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CAPITAL STRUCTURE WITH ASYMMETRIC INFORMATION ABOUT VALUE AND RISK: THEORY AND EMPIRICAL ANALYSIS

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Capital structure, risk and asymmetric information *

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Abstract

The paper builds upon an adverse selection logic to examine empirically the role of risk in firms' capital structure decisions. We argue that risk is an aspect that is missing in the traditional pecking order and that giving risk a role in the adverse selection problem of external financing transforms the traditional pecking order into a more general theory of debt and equity issuance. The main idea is that asymmetric information about risk increases the adverse selection cost of debt relative to equity. This solves the existing empirical puzzle that the traditional pecking order performs worst for young small firms that, it has been argued, face a more severe asymmetric information problem than large mature firms that do issue debt. This paper suggests that young small firms do not face a more severe but a different asymmetric information problem. For these firms, outside investors know less about the risk of their investments. We find robust and economically significant empirical support for an adverse selection logic that conditions on risk. The results do not appear to be driven by debt capacity concerns, market timing or the omission of conventional determinants of leverage.

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Forty-five years after Modigliani-Miller, capital structure is still a puzzle. The pecking order theory of capital structure for example, one of the most influential theories of corporate leverage, has recently fallen on hard times. On the one hand, the theory has considerable intuitive appeal. Firms seeking outside finance naturally face an adverse selection and hence mispricing problem. In order to avoid mispricing, firms finance investments internally if they can, and if they cannot, the argument is that they prefer debt to equity since debt is less sensitive to outside investors not knowing the value of firms' investment projects (Myers and Majluf (1984)).

On the other hand, the pecking order seems to work well empirically when it should not and seems to not work well when it should. Shyam-Sunder and Myers (1999) show that the pecking order is a good first order description of the time series of debt finance for large mature firms. But it is argued that these firms should face little asymmetric information in capital markets. The pecking order cannot explain why young, small, non-dividend paying firms, i.e. firms that supposedly should face large asymmetric information problems, issue equity. For example, Fama and French (2002) test the pecking order and compare it to the main alternative, the trade-off theory. They find that "the pecking order model beats the trade-off model: more profitable firms have less book leverage". But they also find that "the less levered nonpayers [of dividends] are typically small growth firms" and that "the least-levered nonpayers make large net new issues of stock […], even though they appear to have low-risk debt capacity. This is not proper pecking order behavior." Graham and Harvey (2001) and Frank and Goyal (2003) reach similar conclusions.

There is also a theoretical difficulty. Stein (2003) for example points out that "the same basic adverse selection argument that is used by Myers and Majluf (1984) for the equity market can be applied to the debt market, to the extent that the debt involved has some default risk." In other words, if debt is not 100% safe, then it is not clear that asymmetric information necessarily leads to the dominance of debt over equity as predicted by the traditional pecking order.

We show that these difficulties disappear once we recognize that the traditional pecking order assumes that investment risk plays no role in the adverse selection problem of external financing. Debt dominates equity financing only if there is *no* asymmetric information about the risk of firms' future investments. The reverse is true, i.e. equity dominates debt, if there is *only* asymmetric information about the risk of firms' future investments. In between these two extremes, a situation with no adverse selection cost of debt and one with a maximal adverse selection cost of debt, we have a theory of firms' issuing decisions that says that firms issue more equity and less debt if outside investors know less about the risk of firms' investments. In other words, knowing less about risk increases the adverse selection cost of debt.

Thus, we claim that there is no empirical puzzle. Young small firms do not face more but *different* adverse selection costs of external financing.

Our empirical strategy extends the tests of the traditional pecking order of Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) by conditioning on risk. Their tests are based on how firms finance their need for external capital. Using statement of cash-flow data, we construct a measure of this need, the financing deficit, and analyze the empirical sensitivity of debt and equity issues with respect to the financing deficit having ranked firms into risk deciles.

Linking capital structure to risk has been difficult in the past. The survey by Harris and Raviv (1991) shows that the evidence is mixed. Rajan and Zingales (1995), who distill a large body of empirical research on the determinants of capital structure into a cross-sectional model, explicitly exclude measures of risk. Their argument is that traditional measures of risk such as size or the volatility of earnings are too imprecise.

