scores for earnings and dividends, then adjusts the scores by a set of predetermined modifiers for growth, stability within long-term trend and cyclicality. Adjusted scores for earnings and dividends are combined to yield a final score. The classification of scores is presented as follows and we assign a value for each classification: A+ = 7, A = 6, A- = 5, B+ = 4, B = 3, B- = 2, C =1, D (reorganisation) = 0, and LIQ (liquidation) = 0. All non-ranked firm-year observations are set to 0 (SPCSRC)
Misvaluation	It measures the degree of stock mispricing estimated as the ratio of intrinsic value of the stock (V) to the market value of stock (M). See section 3.2 for further details.
Overvaluation	Dummy variable: 1 if the value of the ratio of intrinsic value of the stock (V) to market value of stock (M) is less than the median value of the all firm-years in the full sample, and 0 otherwise. See section 3.2 for further details.
Overvaluation Duration	The numbers of years for any firms with overvalued stock.
Profitability	Ratio of earnings before interest, taxes and depreciation to total assets {(EBIT+ DEP)/AT}
Cash	Ratio of cash and short-term investments to total assets (CHE/AT)
Excess Cash	Dummy variable: 1 if the firm has cash balances (CHE/AT) that are higher than the median value of those that its industry holds (based on Fama & French's 48 industry classifications), and 0 otherwise.
Tobin's Q	Q = {Total assets (AT[6]) – Book value equity (CEQ[60]) + Market value equity (PRCC_F[199]×CSHO [25])} / Total assets (AT[6])
Capital Expenditure	Ratio of capital expenditure to total assets (CAPX/AT).
New Investment	This is measured as capital expenditure (CAPX) + acquisitions (AQC) + R&D (XRD) - sale of PPE (SPPE) - depreciation & amortization (DP). The figures are scaled by total assets.
Optimal Investment	$New\ Investment_t = \alpha + \beta New\ Investment_{t-1} + \gamma Z_{t-1} + \varepsilon_t$ (A3) where Z is the vector of other investment determinants lagged by one period, i.e., leverage, growth, size, age, cash, stock returns, and contemporaneous values of industry and time fixed effects (see Richardson (2006)). The fitted value of this regression is the expected level of New Investment (i.e., Optimal Investment)
Deviation Investment	The deviation from the optimal investment, which is the residual value of the regression model (A3)
Underinvestment	Dummy variable: 1 if the deviation from the optimal investment is negative, and 0 otherwise
Z-Score	Altman's modified Z-score. It is calculated as 3.3×(EBIT/Total assets) + 0.99×(Sales/Total assets) + 1.4×(Retained earnings/Total assets) + 1.2×(Working Capital/Total assets)
Financial Distress	Dummy variable: 1 if Z-score < 1.80, then the firm is considered as financial distressed, and 0 otherwise

Volatility	The standard deviation of monthly stock returns over the past 60 months
Tangibility	Ratio of fixed assets to total assets (PPENT/AT)
Liquidity	The ratio of current assets to current liabilities
Size	Natural logarithm of total sales in 1980 dollars
Age	The number of years the firm has been covered in the Compustat database
Tax Benefit	Marginal corporate tax rate before interest deductions (MTRBID) from database created by Jennifer Blouin, John Core and Wayne Guay using Capital IQ Compustat data.
Dividends	Ratio of common dividends to profit before dividends (DV/IBCOM)
Dividend Payer	Dummy variable: 1 if the firm issues common dividend, and 0 otherwise.
Equity Repurchases	Ratio of share repurchases to total assets (PRSTKC/AT).
Equity Issuance	Ratio of share issuance to total assets (SSTK/AT).
Net Equity Issuance	Ratio of net equity issuance to total assets {(SSTK - PRSTKC)/AT}.
Debt Issuance	Ratio of the change in current and long-term debt to total assets {(DLC+ DLTT - l.DLC - l.DLTT)/AT}.
Total Issuance	Net equity issuance plus net debt issuance.
Option Moneyness	For each CEO-year, we measure the realizable value per option by dividing the total realizable value of the options from ExecuComp (OPT-UNEX-EXER-EST-VAL) by the number of exercisable options (OPT-UNEX-EXER-NUM). Next, we subtract the average realizable value per option from the stock price (PRCC_F) to estimate the average exercise price. The average option moneyness ratio then equals the per option realizable value divided by the average exercise price. ((PRCC_F/PRCC_F - (OPT - UNEX - EXER-EST- VAL)/(OPT – UNEX – EXER - NUM)) -1).
Overconfidence	Dummy variable: 1 if Option Moneyness exceeds 67% at least once during the sample, and 0 otherwise.
CEO Ownership	The percentage of shares owned by the CEO, options excluded. (SHROWN – EXCL - OPTS/ (CSHO×1000))
CEO Age	Executive Age (1/39 = 1) (40/49 = 2) (50/59 = 3) (60/69 = 4) (70/79 = 5) (80/89 = 6) (90/99 = 7) (missing =.)
CEO Director	Executive served as a director during the fiscal year
CEO Tenure	One plus the difference between the current year and the year of appointment as CEO

