Strategic Default and Capital Structure Decision

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Abstract

This paper investigates whether overleverage identifies companies' strategic default incentives. The results show that overlevered firms have lower equity beta than their counterparts. The strategic default option becomes more valuable when the firms are overlevered. Firms are more likely to be overlevered when they have more strategic advantages over their debt holders (i.e. high liquidation costs, high shareholder's bargaining power, and low renegotiation frictions). In addition, for bankrupt firms, overleverage successfully identifies the high probability of filing for the reorganisation bankruptcy code and emerging from the reorganisation plan. Overall, these findings suggest that overleverage is the outcome of an endogenous capital structure decision, which implies a strategic incentive to default.

Keywords: Financial distress, Overleverage, Strategic default
JEL Classification: G10, G32, G33

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1 Introduction

The presence of shareholder recovery alters the risk structure of equity when a firm approaches financial distress (Garlappi and Yan (2011) and Favara et al. (2012)). A firm usually defaults on its debt obligations when its shareholders are unable to make payments as contracted to the debt holders. The possibility of shareholder recovery upon default typically triggers a strategic option to default by shareholders. Shareholders, as the residual claimants, are the last to get paid when a firm goes into bankruptcy. Often, nothing is left to shareholders when a firm goes through a liquidation bankruptcy process. However, shareholder recovery upon financial distress enables shareholders to extract some fraction of firm value from debt holders.

Chapter 11, one of the US bankruptcy codes, leaves significant scope for debt renegotiation upon default. The efficiency of this code has been debated among legislation and policy makers and financial economists for a long time without conclusion. The shareholders' ability to renegotiate debt contracts may deliberately lead to a pre-emptory bankruptcy announcement, which is hard to document. This paper introduces an endogenous deviation from optimal captial structure to identify such a strategic intention (or option) to default, relating the corporate strategic default action upon financial distress to the capital structure decision. This paper is also the first study to investigate companies' strategic default incentives within a financial distress and optimal capital structure setting, using the most comprehensive dataset in COMPUSTAT, CRSP, and Capital IQ that contain approximately 1.5 million stock-month observations and about 141 thousand firm-year observations from January 1961 to December 2014. The results address the concerns of corporate lenders that firms may play a strategic gamewhen they excessively borrow from outsiders. This paper will enable legislation and policy makers to be made aware of the potential weakness of Chapter 11. In addition, it will also show how corporate debt holders should take a thorough and effective assessment of their borrowers before initiating lending procedures.

The rest of the paper is presented as follows. Section 2 reviews the related literature and develops the hypotheses. The methodology used to test the hypotheses is outlined in Section 3. Section 4 describes the data and all variables used in the analysis and followed by the main results in Section 5. Section 6 concludes.

2 Literature and Hypothesis Development

This section reviews the related literature on strategic default, financial distress, and the consequences of deviations from optimal capital structure. In addition, hypotheses are proposed on how deviation from optimal capital structure is related to strategic default.

2.1 Strategic Default and Financial Distress

Given the feasibility to renegotiate debt obligations with debt holders in the event of bankruptcy, shareholders are able to recover some fraction of firm value by deviating from the absolute priority rule (APR) (Franks and Torous (1989), Weiss (1990), Garlappi and Yan (2011), and Hackbarth et al. (2015)). Upholding APR, any junior claimant is not given a stake in the securities of the bankrupt firm until the more senior claimants have been fully satisfied, i.e. APR requires any security being claimed at bankruptcy to be strictly from most senior to most junior. APR violation addresses shareholders' intentional declaration of default.

Hart and Moore (1994) point out the difference between *liquidity default* and *strategic default*. They define liquidity default as a firm's insolvency due to low cash flows. Strategic default is regarded as a firm's declaration of bankruptcy even though the firm has sufficient cash to pay the debt. High liquidation costs prevent firms from bankruptcy because debt holders will receive less from an asset fire sale, which gives shareholders some scope to renegotiate their debt contracts in a debtor-friendly system. As a result, in the event of default, shareholders are able to extract values from debt holders in a debtor-friendly system and APR can be violated. This is in contrast to the strict adherence to APR required by shareholders and debt holders in a creditor-friendly system. Since liquidating a firm upon financial distress generates a loss in firm value relative to the going concern, debt holders may prefer to accept some debt forgiveness if doing so helps the troubled firm survive. This motivates shareholders to default strategically in order to obtain some debt relief from their debt holders.

Several recent studies propose the notion of corporate strategic default that alters the equity risk structure, solving the seemingly contradictory empirical patterns of distress risk and equity returns, documented as the " distress puzzle" (Garlappi et al. (2008), Garlappi and Yan (2011), and Favara et al. (2012)). This is especially true in the US because Chapter 11 (one of the US corporate bankruptcy procedures) gives the right to shareholders to reorganise their debt contracts at the time of default. Therefore, the option to default strategically arises from the likelihood of shareholder recovery upon default under Chapter 11. This new perspective helps explain the empirical regularities within the cross-sectional stock returns.

Deviation from APR in Chapter 11 reorganisation occurs 75% of the time and shareholders receive, on average, 7.6% of the reorganised firm's value (Franks and Torous (1989), Weiss (1990), and Betker (1995)). Franks and Torous (1989) report that among the 27 US firms that defaulted on their outstanding bonds during 1970 through 1984, 21 firms exhibit deviations from APR. 18 of these 21 firms deviate in favour of shareholders, i.e. shareholders receive some consideration (and three of the 21 firms benefit unsecured creditors). Weiss (1990) finds that 29 out of 37 bankruptcy cases among US firms between

1979 and 1986 are in violation of APR. In a more recent study, Morellec et al. (2008) show that the average shareholder recovery among US firms from 1992 to 2004 is about 20% of the asset value during the financial distress period.

Strategic default is found to play an important role in asset pricing (Mella-Barral and Perraudin (1997), Davydenko and Strebulaev (2007), and Garlappi and Yan (2011)). Studies on US bankruptcy codes both numerically and empirically suggest that renegotiation under Chapter 11 has influence on equity value, ex ante bankruptcy cost, credit spread and leverage ratios (Franks and Torous (1994), Bebchuk (2002), Francois and Morellec (2004) ,Bris et al. (2006), and Broadie et al. (2007)). Since the renegotiation option comes directly from Chapter 11, under which shareholders have incentive to deviate from the absolute priority rule and appropriate the rents from bondholders, the shareholders' strategic behaviour underscores the importance of a country's bankruptcy codes. In order to investigate the strategic intention to default, the sample of this paper focuses on US public companies, to whom the strategic default option is available due to Chapter 11. Mella-Barral and Perraudin (1997) find that theoretically a large proportion of credit spread is attributed to the debt holders' anticipation of the risk of strategic default when debt holders have very weak bargaining power against shareholders. Empirically, Davydenko and Strebulaev (2007) show that the threat of strategic default is incorporated in credit spreads and that the spreads are larger when shareholders' bargaining power is more likely to be strong. On the other hand, Garlappi and Yan (2011) indicate a hump-shaped relationship between equity risk and default probabilites, implying that shareholders' option to default strategically lowers equity risk when default probabilities become very high.

Strategic options have significant intrinsic value and they are only realised at the time of execution. Miller (1977) states "permitting stockholders to claim court protection and thereby retain control of a corporation in default would amount to giving them a call option at the expense of creditors." Garlappi et al. (2008) show that expected returns, in general, are not positively related to default probability. They argue that the result is consistent with the model that incorporates shareholders' ability to extract value from debt renegotiation. Garlappi and Yan (2011) find that the presence of shareholder recovery upon financial distress alters the risk structure of equity and causes stock returns to be hump-shaped in default probability. Favara et al. (2012) find that the threat of shareholders' strategic default can reduce equity risk, indicating that this strategic default behaviour is priced. Relating the distress risk anomaly to corporate strategic default action explains the seemingly contradictory results[1] on the relationship between distress risk and equity returns. Therefore, the distress risk anomaly is adapted to strategic default

[1]As mentioned in the beginning of Section 2, some studies show a positive relationship between equity returns and distress risk (Vassalou and Xing (2004) and Kapadia (2011)) whereas some evidence suggest that returns are lower in firms with higher distress intensity (Dichev (1998), Griffin and Lemmon (2002), and Campbell et al. (2008)), regarded as the distress risk anomaly.

resulting from the possibility of shareholder recovery upon financial distress.

2.2 Financial Distress and Optimal Capital Structure

The tradeoff theory of capital structure indicates that *firm value* is maximised at the optimal level of capital structure that balances out marginal benefits and marginal costs of debt. Therefore, excessive usage of debt beyond the optimal level leads to a decrease in firm value. In the absence of strategic default, equity risk increases with leverage, leading to a low equity value. However, the strategic default option becomes valuable when a firm is close to bankruptcy. Garlappi and Yan (2011) show that firms with high default probabilities have lower equity betas than those with median default risk, implying that the value of the strategic default option decreases equity risk for those with high default risk. In addition, Favara et al. (2012) document that the strategic behaviour is more pronounced among firms with high leverage ratios and little strategic evidence in low-leveraged firms. Therefore, the strategic default option is not likely to have intrinsic value when default risk is low. Broadie et al. (2007)) find that the strategic default option increases debt capacity because of the ability to avoid inefficient liquidation. Therefore, the default decision is treated as endogenous. The default boundary is chosen by shareholders, which maximises *equity value* at the time of default, unlike the optimal leverage where *firm value* is maximised.