Moreover, the standard argument of how risk affects capital structure is based on the classic trade-off between the tax benefits and the bankruptcy costs of debt. The tax-bankruptcy trade-off however seems unable to explain firms' capital structures or issuing decisions. Graham (2000) and Lemmon and Zender (2001) find that a large fraction of firms appears to forgo large tax benefits associated with debt financing. At the same time, there is little evidence of sizable bankruptcy costs.

This paper in contrast shows a strong impact of risk on firms' capital structure decisions using an adverse selection argument that says that being less informed about risk increases the adverse selection cost of debt.

We perform a series of robustness checks to see whether our empirical model is mispecified and whether alternative theories of the issuing decision can explain our results. We test for correlation of residuals across firms and time, and include time and year fixed effects. Then we break the sample into different time periods as well as subgroups according to age, size, the market-to-book ratio and whether firms have a credit rating or not. We also consider a subsample of firms that, according to their unlevered Z-score (see MacKie-Mason (1990)), look like firms with investment grade debt. Finally, we also check if we falsely omitted traditional, cross-sectional determinants of leverage.

The paper relates to the controversy between the (traditional) pecking order based on adverse selection and the trade-off theory that sparked recent efforts to combine them empirically (see Hovakimian et al. (2001), Lemmon and Zender (2002), Mayer and Sussman (2002) and Hovakimian et al. (2003)). A related question is whether there are “target” levels of leverage as predicted by the trade-off theory and if yes, what do firms do to reach them (see Welch (2003), Flannery and Rangan (2003) and Kayhan and Titman (2003)).

The organization of the paper is as follows. Section 1 presents the argument for a conditional adverse selection logic. Section 2 develops our empirical strategy. Section 3 describes the sample and presents some descriptive statistics. Section 4 contains the main empirical results. Their robustness and possible alternative explanations are analyzed in section 5. Section 6 concludes.

1. Risk and the adverse selection problem of external financing

To illustrate the argument that a firm issues more equity and less debt when risk plays a larger role in the adverse selection problem of external financing, we present a simple example.

The example considers a firm that raises an amount I of outside financing in order to undertake a risky investment project. The firm’s issuing decision is subject to an adverse selection problem since the outside capital market knows less about the investment project than the firm.

The firm consists of a single project that needs financing. If undertaken, the project either succeeds or fails. There are different types of investment projects indexed by θ. If the project succeeds it returns $x(\theta)$, if it fails it returns nothing. The probability of success is $p(\theta)$. Investment projects have a positive NPV, $p(\theta)x(\theta) > I$. We assume that $p' \leq 0$ and $x' \geq 0$ with at least one strict inequality. A high θ investment thus succeeds less often than a low θ investment but conditional on success, it returns more.

To raise money for the investment project, the firm issues debt and/or equity. Debt is a zero-coupon bond with face value F and equity confers an α % stake in the firm. The expected true value of holding debt and equity in a firm with a type θ investment is:

$$V(F,\alpha,\theta) = p(\theta)[F + \alpha(x(\theta) - F)] \tag{1}$$

The investment project succeeds with probability $p(\theta)$. In that case its return $x(\theta)$ is used to repay the debt F. The equity part α is a claim on the firm after the debt has been repaid, $x(\theta) - F$. When the investment fails, both debt and equity are worthless.[1,2]

The key distortion is that the outside capital market, when contacted by a firm, does not know what kind of investment is being financed. The capital market does not know the type θ. The uninformed market is therefore exposed to an adverse selection, or mispricing, problem. To overcome the adverse selection problem, we follow Myers (1984) who argues that a firm issues "securities whose future value changes least when

[1] The example can be easily generalized to take into account existing assets-in-place, inside cash and pay-offs to debt in the case of failure. The important element is that debt must be risky. Safe debt trivially solves the adverse selection problem. It is also possible to place the adverse selection logic in the context of a reduced form model of costly external finance along the lines of Kaplan and Zingales (1997) and Stein (2003). These generalizations are available from the authors upon request.