Table A2: Logit Regression Predicting Credit Rating

The dependant variable takes value of 1 for the firm with debt rating and zero otherwise in every particular year (item 280). Age is the number of years which a firm has been appeared in Compustat. Tangibility is the property, plant, and equipment (item 8/ item 6) scaled by total assets. Market-to-book is the proxy for growth opportunities ((item 6 – item 60 + item 24 × 25)/ item 6). Size is the natural log of sales (item 12), adjusted for inflation. Profitability is the ratio of EBIT to total sale (item 13/ item 6). Volatility is the deviation of stock returns for past twelve months. Model (2) also includes the industry indicators based on 48 Fama French classifications. All independents variables are lagged in one period. The original sample is 168342 of firm -year observations over the period of 1980-2012.The subsample of firms used in the regression is over the period of 1986-2012 since the data for credit ratings are availed in Compustat.

	Expected Sign	Model(1)	Model(2)
Tangibility	Positive	1.14***	1.29***
		(0.059)	(0.081)
Age	Positive	0.08***	0.07***
		(0.001)	(0.001)
Market-to-book ratio	Negative	-0.15***	-0.12***
		(0.014)	(0.015)
Size	Positive	0.95***	0.95***
		(0.010)	(0.011)
Profitability	Positive	0.11*	0.19***
		(0.060)	(0.063)
Volatility	Negative	-0.01***	-0.01***
		(0.002)	(0.002)
Constant		-9.04***	-9.04***
		(0.086)	(0.132)
Industry Indicator		No	Yes
Observations		91,795	91,795
Pseudo R 2		0.51	0.523

Table A3: Misvaluation Estimation

The Table provides descriptive statistics for parameter estimates employed in Residual Income Model based on Eq(X).

$$V(t) = B_{\,t} + \sum_{t=1}^{\infty} \left(\frac{E(t+1)-(r\times Bt-1)}{(1+r)\hat{}t}\right) + \left(\frac{E-(r\times Bt-1)+(E(t+1)-(r\times Bt)}{2r(1+r)^n}\right)$$

V (t) is the intrinsic value of stock at time t, B(t) is the book value, CE is the annual cost of equity based on CAPM, E t is the return on the equity and n equal two years, which result the following model:

$$V0 = B0 + \frac{E1 - CE \times BO}{(1+CE)} + \frac{E2 - CE \times B1}{(1+CE)} + \frac{E2 - CE \times B1 + E3 - CE \times B2}{2CE(1+CE)\hat{}2}$$

The estimated intrinsic value of the firm V is then divided by market value of the firm to demine the misvaluation. Estimated Misvaluation is measured by:

$$RIM_t = \frac{V_t}{MV_t}$$

RIM_t represent the estimated Misvaluation at time t, V_t and MV_t represent the intrinsic value and market value (CSHO×PRCC_F) of the firm at time t respectibvely. Dum - Overvaluation is a Dummy variable equal to 1 if RIM is less than median, and 0 otherwise.

Variable	**N**	**mean**	**p50**	**sd**
CE-CAPM	122,973	0.143	0.136	0.069
Beta –CAPM	124,457	1.095	1.832	1.038
CE –FF	124,457	0.172	0.874	0.184
Beat -Market –FF	124,457	0.974	1.236	0.959
Beat -Sml –FF	124,457	0.961	1.972	0.819
Beat -Hml –FF	124,457	0.096	3.185	0.128
B0	168,109	339.074	32.559	1064.956
B1	147,149	366.455	39.500	1102.843
B2	130,361	395.996	45.232	1148.540
E1	146,957	42.150	1.201	172.665
E2	128,539	45.962	1.408	179.525
E3	113,901	50.325	1.631	187.500
V	112,300	481.404	38.894	1447.501
MV	147,039	920.871	71.886	3198.182
RIM(Misvaluation)	98,600	0.627	0.538	0.553
Dum – Overvaluation	98,600	0.500	0.000	0.500

Table A4: Optimal Investment

Note: New investment = Total investment ((Capital expenditure$_t$ (CAPX [128]) + Acquisitions$_t$ (AQC [129]) + Research and Development Expenses$_t$ (XRD [46]) - sale of PPE$_t$ (SPPE [107]) - maintenance$_t$ (depreciation and amortisation (DP [125])) divided by Total Assets (AT[6]).