Since equity risk increases with leverage in low-leveraged or low-default-probability firms, the strategic default option does not play a role in equity returns. As financial distress risk increases with leverage, the valuable strategic default option starts to reduce equity risk. As a result, it is possible that companies initially make a firm-value-maximisation decision to benefit all the stakeholders most, choosing the optimal captial structure. However, as they approach financial distress, equity value maximisation becomes the first interest of shareholders at the expense of debt holders. This usually happens when a firm has excessive debt outstanding to repay, i.e. shareholders choose their capital structure beyond the optimal level.

2.3 Strategic Default and Deviation from Optimal Capital Structure

The idea of the strategic default option comes from the possibility of debt renegotiation upon financial distress to recover some of the shareholders' own value. The availability of the strategic default option increases shareholders' expected payoff and reduces equity risk. The presence of such an option relies heavily on a country's bankruptcy law. If a country prevents renegotiation, shareholders are hardly able to appropriate value from debt holders. However, US bankruptcy code Chapter 11 allows a renegotiation, which gives shareholders incentives to utilise the strategic default option. Favara et al. (2012)

find that strategic default has impact on equity risk only in countries where the bankruptcy codes favour debt renegotiations. Garlappi and Yan (2011) document a hump-shaped relationship between equity returns and default probabilities on a sample of US companies. As a result, the strategic default option does have an empirical impact on equity pricing. The choice of the endogenous default threshold *ex post* is to maximise *equity value* (Fan and Sundaresan (2000), Francois and Morellec (2004), and Davydenko and Strebulaev (2007)) whereas optimal capital structure is detemined *ex ante* to maximise *firm value*. Due to the conflict of interest between shareholders and debt holders, the actual capital structure decision may not be in the best interest of all the corporate stakeholders and is instead likely to deviate from its optimal leverage.

Most literature does not distinguish optimal and target capital structure and uses some firms' characteristics as the determinants of capital structure (Fama and French (2002), Leary and Roberts (2005), Uysal (2011), among others). However, optimal capital structure and target capital structure are two different concepts although both of them have the same underlying intuition, the tradeoff theory. Optimal capital structure is selected to maximise firm value whereas target capital structure is determined by firms' characteristics. Some recent studies estimate the optimal capital structure for each firm at which firm value is maximised (Korteweg (2010) and van Binsbergen et al. (2010)). This paper considers deviations from optimal capital structure, not target, since deviation from optimal capital structure lowers firm value and therefore can be regarded as the intention to take advantage of the strategic default option by shareholders. Favara et al. (2012) find that the benefits from debt renegotiation have less impact on reducing equity risk in low-leveraged firms compared with high-leveraged ones. This paper extends their study by investigating whether deviations from optimal capital structure have an impact on reducing equity risk, especially overleverage. In other words, overleveraged firms may be more likely to take advantage of the strategic default option. As a result, the main research question is: Can overleverage (i.e. greater than the optimal level) identify a firm's strategic intention to default?

To answer this question, several sub-questions must necessarily be answered first. The existing literature on strategic default (Garlappi et al. (2008) and Garlappi and Yan (2011)) identifies that the presence of shareholder recovery upon default alters the equity risk structure, and the pattern of equity beta against default probability shows the impact of strategic default on the equity risk structure. Since shareholders' strategic default is a real option, it has all the option properties, such as moneyness. To determine the value of an option, it is necessary to know whether the option is in the money, at the money, or out of the money. The most novel part of this paper is that we treat the point of optimal capital structure as the cutoff point of strategic default option to be at the money. If a firm is overleveraged, it is regarded as in the money; if underleveraged, it is out of the money.

In the Garlappi and Yan (2011) model, with no shareholder recovery as in Figure 1 (a), equity beta increases with default probability. With increasing shareholder recovery in Figure 1 (b), equity beta is hump-shaped responding to default probability. However, Garlappi and Yan (2011) do not discuss the turning point in Figure 1 (b) in any detail. This paper regards the turning point as closely related with optimal capital structure. At the turning point, a firm is optimally levered. Beyond the turning point, a firm is overleveraged, meaning that the firm's excess leverage[2] is greater than zero. Figure 2 assumes that as default probabilities increases, no matter whether there is a shareholder recovery rate or not, the default risk factor loading will always rise with excess leverage in the positive direction.

Two leading factors, market risk and default risk, affect stock returns. For underleveraged firms, these two factors affect share prices in the same direction. However, for overleveraged firms (positive excess leverage), the two factors influence share prices in the opposite directions. The strategic default option adds value to equity and high default risk depresses equity. By combining these two factors, the return pattern for distressed stocks can be resolved. Based on the strategic debt service model, we know at least that equity value is not maximised at the turning point. When firms are playing the strategic game, they are assumed to act in the best interest of shareholders, i.e. equity value maximisation, not firm value maximisation. Hence, we arrive at Hypothesis a:

Hypothesis a *Overlevered firms have lower equity beta than their counterparts.*

H_0: *Excess leverage does not reduce equity beta.*

H_1: *Excess leverage reduces equity beta.*

Favara et al. (2012) suggest that the strategic default impact on equity beta also depends on firm-level strategic factors such as shareholder bargaining power, renegotiation friction, and liquidation cost. Here we come to Hypothesis b:

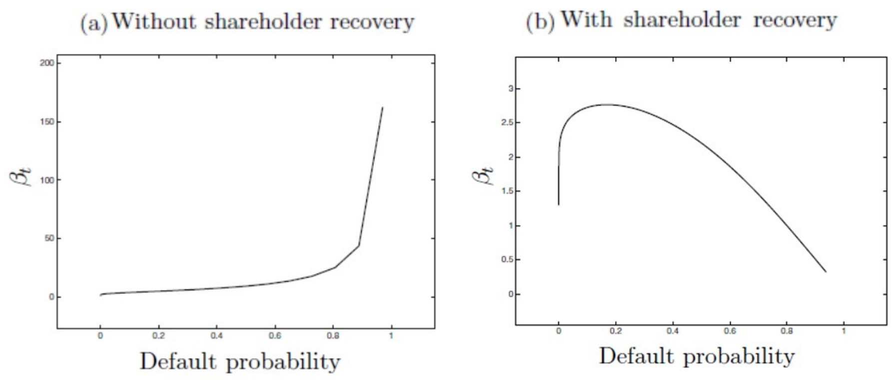
Hypothesis b *Firms with more strategic advantages tend to be overlevered.*

H_0: *Excess leverage is not positively related with firm strategic advantages.*

H_1: *Excess leverage is positively related with firm strategic advantages.*

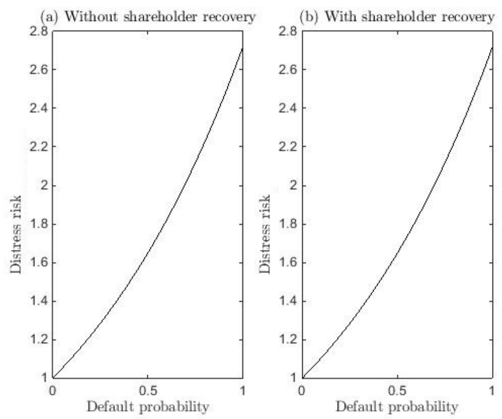
[2] Excess leverage is defined as the actual leverage ratio minus the optimal leverage ratio. Excess leverage is positive when a firm is overleveraged and negative when it is underleveraged.

Figure 1. Equity Beta and Default Probability with Variate Shareholder Recovery



This figure comes from Figure 1 of Garlappi and Yan (2011).

Figure 2. Distressed Risk and Default Probability



We assume that as default probabilities increases, no matter whether there is a shareholder recovery rate or not, the default risk factor loading will always rise with excess leverage in the positive direction.

3 Methodology

This section first presents the pricing model of strategic debt service, followed by the estimations of financial distress risk, optimal capital structure and equity beta. Lastly, some asset pricing tests are addressed.