[2] Note that having two possible return realizations, one of which is zero, does not mean that there is no difference between debt and equity. To see this, let there be only two types: θ_1 and θ_2. Since the outside investor does not know the type, both debt and equity must be defined over three possible return realizations: 0, $x(\theta_1)$ and $x(\theta_2)$. Note also that a firm would never issue debt with a face value $F>x(\theta)$ since this would mean handing over the investment surplus to the outside market.

the manager's inside information is revealed to the market". On can formalize Myers' argument by focusing on the combination of debt and equity (F^*, α^*) whose true value is independent of the type θ:

$$V(F^*, \alpha^*, \theta) = K \quad \text{for all} \quad \theta \tag{2}$$

where K is an arbitrary constant. When the true value of debt and equity is independent of a firm's private information, then their value does not change when the private information is revealed to the market.[3]

To characterize a firm's financing decision, one differentiates (2) with respect to θ and obtains:

$$-F^* p' = \frac{\alpha^*}{1-\alpha^*}(px)' \tag{3}$$

Equation (3) illustrates that a firm's financing choice that is robust to the adverse selection problem depends on the nature of the adverse selection. The left hand side describes the potential for mispricing debt while the right hand side describes the potential for mispricing equity. The potential for mispricing depends on what asymmetric information about θ really means. For example, suppose that there is no asymmetric information about a firm's investment risk, i.e. all investment projects have the same probability of success, $p' = 0$. In that case we have $\alpha^* = 0$ in order to uphold equation

[3] Myers (1984) informal argument about optimal securities in the presence of adverse selection essentially picks an efficient pooling equilibrium in a fully fletched game with an informed principal (see for example Nachman and Noe (1994), and also Barclay and Smith (1999) for a discussion). Equation (3) can be derived in the context of such a game (available from the authors upon request) but the main insight would be somewhat obscured due to technical complications such as having to specify appropriate out-of-equilibrium beliefs.

(3). The firm should not issue any equity since the potential for mispricing debt is zero. This is the original pecking order of Myers and Majluf (1984).[4]

But one can easily obtain the reverse conclusion. Suppose that there is *only* asymmetric information about risk, i.e. all investment projects have the same expected return (they are mean preserving spreads), $(px)' = 0$. Now the firm should never issue debt, $F^* = 0$, because equity is not mispriced.[5]

The example motivates the following observations. First, the standard pecking order is a special case that is obtained under the assumption that risk plays no role in the adverse selection problem of external financing. Second, the standard pecking order is completely reversed under the opposite assumption that only risk plays a role in the adverse selection problem. Third, linking these two polar cases, the same logic therefore says that a firm should issue more equity and less debt if risk plays a larger role the adverse selection problem of external financing.

This potentially resolves the puzzle mentioned in the introduction, namely that the traditional pecking order cannot explain why large mature firms issue debt and young small firms issue equity. The solution is that young small firms do not face more but *different* adverse selection costs of external financing, the difference being driven by the

[4] In their original analysis there is no asymmetric information about risk simply because they assume that investment projects never fail. Nachman and Noe (1994) show that in order to obtain the original pecking order when investment projects are risky, one needs to assume that the projects' cash-flows can be ordered by a slightly stronger version of first order stochastic dominance (FOSD). Assuming FOSD essentially means that investment projects can be ranked *independently* of preferences towards risk (see for example Huang and Litzenberger (1988)). Nachman and Noe also show that this condition (conditional FOSD) excludes the case of lognormally distributed returns which invalidates the option-pricing argument used by Myers and Majluf when they argue that debt generally dominates equity in the presence of adverse selection.

[5] An early application of the potential for mispricing debt under mean-preserving spreads is Stiglitz and Weiss (1981). They assume that an uninformed outside investor (a bank) knows the mean but not the variance of firms' investment returns. They go on to show that the potential for mispricing debt may induce a bank not raise the price of debt despite facing an excess demand for loans. Myers (1984) also acknowledges that "if there is asymmetric information about the variance rate but not about firm value […], the pecking order could be reversed".

role of risk. An outside investor presumably knows less about the risk of an investment if he faces a young small non-dividend paying firm than if he faces a large mature dividend paying firm. Hence, the former issue equity and the latter issue debt in order to minimize adverse selection costs.