Variable	N	mean	sd	min	max
Capital Expenditure	165,584	0.071	0.092	0.000	0.461
R&D	168,325	0.056	0.197	0.000	0.686
ACQ	160,384	0.021	0.075	0.000	0.368
Sale of PPE	135,090	0.011	0.085	0.000	0.181
Total investment	158,936	0.134	0.780	-0.062	0.856
Depreciation	166,917	0.050	0.057	0.000	0.247
New Investment	158,554	0.084	0.152	-0.211	0.786

Extended of Analysis of investment expenditure

This Table reports the result of investment model for the sample of 168,325 firm-year observations over the period of 1980-2012. The dependant variable is New Investment and the determinants of investment are as follows: Leverage is measured by the total debt divided by the sum of total debt and book value of equity, (DLTT [9]) + DLC [34])/(DLTT [9]) + DLC [34]) + CEQ [60]). Size is computed by the log of total assets (AT[6]) measured at the start of the year. Age is the number of years that the firm has been listed in Compustat. Cash refers to the balance of cash and short term investment (CHE[1]). Stock Return is measured as the change in market value for the year prior to the investment. Growth is computed as the different between observed firm value and the estimated value of assets in place. Accordingly, the value of the asset in place deflated by market value equity (CSHO[25] × PRCC_F[199]. The value of asset in place is estimated as $(1 - \alpha r)bv + \alpha(1+r)x - \alpha rd$. Where $\alpha = (\acute{\omega}/(1+r-\acute{\omega}))$ and r = 12% and $\acute{\omega} = 0.62$ and it refers to abnormal earning persistence parameter from Ohlson (1995) framework, bv stands for value of common equity (CEQ [60]), d is dividends payment (DVC [21]) and x is operation income after depreciation (OPIADP [178]).

VARIABLES	Predicted Sign	(1)	(2)
L.Growth	Negative	-0.01***	-0.00***
		(0.001)	(0.001)
L.Leverage	Negative	-0.05***	-0.05***
		(0.002)	(0.002)
L.Cash	Positive	0.14***	0.14***
		(0.002)	(0.002)
L.Age	Negative	-0.00***	-0.00***
		(0.000)	(0.000)
L.Size	Positive	0.00***	0.00***
		(0.000)	(0.000)
L.Yearly Stock Return	Positive	0.00***	0.00***
		(0.000)	(0.000)
L.New Investment	Positive	0.49***	0.48***
		(0.005)	(0.005)
Constant		0.02***	0.02***
		(0.001)	(0.003)
Time Fixed Effects		N	Y
Industry Fixed Effects		N	Y
Robust standard errors		Y	Y
Observations		112,116	112,116
df-m		7	52
Adjusted R^2		0.405	0.410
F		5100	761.3

Table A5: Prediction of Target Leverage

Size is the natural log of sales (data 12), adjusted to 1980 dollars. Tangibility is the property, plant, and equipment (data8) scaled by total assets Market-to-book is (total assets – book equity + market equity)/total assets. R&D is the research and development expense (data 46) scaled by sales. We replace missing value of R&D with zero. We also use indicator variable for those firm with no missing R&D expenses. Industry median leverage ratio in regression based on 48 Fama-French industry classification. Wald test represents the joint significant of coefficients. Correlation 1 and 2 are first and second order of autocorrelation of residual under the null of no serial correlation. Sargan and Hansen tests for the null of validity of instruments (over-identification restriction).

	(1)	(2)	(3)
Variables	**OLS**	**Fixed Effects**	**SYS-GMM**
Total Debt $_{t-1}$	0.76***	0.59***	0.63***
	(0.003)	(0.004)	(0.011)
Profitability2	-0.09***	-0.11***	-0.06***
	(0.003)	(0.003)	(0.014)
Q	-0.00***	-0.00***	0.00***
	(0.000)	(0.000)	(0.001)
Depreciation	-0.01	0.00	0.01**
	(0.012)	(0.015)	(0.049)
Size	0.00***	0.01***	0.00**
	(0.000)	(0.000)	(0.002)
Tangibility	0.07***	0.13***	0.11***
	(0.002)	(0.004)	(0.040)
RD_sale	-0.01***	-0.00***	-0.00**
	(0.001)	(0.001)	(0.002)
RD_Dummy	-0.01***	-0.01***	-0.00
	(0.001)	(0.002)	(0.008)
Industry median leverage	0.08***	0.17***	0.14***
	(0.005)	(0.008)	(0.061)
Constant	0.02***	0.00	-0.09***
	(0.002)	(0.003)	(0.014)
Year Dummy	Y	Y	Y
Observations	132,112	132,112	132,112
Number of firms		14,854	14,854
R-squared	0.662	0.341	
Wald Test	6478***	45131***	10513***
Correlation1(p-value)			(0.000)
Correlation2(p-value)			(0.859)
sargan test(p-value)			(0.000)
Hansen J test(p-value)			(0.000)
Robust standard errors in parentheses***p<0.01, ** p<0.05, * p<0.1			