3.1 Modelling Strategic Default

This paper closely follows the pricing model of strategic debt service as in Favara et al. (2012), which considers liquidation cost, bargaining power, and renegotiation friction as the strategic factors. Davydenko and Strebulaev (2007) also apply the same model to study the strategic factors in relation to credit spread. The model of strategic debt service allows the existence of renegotiation friction[3]. A firm's equity beta can be derived as:

$$\beta_E = 1 + \frac{(1-\tau)\frac{c}{r}}{E} - \frac{(1-\tau)\frac{c}{r}}{E}(\frac{X}{X_S})^{\lambda}, \tag{1}$$

$$X_S = \frac{r-\mu}{r}\frac{\lambda}{\lambda-1}\frac{c}{1-(1-q)\eta\alpha}; \tag{2}$$

$$\lambda = (\frac{1}{2} - \frac{\mu}{\sigma_X^2}) - \sqrt{(\frac{1}{2} - \frac{\mu}{\sigma_X^2})^2 + \frac{2r}{\sigma_X^2}} \tag{3}$$

where τ is the corporate tax rate; c is a perpetual coupon payment; E is the firm's equity value; X is the cash flow from operations, is independent of capital structure choices and follows a geometric Brownian motion with a constant growth rate $\mu_X > 0$ and a constant volatility σ_X,

$$dX_t = \mu X_t dt + \sigma_X X_t dB_t \tag{4}$$

where B_t is a standard Brownian motion;
X_S is the endogenous default boundary; $(\frac{X}{X_S})^{\lambda}$ is the risk-neutral probability of default and renegotiation; α is liquidation cost; η represents shareholders' bargaining power; q stands for renegotiation friction.

Favara et al. (2012) investigate the relationship between the equity beta and liquidation cost, bargaining power, and renegotiation friction both theoretically and empirically. Debt coupon payment c is treated as constant until the firm goes bankrupt. Since deviation from optimal capital structure leads to divergence from the firm value maximisation, this paper examines how equity beta varies with coupon payment (i.e. a firm's debt level) to capture the strategic intention of being overlevered.

3.2 Financial Distress

To measure a firm's financial distress risk, this paper follows the Vassalou and Xing (2004) distance-to-default (DD) method. Many studies regarding default risk apply the same process to evaluate a firm's default probability (Bharath and Shumway (2008), Campbell et al. (2008), Chava and Purnanandam (2010)). Though Vassalou and Xing (2004) and Campbell et al. (2008) employ different default probability measures, they provides the similar results and the correlation between the two default measures is very high (Filipe et al. (2014)).

Following Vassalou and Xing (2004), the Merton (1974) DD is given by:

$$DD_t = \frac{ln(\frac{V_t}{F_t}) + (\mu - \frac{1}{2}\sigma^2)T}{\sigma\sqrt{T}} \tag{5}$$

[3] See Favara et al. (2012) for the detailed model setup of strategic debt service.

and the corresponding expected default frequency (EDF) is expressed as

$$EDF = N(-DD) = N(\frac{ln(\frac{V_t}{F_t}) + (\mu_V - \frac{1}{2}\sigma_V^2)T}{\sigma_V\sqrt{T}}) \tag{6}$$

where V_t is the market value of a firm's underlying assets and follows a geometric Brownian motion with a constant growth rate μ_V and a constant volatility σ_V,

$$dV_t = \mu_V V dt + \sigma_V V dB_t \tag{7}$$

where B_t is a standard Brownian motion;
F_t is the face value of a firm's debt at time t. T is the time to maturity of debt.

A firm's market value of assets and its asset volatility need to be estimated to obtain the DD and EDF. The calculation of σ_V is an iterative procedure. We apply the methodology of Vassalou and Xing (2004) to construct the daily EDF for the entire sample and obtain the monthly average of EDF for each firm[4].

3.3 Optimal Capital Structure

Both van Binsbergen et al. (2010) and Korteweg (2010) estimate an added 5% firm value from using debt although their approaches are different. van Binsbergen et al. (2010) simulate a tax benefit function for each firm from 1980 to 2007 and estimate the optimal level of debt for each firm-year. Korteweg (2010) uses a Bayesian statistical approach to obtain the model-implied optimal leverage for each firm-year on the sample from 1994 to 2004. This paper employs the methodology of Korteweg (2010) because the sample period can be extended as far as the first available year by using the Korteweg (2010) bayesian estimates for the following specification of net benefits of debt relative to total firm value:

$$B_{it}/V_{it}^L = X_{0it}^{'}\theta_0 + (X_{1it}^{'} \cdot L_{it})\theta_1 + (X_{2it}^{'} \cdot L_{it}^2)\theta_2 \tag{8}$$

where B_{it} is the net benefits of leverage; V_{it}^L is the market value of levered firm; vectors X_{0it}, X_{1it}, X_{2it} consist of a number of firm characteristics; θ_0, θ_1, and θ_2 are parameter vectors, which are common to all firms and time-invariant[5].

The model-implied optimal leverage maximises the net benefit of leverage in Equation (8), which is computed for each firm ever year. The parameter vectors θ_0, θ_1, and θ_2 are directly obtained from the Korteweg (2010) estimates of these parameter vectors. The parameter vectors θ_0, θ_1, and θ_2 are common to all companies and time-invariant. Although the sample period of Korteweg (2010) is 1994-2004, the θ parameters can be adapted to any

[4]Please seeVassalou and Xing (2004) for the DD estimation details.
[5]Please refer to Table 3 of Korteweg (2010) for the optimal leverage estimation details.

period as suggested in the Korteweg data website[6]. As a result, the use of the Korteweg (2010) parameter estimates is suitable for any sample period for all the US companies.

3.4 Strategic Default

Equity beta and some firm characteristics are related to evaluating a company's strategic default (Davydenko and Strebulaev (2007), Garlappi and Yan (2011), and Favara et al. (2012)). Garlappi and Yan (2011), in particular, argue a hump-shaped relationship between beta and default probability, suggesting that the presence of the strategic default option plays an important role.

3.4.1 Equity Beta

Equity beta at the firm level is measured in two ways on a firm-month basis using daily stock returns, also employed by Garlappi and Yan (2011):

Firstly, using daily returns for each firm month to obtain monthly conditional beta, is the following equation:

$$r_{it} = \alpha_i + \beta_i r_{mt} \tag{9}$$

where r_{it} is the excess stock return on firm i and r_{mt} is the market excess return on the value-weighted CRSP index[7].

Secondly, using daily returns for each firm-month to obtain a sum of betas, is the following equations:

$$r_{it} = \alpha + \beta_{i1} r_{mt-1} + \beta_{i2} r_{mt} + \beta_{i3} r_{mt+1} \tag{10}$$

$$\beta_i = \sum_{k=1}^{3} \beta_{ik}. \tag{11}$$

Equation (10) includes one-period lead and one-period lag of excess market return besides the current-period excess market return, following Dimson (1979)[8]. The monthly firm equity beta is the sum of all three β_s on the current, one-period lead, and one-period lag of excess market returns as expressed in Equation (11). This paper uses the beta estimates from the first methodology as the main analysis. The Dimson beta estimates are applied

[6] http://www-bcf.usc.edu/~korteweg/datacode.html

[7] Excess stock returns and excess market returns are calculated using 1-month T-bill rate. Both 1-month T-bill rate, excess market return on the value-weighted CRSP, and Fama-French size and value factors are obtained from Kenneth R. French data library: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html.

[8] Scholes and Williams (1977) take multiple lags and leads, which is not necessary in our case, since a single lag and lead remove nonsynchronous trading problem.

for robustness checks.

3.4.2 Firm Strategic Factors

This paper employs Davydenko and Strebulaev (2007) strategic factor proxies to measure the firm shareholders' strategic advantage over debt holders, namely costs of liquidation, shareholders' bargaining power, and renegotiation friction. In addition to these individual strategic factors, we aggregate the effect of all three strategic factors on firm equity beta to examine how equity beta varies with the aggregated strategic advantage. The aggregated variable is constructed as follows.

First, all the sampled firms are ranked annually and individually on each of the three strategic factors. Since Favara et al. (2012) indicate that equity beta is negatively related with liquidation cost and shareholders' bargaining power and increases with renegotiation friction, the effect of liquidation cost and shareholders' bargaining power on equity beta is opposite to the effect of renegotiation friction. The individual effect of each of the strategic factors on equity beta can be ambiguous due to the opposite impact. Moreover, Davydenko and Strebulaev (2007) and Favara et al. (2012) report an interacted effect of liquidation cost, shareholders' bargaining power, and renegotiation friction on strategic default. As a result, a construction of the aggregated effect is necessary to examine how equity beta varies with the total strategic advantage. Second, the aggregated strategic measurement for firm i is defined as: $\text{aggregated strategic advantage}_i = ln(\text{liquidation cost rank}_i * \text{shareholders' bargaining power rank}_i/\text{renegotiation friction rank}_i)$.

4 Data

This paper consists of U.S. public companies that have both stock data in CRSP and accounting records in COMPUSTAT from 1961 to 2014 but excludes financial and regulated utilities companies with SIC between 6000-6999 and 4900-4999, respectively. Stock return files come from CRSP and annual and quarterly accounting data are collected from COMPUSTAT. The main analysis employs the annual financial information. Quarterly financial data, particularly the items *Debt in One Year* and *Long-term Debt*, are used for the estimation of DD and EDF. Firm-year observations with missing values of total asset, total debt and total market value and negative book equity are dropped. Research and development expense is replaced with zero if missing. Stock-month observations with missing values of beta and EDF are dropped. Leverage ratios are bounded between 0 and 1. All the variables are winsorised at 1^{st} and 99^{th} percentiles of their pooled distributions across all firm-year observations and all firm-month observations, respectively[9]. To avoid accounting reporting delays, this paper applies the same approach as in Vassalou and Xing (2004) that accounting data is lagged by four months for annual data type and two months for quarterly data type to align with stock return data[10]. The final baseline sample contains 1,462,659 stock-month observations and 141,277 firm-year observations from January 1961 to December 2014.

In addition, CEO, insiders, and institutional shareholdings are collected from Capital IQ. Since Capital IQ began to maintain institutional ownership data in 2004, the subsample ranges from 2004 to 2014 in order to study the relationship between a firm's overleverage and the strategic advantage. The subsample of shareholdings consists of 16,391 firm-year observations. As an additional examination of a firm's capital structure decision to be overlevered, 109 bankrupt firms from 1990 to 2014 are extracted from the baseline sample. Their financial data, in particular the degree of overleverage, is observed commencing five years before the bankruptcy announcement, resulting in 370 firm-year observations. The corporate bankruptcy information is obtained from Capital IQ, including the filing type and the consequent status[11].

4.1 Variable Measures

A number of variables are chosen to study the strategic intention of a firm being overlevered. First, to estimate firm-year optimal leverage, we use the variables by Korteweg (2010) to obtain the model-implied optimal leverage. Second, equity beta and DD (or EDF) are estimated on the stock returns. Third, this paper follows Davydenko and Strebulaev (2007)'s empirical proxies for strategic factors. A list of these variables are presented in Table 1 and detailed below.

4.2 Summary Statistics

Table 2 presents summary statistics on all the variables that are used throughout the paper. Panel A gives the statistics of the entire sample on a firm-month basis including the monthly beta and EDF; and Panel B shows the statistics on the subsample with share ownerships information on a firm-year basis.

In the unreported correlation table, the correlation between the optimal leverage and the

[9]We follow Campbell et al. (2008) for the winsoring procedure, except that we use 1^{st} and 99^{th} percentiles as this is sufficient to remove outliers.

[10]The SEC deadlines for filing periodic reports: 90 days after the end of the fiscal year for 10-K annual reports and 45 days after the end of the fiscal quarter for 10-Q quarterly reports.

[11]The status is classified into 'Announced', 'Case Consolidated', 'Dismissed', 'Emerged/Reorganised', and 'Liquidated/Out of Business'.

actual leverage is 0.09 at a 5% significance level despite the small magnitude. A firm's capital structure decision is positively related with the optimal level of debt, i.e. when managers are making decisions on capital structure, they take the firm value maximisation objective into account. However, the correlation between the optimal leverage and the excess leverage is relatively negatively high (-0.30) at a 5% significance level, implying that firms with high optimal leverage are less likely to be overleveraged. Consistent with the previous literature (for example, Broadie et al. (2007)), the optimal leverage implies a firm's debt capacity, and firms with more debt capacity are able to borrow more and are less likely to overleverage themselves. On the other hand, the actual leverage is positively related with the excess leverage (0.92) at a 5% significance level. Ideally, firms should stay at the optimal level of capital structure whereas the positive relationship between the actual leverage and the excess leverage suggests that the actual leverage may be endogenously determined by the company, which leads to deviation from the optimum to maximise firm value.

Table 1. Variables Description

This table outlines the variables used in the analysis.

Variable Name	Application	Description	Data Source
Leverage	Optimal Leverage	Net debt/(Net debt + Market equity).	COMPUSTAT
Profitability	Optimal Leverage	EBITDA/Sales.	COMPUSTAT
Depreciation	Optimal Leverage	Depreciation expense/Total assets.	COMPUSTAT
Tangibility	Optimal Leverage	Net PPE/Total assets.	COMPUSTAT
Growth	Optimal Leverage	Market-to-book of equity.	COMPUSTAT
Size	Optimal Leverage	Log(Total assets).	COMPUSTAT
Volatility	Optimal Leverage	Std.Dev.$\{(\text{Profitability}_t/\text{profitability}_{t-1})\}$.	COMPUSTAT
Optimal leverage	Optimal Leverage	Model-implied optimal leverage.	Korteweg (2010) Bayesian estimation model
DD	Financial distress	Distance to default, estimated from Merton (1974) option model.	COMPUSTAT, CRSP
EDF	Financial distress	Expected default frequency, defined as N(-DD).	COMPUSTAT, CRSP
Beta	Equity beta	Estimated from CAPM using daily stock returns.	CRSP
Nonfixed assets	Costs of liquidation	1 - Net PPE/Total assets.	COMPUSTAT
R&D expense	Costs of liquidation	R&D/Total investments.	COMPUSTAT
CEO shareholdings	Shareholders' bargaining power	Proportion of shares held by CEO.	Capital IQ
Insider shareholdings	Shareholders' bargaining power	Proportion of shares held by insiders.	Capital IQ
Filpped HHI	Renegotiation frictions	1 - Herfindahl index of institutional shareholders; $\textit{Herfindahl index}_i = \sum_j S_{ij}^2/(\sum_j S_{ij})^2$, where S_{ij} is the proportion of shares held by the jth institutional shareholder of firm i.	Capital IQ
Short-term debt	Renegotiation frictions	Short-term debt/Total debt.	COMPUSTAT
ln(ME)	Control variable	Log(Market equity).	COMPUSTAT

Table 2. Summary Statistics

This table reports summary statistics of 1,462,659 firm-month observations in Panel A and 16,391 firm-year observations in Panel B. Panel A covers the entire sample from 1961 to 2014 and Panel B selects the subsample with share ownership information from Capital IQ, ranging from 2004 to 2014. Definitions of all variables are listed in Table 1. Optimal leverage and excess leverage have the SIC and FF brackets, standing for the estimation of optimal leverage based on two-digit SIC and Fama-French 48 industries classifications, respectively.

Panel A: The Entire Sample

Variable	Mean	Median	Std.Dev.	Min	Max	N
Leverage	0.365	0.253	0.355	0	1	1,462,659
Profitability	0.091	0.105	0.264	-1	1	1,462,659
Depreciation	0.046	0.038	0.035	0	0.251	1,462,659
Tangibility	0.319	0.270	0.222	0	1	1,462,659
Size	5.051	4.831	2.239	-1.802	13.590	1,462,659
Volatility	0.495	0.299	0.533	0	9.012	1,462,659
Optimal leverage (SIC)	0.173	0.162	0.143	0	1	1,462,659
Optimal leverage (FF)	0.189	0.163	0.163	0	1	1,462,659
Excess leverage (SIC)	0.193	0.065	0.371	-1	1	1,462,659
Excess leverage (FF)	0.176	0.052	0.376	-1	1	1,462,659
Intangibility	0.682	0.730	0.222	0	1	1,462,659
Market-to-book	1.385	0.982	1.333	0	10.564	1,462,659
R&D	1.458	0	5.912	0	59.181	1,462,659
Short-term debt	0.309	0.183	0.319	0	1.000	1,462,659
ln(ME)	4.724	4.515	2.418	-4.308	13.139	1,462,659
Beta	0.804	0.742	1.178	-2.789	4.532	1,462,659
EDF	0.074	0.000	0.194	0	0.952	1,462,659

Panel B: The Shareholdings Subample

Variable	Mean	Median	Std. Dev.	Min	Max	N
Leverage	0.178	0.094	0.225	0	1	16,391
Profitability	0.084	0.113	0.310	-1	1	16,391
Depreciation	0.044	0.037	0.032	0	0.251	16,391
Tangibility	0.272	0.191	0.240	0	1	16,391
Size	6.560	6.611	2.049	1	13.590	16,391
Volatility	0.480	0.288	0.503	0	6.017	16,391
Optimal leverage (SIC)	0.154	0.141	0.137	0	1	16,391
Optimal leverage (FF)	0.165	0.139	0.157	0	1	16,391
Excess leverage (SIC)	0.024	-0.006	0.234	-0.719	1	16,391
Excess leverage (FF)	0.013	-0.015	0.242	-0.896	1	16,391
Intangibility	0.728	0.809	0.240	0	1	16,391
Market-to-book	1.587	1.210	1.276	0	10.564	16,391
R&D	2.933	0	9.186	0	59.181	16,391
Short-term debt	0.245	0.096	0.315	0	1	16,391
ln(ME)	6.530	6.564	2.110	0.105	13.131	16,391
Flipped HHI	0.889	0.946	0.143	0	0.988	16,391
Insider shareholdings (%)	10.161	3.250	14.767	0	100	16,391
CEO shareholdings (%)	2.571	0.026	8.154	0	100	16,391

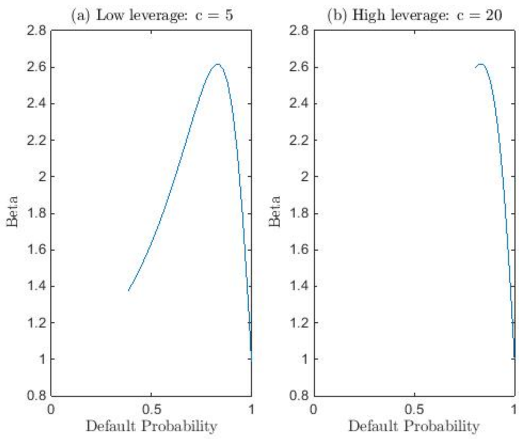
5 Analysis of Results

This section first outlines the simulated results from the strategic default model and then discusses the empirical results on the hypotheses in detail.