Notes: This study employs a conventional model of target debt ratio. In particular, we use a set of firm's characteristics that are commonly identified in the literature (e.g. Flannery and Rangan 2006, Frank and Goyal 2009) as important determinants of leverage: firm size(larger firms are expected to use a higher level of debt), tangibility

(firms with more tangible assets have greater access to debt financing), market to book (firms with more growth options use lower debt to reduce information asymmetry), non-debt tax shield (firms with a higher value of deprecation can substituted this expense for interest deduction of debt financing, hence use a lower level of debt), research and development (firms with a greater level of R&D expenses have less room for interest payment on debt, lower level of debt), Profitability (firms with higher income prefer lower external/debt financing) and median industry leverage to control for industry characteristics which have not been captured by the model. Furthermore, Flannery and Rangan (2006) state the past value of the dependent variable may explain the current value. Following them, the lag of the dependent variable is also included in our model; the inclusion of lagged leverage also allows for the target behaviour.

In model (1) target leverage is estimated in the usual fashion, pooled regression (OLS) a single equation for all data together. This approach is the simplest way which estimates all cross-sectioned and time series observations of all dependent variables in a single column, and similarly all of the observations of each independent variable in a single column. OLS pooled regression has some limitations as this model neglects the heterogeneity across individual firms and assumes that all coefficients including the intercept are the same for all individual firms over time. Therefore, the estimation of parameters might be biased. Hovakimian and Li (2011) argue that one of the most important concerns in estimating target debt ratio is related to the choice of its determinants. Therefore, by using fixed firm effects in model 2, we mitigate the concern about unobserved firm heterogeneity (i.e. reputation, managerial skills etc.). However, it is known that the estimated coefficients in fixed effects models are imprecise, especially for those variables that do not change over time and more importantly the lag of dependent variable is correlated with idiosyncratic error due to presence of endogenous explanatory variables.

In the econometric context, an explanatory variable is known to be endogenous if it is correlated with the error term of the data generating process in the population. Sources of endogeneity problems are mainly related to omitted variables, measurement error of variables, or/and reverse causality between dependent and independent variables. Omitted variable is the most common reason for endogeneity, which usually arises when we need to control for one or more variables in the model but the variable cannot be considered due to unavailability. As a result, the variation of the omitted variable will be captured in the error term. However, if the omitted variable is time invariant, then employing a simple fixed effects model can alleviate this problem, because the dummy variables included for individual effects automatically control for time invariant variables. The second source of endogeneity may arise if a variable is measured with error. For instance, in our model we employ a common proxy of growth opportunity, Tobin's Q (total assets – book equity + market equity)/total assets). This proxy is one of the set of possible measures of growth opportunity which might be a noisy signal for this variable. Therefore, the measurement error will be captured in the error term and can lead to correlation between the error term and the explanatory variable. Simultaneity or reverse causality is another source of endogeneity which occurs when the dependent and at least one of the explanatory variables are determined simultaneously, i.e. it can be argued either that the dependent variable causes the explanatory variable or vice versa. Thus, if an explanatory variable is determined partly as a function of the dependent variable, then there is a possibility that the dependent variable and error term will be correlated.

Clearly, given endogenous explanatory variables, both OLS and fixed effects models produce inconsistent estimates of all the parameters. One possible way of controlling this type of problem is to find an instrument for the explanatory endogenous variable. A valid instrument is a variable that satisfies two conditions, (a) a sufficient correlation with the endogenous variable (b) but not with others. However, applying an instrumental variable regression may lead to a very poor result if the instruments are weak. Furthermore, in a capital structure context, finding an appropriate instrument is not easy and normally researchers rely on lagged values of variables, which then are predetermined. Therefore, we employ System-GMM Blundell and Bond (1998) which allows us to control for the possible endogeneity of the explanatory variables (which have been ignored in both former models). In this model, predetermined and endogenous variables in levels are instrumented with suitable lags of their own first difference. Model 3 reports GMM estimates where all right hand side variables (except lag dependent variable) are assumed to be endogenous. The lag levels of t-2 through t-5 of both dependent and independent variables are used as instruments. The validity of this method depends on the assumption regarding the serial correlation of residuals and the validity of instruments. Correlation tests confirm the null of no second order serial correlation. However, both Sargan and Hansen tests reject the null (the validity of instruments) at the 1% level. These problems are not resolved by using different lags of instruments. Other studies including Zhou *et al.* (2014) reached the same conclusion and also report rejection of the validity of different levels of instrument lags in estimating target leverage. Therefore, the system–GMM approach has dubious validity and hence we rely on estimation of the dynamic fixed effect (model 2) and report the level of deviation from target leverage based on this method.