5.1 Model Predictions

Section 3.1 describes the strategic default model with liquidation cost, shareholders' bargaining power, and renegotiation friction. Previous literature on strategic default studies how the equity beta behaves against default probability in relation to liquidation cost, shareholders' bargaining power, and renegotiation friction but does not consider how equity beta varies with leverage. This paper aims to investigate the strategic intention regarding the capital structure decision. Applying Equations (1) to (2), Figure 3 shows the relationship between equity beta and default probablity with constant leverage and variant strategic advantages as suggested by previous studies (Garlappi and Yan (2011) and Favara et al. (2012)). When a firm's leverage ratio is low, shown in graph (a) of

Figure 3. Equity Beta and Default Probability with Variate Leverage

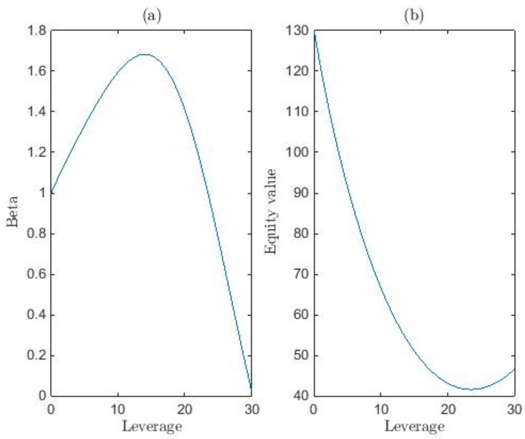


This figure reports equity beta as a function of default probability. Equity beta and default probability are calculated according to Section 3.1. The parameters used for the graphs are: $\mu = 0.01$, $\sigma = 0.4$, $r = 0.06$, $\tau = 0.35$, $q = 0.5$, $\alpha = 0.5$, $\eta = 0.5$, $c = 5$ for (a) and $c = 20$ for (b). X ranges from 0 to 10.

Figure 3, it shows a hump-shaped relation between equity beta and default probability as firm cash flow varies. As leverage rises to a high level, shown in graph (b) of Figure 3, the hump-shaped relation disappears and equity beta continuously decreases with default probabilities. Both scenarios suggest that the presence of the strategic default option begins to play a role in reducing equity beta as default probability increases. The value of strategic default option is more pronounced in high-leveraged firms whereas the strategic default option for low-leveraged firms does not carry value with sufficient cash flows and therefore low default probabilities (i.e. Equity beta increases with default probabilites at the low-level default probabilitiies.).

Figure 4 reports the hump-shaped relationships between equity beta and leverage, and equity value and leverage, suggesting that equity beta starts falling as leverage increases. The hump shape between equity beta and leverage implies that a firm may have an optimal leverage ratio to reach the maximum equity beta and thereafter equity beta starts to decrease. In a general context of capital structure, equity beta always increases with financial leverage. The tradeoff theory suggests that firm value is maximised at the optimal level of leverage. The strategic default implies that shareholders choose an endogenous default threshold upon bankruptcy to maximise their own value at the expense of debt holders and therefore reduce equity risk, i.e. equity beta in this case. The hump-shaped relationship between equity beta and leverage strongly supports the main hypothesis in this paper - a company's decision to be overleveraged can serve to identify the strategic intention to default.

Figure 4. Leverage in Relation with Equity Beta and Equity Value



This figure reports equity beta as a function of leverage in (a) and equity value as a function of leverage in (b). Equity beta and equity value are calculated according to Section 3.1. The parameters used for the graphs are: $\mu = 0.01$, $\sigma = 0.4$, $r = 0.06$, $\tau = 0.35$, $q = 0.2$, $\alpha = 0.5$, $\eta = 0.8$, $X = 10$. c ranges from 0 to 30.

5.2 Empirical Results

5.2.1 Equity Beta and Overleverage

A. The Effects of Overleverage and the Bankruptcy Reform

Using univariate t-tests, this paper compares equity beta for overlevered firms with their counterparts on various sorting groups: EDF-decile, excess leverage-decile, leverage-decile, and optimal leverage-decile respectively, to test hypothesis a - whether overleveraged firms have lower equity beta than their counterparts. A significant difference in the equity beta would suggest that overleverage may identify the strategic intention to default.

Table 3 reports how equity beta varies with default probability. All the stocks are sorted into deciles at the end of each month according to the monthly average of EDF for each firm. Stocks are also identified according to whether the corresponding firm is overleveraged or not, and the results of equity betas are presented in Panel A. In addition, the 1978 Bankruptcy Reform Act becomes more favourable to shareholders in reorganisation at bankruptcy. The effect of the bankruptcy reform on equity beta is reported in Panel B. Prior to 1979[12], shareholders were in a weak position regarding reorganisation and therefore overleverage may not be a strategic action by the company. The difference in the equity beta between overleveraged firms and their counterparts may not be significant. Therefore, Panel C of Table 3 shows the interacted effect of overleverage and the bankruptcy reform on equity beta.

As Panel A Table 3 shows, the equity beta displays a hump shape in default probability measured by EDF, consistent with the findings of Garlappi and Yan (2011) that document equity beta in a quadratic relation with default probability. Equity beta increases up to the 5th EDF decile (decile mean = 0.871) and declines afterward. After separating the sample into overlevered and non-overlevered firms, the hump-shaped relation between equity beta and default probability persists in each group. In each decile, equity betas for overlevered firms are consistently significantly lower than their counterparts from the lowest decile (Dif. = 0.165, t-statistic = 32.917) to the 8th decile (Dif. = 0.018, t-statistic = 2.249). Although the 9th and 10th deciles (Dif. = -0.014 and -0.009, t-statistic = -1.422 and -0.769, respectively) exhibit the opposite sign in the difference in equity beta between overlevered and non-overlevered firms, both the magnitude and significance are weak. The opposite results on the 9th and 10th deciles suggest that with high default probabilities the strategic default option for overleveraged firms is not as valuable as those overlevered but with relatively low default probabilities. This may be due to the fact that the value of the strategic default option also depends on the extent to which the firm holds the strategic advantage over its debt holders.

Panel B Table 3 presents the effect of the 1978 Bankruptcy Reform Act on equity beta. The bankruptcy reform significantly reduces the equity beta for stocks with relatively high default probabilities, as the reform gives the shareholders of distressed companies renegotiation advantages in a more favourable way.

The interacted effect of the bankruptcy reform and overleverage on equity beta in relation with default probability is presented in Panel C Table 3. For the overleveraged firms, the reform effect consistently shows that the value of the strategic default option from

[12]The 1978 Bankruptcy Reform Act came into effect on October 1, 1978. As a result, the calender year 1979 is treated as the cut-off year to examine the impact of the bankruptcy.

Chapter 11 reduces equity risk with a strong overall t-statistic of 57.791. On the other hand, the strategic default option of Chapter 11 from the reform has a reduced pricing impact on the non-overlevered firms with an overall t-statistic of 1.653.

B. Actual Leverage, Optimal Leverage, and Excess Leverage

Stocks are sorted into deciles according to actual leverage, optimal leverage, and excess leverage, respectively. For each individual decile sorting, the averages of beta, excess leverage, optimal leverage, actual leverage, and EDF in each decile group are reported in Table 4.

In Panels A and C of Table 4, actual leverage and excess leverage sortings display similar patterns to equity beta and EDF, respectively, as the decile increases. Equity beta is hump-shaped in both actual leverage and excess leverage. It increases until the 3rd decile of both actual leverage and excess leverage sortings (Beta = 0.8681 and 0.8786, respectively) and drops afterward. EDF consistently increases in both sortings as the decile increases. In addition, the averages of excess leverage in actual leverage sorting and actual leverage in excess leverage sorting move together and increase monotonically from the lowest decile to the highest decile(the former from -0.076 to 0.676 and the latter from 0.156 to 0.849). This highly consistent result in both sortings is likely due to the fact that the correlation between actual leverage and excess leverage is significantly high (Corre.Coef. = 0.902 in the unreported correlation table). On the other hand, the variations of optimal leverage among the deciles are not monotonic with the increase in either actual leverage or excess leverage. The correlations of optimal leverage with actual leverage and excess leverage, respectively, are relatively low compared with the correlation between actual leverage and excess leverage, suggesting that the capital structure decision may be endogenously determined by the managers to maximise shareholders' value at the expense of debt holders, i.e. managers act in the best interest of shareholders. As Panel B of Table 4 shows, the variation patterns of equity beta, excess leverage, actual leverage, and EDF in relation to optimal leverage are ambiguous. As a result, the value of the strategic default option largely depends on the actual capital decision, not optimal capital structure that maximises firm value. The companies' endogenous capital structure decisions, especially those being overleveraged, imply the valuable strategic default option.

Panels A and C further suggest that on average equity beta starts to decrease when the firm becomes overlevered. Equity beta reaches the maximum at the 3rd decile in both sortings. Meanwhile, the decile averages of excess leverage in Panels A and C respectively, change from negative at the 3rd decile (-0.024 for actual leverage sorted and -0.029 for excess leverage sorted) to positive at the 4th decile (0.005 for actual leverage sorted and 0.032 for excess leverage sorted). This finding is in accordance with the model predictions shown in Figure 4 and supports the conjecture shown by Figures 1 and 2. The strategic

Table 3. Overleverage Effect and the Bankruptcy Reform Effect on Equity Beta

This table reports the effects of overleverage and the bankruptcy reform on equity beta according to EDF decile. Panel A gives the results on the differences in equity beta between underlevered and overlevered firms. Panel B shows the bankruptcy reform effect on equity beta. The joint effect of firms' overleverage and the bankruptcy reform is presented in Panel C. The overleverage measurement is based on Fama-French 48 industry classification.

EDF decile	Low 1	2	3	4	5	6	7	8	9	High 10	Total
					Panel A: Overleverage Effect						
All firms											
Beta	0.705	0.793	0.827	0.856	0.871	0.869	0.854	0.813	0.764	0.686	0.804
Underlevered firms											
Beta	0.741	0.849	0.898	0.926	0.932	0.917	0.880	0.827	0.753	0.679	0.850
Overlevered firms											
Beta	0.576	0.660	0.718	0.779	0.821	0.840	0.843	0.809	0.767	0.688	0.768
Dif. Beta	0.165	0.189	0.180	0.147	0.111	0.077	0.037	0.018	-0.014	-0.009	0.082
t-stat	32.917	37.655	35.399	27.441	19.275	12.210	5.236	2.249	-1.422	-0.769	41.821
					Panel B: The Bankruptcy Reform Effect						
Before the reform											
Beta	0.653	0.768	0.818	0.879	0.932	0.967	0.972	0.945	0.908	0.774	0.862
After the reform											
Beta	0.729	0.805	0.832	0.845	0.843	0.824	0.800	0.753	0.699	0.647	0.778
Dif. Beta	-0.077	-0.037	-0.013	0.034	0.089	0.143	0.172	0.192	0.208	0.127	0.084
t-stat	-17.068	-7.423	-2.480	5.916	14.543	21.853	24.664	25.686	25.699	14.089	40.188
					Panel C: The Joint Effect of Overleverage and the Bankruptcy Reform						
Overlevered firms before the reform											
Beta	0.610	0.703	0.759	0.848	0.907	0.951	0.972	0.949	0.915	0.787	0.865
Overlevered firms after the reform											
Beta	0.536	0.618	0.683	0.726	0.761	0.767	0.762	0.726	0.685	0.636	0.705
Dif. Beta	0.075	0.085	0.076	0.122	0.146	0.184	0.210	0.222	0.230	0.151	0.160
t-stat	8.216	10.460	10.314	16.739	19.891	24.579	27.067	27.393	26.580	15.522	57.791
Underlevered firms before the reform											
Beta	0.678	0.823	0.898	0.939	0.998	1.029	0.976	0.916	0.819	0.604	0.855
Underlevered firms after the reform											
Beta	0.762	0.857	0.898	0.922	0.916	0.893	0.863	0.813	0.744	0.691	0.849
Dif. Beta	-0.084	-0.034	0.000	0.016	0.082	0.136	0.114	0.103	0.075	-0.087	0.006
t-stat	-15.668	-5.209	0.020	1.702	7.125	9.631	6.548	4.888	2.782	-3.198	1.653

Table 4. Leverage, Optimal leverage, and Excess Leverage Sortings

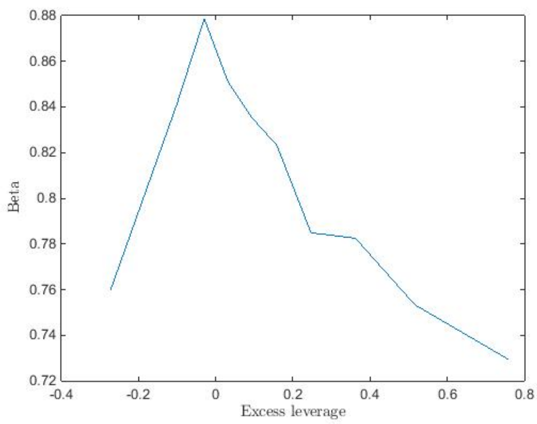
This table presents the variations in equity beta, excess leverage, optimal leverage, leverage, and EDF across decile groups according to leverage in Panel A, optimal leverage in Panel B, and excess leverage in Panel C, respectively. The overleverage measurement is based on Fama-French 48 industry classification.

	Low 1	2	3	4	5	6	7	8	9	High 10	Total
					Panel A: Sorted by Leverage						
Beta	0.844	0.862	0.868	0.835	0.813	0.802	0.772	0.761	0.737	0.746	0.804
Excess leverage	-0.076	-0.051	-0.024	0.005	0.060	0.127	0.228	0.335	0.485	0.676	0.176
Optimal leverge	0.145	0.152	0.160	0.183	0.198	0.211	0.214	0.217	0.207	0.202	0.189
Leverage	0.069	0.100	0.137	0.188	0.257	0.338	0.442	0.552	0.692	0.877	0.365
EDF	0.028	0.027	0.030	0.034	0.042	0.057	0.080	0.110	0.152	0.180	0.074
					Panel B: Sorted by Optimal Leverage						
Beta	0.768	0.792	0.816	0.843	0.851	0.836	0.801	0.774	0.769	0.790	0.804
Excess leverage	0.352	0.335	0.285	0.221	0.190	0.164	0.136	0.111	0.071	-0.100	0.176
Optimal leverge	0.009	0.034	0.076	0.116	0.149	0.178	0.209	0.250	0.324	0.544	0.189
Leverage	0.360	0.369	0.361	0.337	0.339	0.343	0.345	0.361	0.395	0.444	0.365
EDF	0.131	0.112	0.089	0.068	0.058	0.051	0.048	0.050	0.061	0.069	0.074
					Panel C: Sorted by Excess Leverage						
Beta	0.760	0.841	0.879	0.851	0.836	0.823	0.785	0.783	0.753	0.729	0.804
Excess leverage	-0.272	-0.101	-0.029	0.032	0.093	0.159	0.247	0.362	0.516	0.758	0.176
Optimal leverage	0.428	0.246	0.203	0.173	0.149	0.130	0.161	0.162	0.145	0.091	0.189
Leverage	0.156	0.145	0.174	0.205	0.242	0.289	0.408	0.524	0.661	0.849	0.365
EDF	0.030	0.021	0.026	0.031	0.042	0.054	0.077	0.103	0.148	0.206	0.074

default option starts to reduce equity risk when the firm becomes overleveraged. In other words, the strategic default option is more valuable when a firm is overleveraged than otherwise. Previous studies on the strategic default do not consider the deviation from the optimal capital structure, defined as excess leverage in this paper. Favara et al. (2012) document that the strategic default option does not affect the risk structure of equity for low-leveraged firms as much as that for high-leveraged firms. Without the measure of the deviation from the optimal leverage, the reason why equity beta starts to decrease in the 4th decile as Panels A and C of Table 4 show (Beta = 0.835 and 0.851, respectively) cannot be identified. However, excess leverage captures the turning point of equity beta in both actual leverage and excess leverage sortings. For underleveraged firms, the equity beta increases with the excess leverage. On the other hand, for overleveraged firms, the equity beta decreases as the excess leverage rises. The nonlinear relationship between equity beta and excess leverage is described in Figure 5 according to the decile averages of equity beta and excess leverage in Panel C Table 4.

The quadratic shape of equity beta in relation to excess leverage implies that the presence of the strategic default option reduces equity beta when firms are overleveraged. In other words, a firm's option to default strategically, as a real option, is in the money when the firm is overleveraged. The strategic default option does not have a pricing effect on equity risk for the underleveraged firms, i.e. out of the money. As a result, excess leverage, the measure of deviation from optimal capital structure, sets the benchmark of the value of the strategic default option.

Figure 5. Excess Leverage and Equity Beta



This figure shows equity beta as a quadratic function of excess leverage according to Panel C Table 4.

C. Strategic Default and Financial Distress on Equity Returns

The financial distress anomaly can be reconciled within the context of the strategic default option (Garlappi and Yan (2011)). As default probability increases, equity beta exhibits a hump shape due to the presence of shareholders' recovery upon financial distress. Consequently, distressed stocks have low equity returns because of the low equity betas. According to this argument, overlevered firms have lower equity betas than their counterparts as shown in Table 3 and therefore would also have lower equity returns. However, Table 5 reports the seemingly contradictory results in return difference between overlevered and non-overlevered firms according to the EDF-sorted deciles.

Overlevered firms in Panel B consistently have lower equity betas than their counterparts in Panel A throughout the EDF deciles. Stock excess returns, on the other hand, are higher for the overlevered firms than for the non-overlevered firms from the 4th EDF decile (Dif. Exret = -0.003, t-statistic = -4.603) to the 9th EDF decile (Dif. Exret = -0.001, t-statistic = -0.906), which is hard to explain under the theory of strategic default (Garlappi et al. (2008) and Garlappi and Yan (2011)). Although the strategic default option can reduce the riskiness of equity as default probability increases, financial distress risk also rises accordingly. The impact of the strategic default option on decreasing equity returns may be offset by the impact of the increasing financial distress risk on increasing equity returns[13]. As a result, as default probability rises, the change of stock returns may depend on whether the strategic default option or financial distress risk dominates equity returns. To examine the joint effect of the strategic default option, reflected in equity beta, and financial distress risk, we construct a variable $Beta * EDF$, the natural logarithm of the interaction of equity beta and EDF, implying that a large value of

[13]Some studies find that investors are compensated with high stock returns for bearing additional financial distress risk (Vassalou and Xing (2004), Chava and Purnanandam (2010), and Kapadia (2011)).

Table 5. Excess Leverage, Equity Beta, and Financial Distress Risk on Stock Returns

This table shows the results on the differences between underlevered and overlevered firms in stock excess return, equity beta, EDF, and the interaction term of equity beta and EDF, $Beta * EDF$ across the EDF-sorted deciles. $Beta * EDF$ is calculated for each firm-month observation and the average of each decile is reported. The overleverage measurement is based on Fama-French 48 industry classification.

EDF decile	Low 1	2	3	4	5	6	7	8	9	High 10	Total
Underlevered firms											
Excess return	0.016	0.017	0.017	0.014	0.013	0.011	0.007	0.003	-0.004	-0.014	0.012
Beta	0.741	0.849	0.898	0.926	0.932	0.917	0.880	0.827	0.753	0.679	0.850
EDF	$1.42*10^{-10}$	$5.49*10^{-7}$	$2.68*10^{-5}$	$3.11**10^{-4}$	0.002	0.006	0.016	0.045	0.133	0.532	0.030
Beta*EDF	-61.341	-49.763	-36.240	-25.800	-18.727	-13.488	-9.547	-6.358	-3.714	-1.395	-27.921
Overlevered firms											
Excess return	0.015	0.017	0.016	0.017	0.015	0.013	0.010	0.005	-0.003	-0.021	0.005
Beta	0.576	0.660	0.718	0.779	0.821	0.840	0.843	0.809	0.767	0.688	0.768
EDF	$2.8*10^{-10}$	$1.11*10^{-6}$	$5.19*10^{-5}$	0.001	0.002	0.008	0.022	0.056	0.152	0.501	0.107
Beta*EDF	-63.511	-49.698	-34.529	-24.162	-17.392	-12.543	-8.874	-6.003	-3.632	-1.707	-14.309
Dif. Excess return	0.001	$1.47*10^{-4}$	$1.58*10^{-4}$	-0.003	-0.003	-0.002	-0.004	-0.002	-0.001	0.007	0.006
t-stat	2.152	0.221	0.231	-4.603	-3.663	-2.667	-3.850	-2.058	-0.906	4.370	22.977
Dif. Beta	0.165	0.189	0.180	0.147	0.111	0.077	0.037	0.018	-0.014	-0.009	0.082
t-stat	32.917	37.655	35.399	27.441	19.275	12.210	5.236	2.249	-1.422	-0.769	41.821
Dif. EDF	$-1.38*10^{-10}$	$-5.6*10^{-7}$	$2.51*10^{-5}$	$2.24*10^{-4}$	-0.001	-0.002	-0.006	-0.011	-0.020	0.031	-0.077
t-stat	-3.609	-8.231	-13.134	-14.473	-13.204	-15.385	-17.800	-16.768	-15.797	14.313	-243.176
Dif. Beta*EDF	2.170	-0.065	-1.711	-1.638	-1.334	-0.945	-0.673	-0.356	-0.082	0.312	-13.612
t-stat	8.996	-0.510	-18.104	-23.745	-24.976	-22.129	-18.499	-10.614	-2.406	7.929	-363.452

$Beta*EDF$ can be caused by either large equity beta or large EDF (or both). Since EDF can be regarded as the financial distress risk factor loading (see for example Vassalou and Xing (2004)), a large EDF indicates high financial distress risk and therefore a high equity return. Meanwhile, equity beta reduces as EDF rises because of the value of the strategic default option, suggesting a low equity return. Therefore, a large $Beta * EDF$ implies a high equity return, which incorporates the benefit of the strategic default option and financial distress risk.

When taking financial distress risk into account, overleveraged firms have not only lower equity betas but also higher distress risk of 0.107, measured by EDF, compared with distress risk for non-overleveraged firms (EDF = 0.030 with a t-statistic of -243.176). As a result, overleveraged firms with low equity risk do not earn low equity returns because they have higher financial distress risk than their counterparts. $Beta * EDF$ captures the net effect of strategic default and financial distress risk. In the 1st EDF decile, the difference in $Beta * EDF$ between non-overleveraged and overleveraged firms is 2.170 with a t-statistic of 8.996. The difference in excess stock returns in the 1st decile is also significantly positive at 0.0014 with a t-statistic of 2.152. The return differences between non-overleveraged and overleveraged firms in the 2nd and 3rd deciles are not significant as shown in Table 5 despite higher $Beta*EDF$ for overleveraged firms. From the 4th decile to the 9th decile, overleveraged firms have higher $Beta * EDF$ than non-overleveraged firms and therefore earn higher excess returns. In the highest EDF decile, because non-overleveraged firms have higher $Beta * EDF$ (Dif. $Beta * EDF$ = 0.312, t-statistic = 7.929), they have higher excess returns (Dif. Exret = 0.0072, t-statistic = 4.3697).

5.2.2 Overleverage and Strategic Advantages

The subsample with available corporate share ownership data tests hypothesis b, consisting of 16,391 firm-year observations. Firms are sorted into deciles according to *Nonfixed assets*, *CEO share ownership*, *1 - Herfindahl index of institutional ownership* and the aggregated strategic advantage *Aggregated Advantage* as discussed in section 3.4.2, respectively. The individual impact of each strategic factor and the aggregated strategic advantage influence on equity beta and excess leverage are shown in Table 6.

Panels A to C report the variations of *Nonfixed assets*, *CEO share ownership*, and *1 - Herfindahl index of institutional ownership*, respectively, across the decile groups. Neither equity beta nor excess leverage varies monotonically as the decile rises from low to high according to each strategic factor. This implies that the shareholders' strategic factors have a joint effect on equity beta and excess leverage. The results are consistent with the findings of Davydenko and Strebulaev (2007) and Favara et al. (2012) that the strategic factors are inter-related when determining the sensitivity to strategic actions. As a result, the aggregated strategic advantage *Aggregated Advantage* measures just such an interacted relationship. In panel D of Table 6, the overall variation patterns of equity beta and excess leverage are monotonically decreasing and increasing respectively, as the decile of *Aggregated Advantage* rises from the lowest decile to the highest decile. The monotonic decline in equity beta is consistent with the findings of Favara et al. (2012) that the value of the strategic default option is reflected in the equity beta and depends on strategic factors such as costs of liquidation, shareholders' bargaining power, and renegotiation friction. Furthermore, the relationship between excess leverage and the aggregated strategic advantage suggests that strategic default positively affects the overleverage decision, i.e. overleverage can identify the strategic intention of bankruptcy announcements.

The multivariate analysis applies the Fama-MacBeth regression to test whether the advant -ageous proxies in strategic default increase a firm's propensity to be overlevered (and degree of overleverage). The independent variables are the strategic advantage proxies and some firm characteristics such as firm size and market-to-book are controlled. Table 7 presents the regression results of excess leverage on strategic advantage variables. *Nonfixed assets*, *CEO share ownership*, and *1 - Herfindahl index of institutional ownership* are the

Table 6. Equity Beta, Excess Leverage, and Strategic Advantages

This table presents the variations in equity beta and excess leverage across decile groups according to nonfixed assets, CEO shareholdings, flipped HHI, and aggregated strategic advantage. The results are based on the shareholdings subsample from 2004 to 2014. Flipped HHI is 1 - Herfindahl index of institutional shareholdings. Aggregated strategic advantage is measured by aggregated strategic advantage$_i$ $= ln$(liquidation cost rank$_i$ $*$ shareholders' bargaining power rank$_i$/renegotiation friction rank$_i$). The overleverage measurement is based on Fama-French 48 industry classification.

	Low 1	2	3	4	5	6	7	8	9	High 10	Total
Panel A: Sorted by Nonfixed Assets											
Beta	1.082	1.085	1.074	1.085	1.091	1.091	1.023	1.067	1.036	1.042	1.067
Excess leverage	-0.152	-0.008	0.033	0.032	0.034	0.031	0.038	0.050	0.039	0.076	0.017
Panel B: Sorted by CEO Shareholdings											
Beta	1.072	1.065	1.026	1.045	1.063	1.095	1.183	1.139	1.032	0.954	1.067
Excess leverage	0.032	0.030	0.016	0.012	0.010	-0.002	-0.002	0.013	0.021	0.042	0.017
Panel C: Sorted by Flipped HHI											
Beta	0.580	0.675	0.871	1.134	1.271	1.278	1.295	1.258	1.181	1.132	1.067
Excess leverage	0.095	0.074	0.030	0.030	0.020	0.014	0.004	-0.004	-0.027	-0.063	0.017
Panel D: Sorted by Aggregated strategic advantage											
Beta	1.198	1.202	1.160	1.139	1.119	1.101	1.149	1.022	0.921	0.665	1.067
Excess leverage	-0.085	-0.038	-0.010	0.008	0.011	0.033	0.026	0.050	0.072	0.106	0.017

strategic proxies for liquidation cost, shareholders' bargaining power, and renegotiation frictions, respectively, as the base specification.

Table 7. Regressions for Excess Leverage and Strategic Advantages

This table reports the pooled OLS results for the shareholdings subsample from 2004 to 2014. Excess leverage is the dependent variable. The overleverage measurement is based on Fama-French 48 industry classification. t-stats are reported in brackets. ***, **, and * signify results significant at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Market-to-book	-0.042***	-0.042***	-0.046***	-0.038***	-0.045***
	[-8.009]	[-7.837]	[-8.673]	[-7.263]	[-8.461]
Size	0.006***	0.007***	-0.006***	0.001	-0.004***
	[6.493]	[7.762]	[-7.871]	[1.254]	[-5.312]
Nonfixed assets	0.267***	0.270***	0.264***		0.268***
	[12.391]	[12.667]	[13.033]		[13.416]
R&D				0.0005685*	
				[1.947]	
CEO shareholdings	0.0004998**		0.0009082**		
	[2.300]		[2.895]		
Insider shareholdings		0.0007401***		0.0004474*	0.0010891***
		[3.756]		[2.140]	[4.541]
Flipped HHI	-0.285***	-0.281***		-0.240***	
	[-21.055]	[-20.458]		[-13.470]	
Short-term debt			-0.033***		-0.033***
			[-5.027]		[-5.198]
Constant	0.094**	0.073*	-0.066**	0.267***	-0.092***
	[2.657]	[2.047]	[-2.335]	[10.853]	[-3.197]
Observations	16,391	16,391	16,391	16,391	16,391
R-squared	0.141	0.143	0.123	0.066	0.126

Hypothesis b states that firms with more strategic advantages tend to be overlevered, implying excess leverage in positive relationships with liquidation costs and shareholders' bargaining power, respectively, and in a negative relationship with renegotiation frictions. The regression results in Table 7 support hypothesis b. All the coefficients on the strategic proxies have their expected signs and also show the statistical significance. Column (1) shows the results for the base specification. The coefficient on *Nonfixed assets* (Coef. = 0.267), a proxy for liquidation costs, is positive and highly statistically significant (t-statistic = 12.391). This implies that firms with high liquidation costs tend to be overleveraged to extract the value from their debt holders. The results are aligned with the findings of credit spread (Davydenko and Strebulaev (2007)) and equity beta (Favara et al. (2012)) on the strategic default behaviour that high liquidation costs imply a strong strategic advantage for shareholders. *CEO share ownership*, that represents the equity's bargaining power, is 0.0004998 with a t-statistic of 2.300. It suggests that the company capital structure decision to be overlevered is endogenous and strongly dependent on shareholders' bargaining power. Renegotiation friction is measured by *1 - Herfindahl index of institutional ownership*, the dispersion of institutional shareholdings. The difficulty in the distressed renegotiation with debt holders restricts shareholders' ability to deviate from APR and therefore lead to less strategic advantage. The negative sign on *1 - Herfindahl index of institutional ownership* (Coef. = -0.285, t-statistic = -21.055) further confirms that overleverage displays a strategic intention to utilise the benefit of Chapter 11 when there are fewer obstacle for shareholders in the distressed renegotiation with debt holders. The results of the proxies for the strategic factors are consistent with the previous studies regarding the influence of strategic default on asset prices (Davydenko and Strebulaev (2007), Favara et al. (2012), and Hackbarth et al. (2015)). The results are consistent across the different measures of strategic factors in columns (2) - (5) of Table 7.

These strategic variables represent the extent to which shareholders have the overall strategic advantage over debt holders in the debt renegotiations upon financial distress. The regression results in Table 7 show that excess leverage increases with the firm's strategic advantage and therefore hypothesis b is held. In other words, overleverage is an indication of intentionally deviating from optimal capital structure to take advantage of debt renegotiation under Chapter 11 against debt holders. The firm's debt level is an endogenous decision to utilise the strategic default option and further maximise shareholders' value.

5.2.3 Strategic Overleverage: Bankruptcy Cases

To test the main hypothesis that overleverage can identify a firm's strategic intention ot default in a more solid way, this section collects a list of bankrupt companies and examines the impact of oveleverage on the distressed filing type and the bankruptcy outcome by the court. All of the bankrupt companies on this list voluntarily filed for bankruptcy, under either Chapter 7 or Chapter 11. Table 8 reports the findings of the overleverage impact on the bankruptcy outcome using a probit model.

Columns (1) and (2) include excess leverage as the unique independent variable. The rationale of only one independent variable follows the previous findings in Table 7 that excess leverage is highly significantly and related to firm characteristics and strategic advantages. Therefore, in the probit regression tests, we do not include other variables to control for firm-level variations.

Column (1) gives the results on the likelihood of filing for Chapter 11 in relation with excess leverage. The dependent variable is a binary variable that equals to 1 if the bankrupt firm filed for Chapter 11 and 0 for Chapter 7. The results show that the firms with higher excess leverage are more likely to file for Chapter 11 (Coef. = 0.555, t-statistic = 1.930), implying that the more a firm is overlevered, the greater chance the firm will file for bankruptcy under Chapter 11.

Table 8. Overleverage in Bankruptcy Cases

This table shows 109 bankrupt firms during 1990-2014 collected from Capital IQ. Using a probit model, the overleverage effect on the likelihood of filing for Chapter 11 and the likelihood of successfully emerging from a reorganisation plan is presented in column (1) and column (2), respectively. The dependent variable in column (1) equals 1 if the bankrupt firm filed for Chapter 11 and 0 otherwise. The dependent variable in column (2) equals 1 if the bankrupt firm emerged from a reorganisation plan and 0 otherwise. The overleverage measurement is based on Fama-French 48 industry classification. t-stats are reported in brackets. ***, **, and * signify results significant at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Excess leverage	0.555*	0.463**
	[1.930]	[2.099]
Constant	1.048***	0.146*
	[9.846]	[1.673]
Observations	370	370
Pseudo R2	0.014	0.009

The relationship between excess leverage and the probability of emerging from Chapter 11 reorganisation is presented in column (2) of Table 8. The binary dependent variable is equal to 1 if the bankrupt firm successfully emerged from Chapter 11 reorganisation and 0 for all other outcomes (see Footnote 11 for the detailed bankruptcy status). As the results show, higher excess leverage causes more frequent successful reorganisations (Coef. = 0.463, t-statistic = 2.099). This confirms that overleverage takes the strategic advantage into account and therefore results in a higher probability of emerging from Chapter 11 reorganisation. Firms with more strategic advantages over debt holders tend to be overlevered. When coming to the real bankruptcy cases, the likelihood of a successful reorganisation, to a large extent, can be identified by whether the firm is overlevered or not.

6 Concluding Remarks

Hart and Moore (1994) classify the default type into *liquidity default* and *strategic default*. However, in reality, strategic default is an unobservable event (Guiso et al. (2013)). This paper proposes a new perspective of strategic default according to the positive deviation from optimal capital structure, in particular. Overleverage helps identify the tendancy towards strategic default. The results in this paper show that overleveraged firms have lower equity beta than their counterparts and equity beta also presents a hump-shaped relation with the excess leverage measure. It suggests that the strategic default option becomes valuable when a firm is overlevered and therefore reduces equity beta. In addition, firms are more likely to be overlevered when they have large strategic advantages in distress renegotiations with their debt holders. Finally, this paper examines the filing type and the bankruptcy outcome of 109 bankrupt companies and their capital structure conditions (i.e. whether overlevered or not). The results indicate that overleveraged distressed firms are more likely to file for the reorganisation bankruptcy code (Chapter 11) and are more able to emerge from a reorganisation plan. This finding confirms that overleverage has a strategic implication for the capital structure decision, allowing for the identification of firms' strategic default incentives.

This paper is the first to relate deviation from optimal capital structure to strategic default due to conflict of interest between shareholders and debt holders. By deviating from optimal capital structure, shareholders are able to maximise equity value to obtain the value of the strategic default option. As a result, a firm's degree of overleverage implies the incentive to default strategically, which enables an unobservable event to become identifiable and measurable. In addition, knowing how far the borrowing firms are deviating from their optimal capital structures, firms' debt holders can restrict the amount that the firms can borrow and thus protect themselves from the violations of APR that occur at the time of default.

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