The remainder of the paper attempts to push the argument further by testing empirically such an adverse selection logic that conditions on the role of risk.

2. Empirical strategy

This section presents and discusses our empirical strategy. It builds upon the recent tests of the traditional pecking order by Shyam-Sunder and Myers (1999) and Frank and Goyal (2001).

Focusing on cash-flows

Shyam-Sunder and Myers (1999) propose a test of the original pecking order based on how firms finance their need for external capital. A theory of capital structure based on asymmetric information at the moment at which a firm contacts the external capital market has a priori nothing to say about the *level* of debt, or leverage. The starting point is therefore the following accounting identity of cash *flows*:

$$DEF = I + DIV + \Delta W - C = \Delta D + \Delta E \qquad (4)$$

A firm's financing deficit *DEF*, i.e. the difference between uses of funds (dividends *DIV*, investment *I* and changes in net working capital ΔW) and internal sources of funds (the internal cash-flow *C*), must be balanced by external sources of funds, i.e. either the issuance of debt ΔD or equity ΔE (we follow the definitions of Frank and Goyal (2003);

see also Helwege and Liang (1996), Shyam-Sunder and Myers (1999), and Chang and Dasgupta (2003)).

Since Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) are interested in testing the traditional pecking order in which debt dominates equity, they test $DEF = \Delta D$ by running the following pooled panel regression:

$$\Delta D_{it} = a + bDEF_{it} + \varepsilon \tag{5}$$

In order to test an adverse selection logic of costly external financing that conditions on the role of risk, we employ (5) conditionally by ranking firms into deciles, n=1,2…10, according to a measure that proxies for the role of risk, which we discuss in the next section, and then run regression (5) separately in each decile n:

$$\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon \tag{6}$$

The key hypothesis is that we expect to be able to rank the estimated coefficients on the financing deficit monotonically: $\hat{b}_1^D > \hat{b}_2^D > \ldots > \hat{b}_{10}^D$. Firms in higher deciles issue more equity and less since risk plays a larger role in the adverse selection problem in higher deciles.

In addition to (6), we also test to what extent equity is issued to finance the deficit in each decile n:

$$\Delta E_{it} = a + b_n^E DEF_{it} + \varepsilon \tag{7}$$

Since (4) is an accounting identity, checking that the estimated coefficients on the deficit from (6) and (7) add up to one in each decile, $\hat{b}_n^D + \hat{b}_n^E = 1$ for all n, is a useful test of the accuracy of the cash-flow data.

Grouping firm into deciles based on recent asset volatility

The hypothesis is that the outside capital market being uninformed about firms future investment risks drives up the adverse selection cost of issuing debt. We use firms' recent volatility of assets to group them into deciles and argue that the outside capital market knows less about the risk of investments for firms in higher recent asset volatility deciles. In other words, we expect that when raising external financing, firms whose asset values have fluctuated a lot, face a higher adverse selection cost of debt than firms whose asset values have been stable.

We use last year's asset volatility to make sure that the market "knows" the extent to which risk plays a role in the adverse selection problem. Current or even realized future investment risk however must be unknown. Otherwise, there would be no adverse selection problem in the first place. Using a one year lag also ensures that there is no contemporaneous interplay between the issue decision and asset volatility. Using longer lags however would weaken the link between the role of risk in the adverse selection problem and the *current* capital structure decision.[6]

We construct two measures of asset volatility. The first one consists of unlevering the volatility of equity. Unlevering is needed since the volatility of equity mechanically increases with leverage. We compute the standard deviation of the daily return on the market value of a firm. The market value of assets is defined as in Fama and French

[6] There is an issue concerning the overlap or gap between the calendar year used for stock price data and the fiscal year used for financial data. This overlap or gap exists for 48% of all firms. We check the robustness of our results by using only firms whose fiscal year is the calendar year. The results are unchanged.

(2002) (see also our appendix).[7] If there are less than 90 days of stock price data, the firm/year observation is deleted from the sample.

The second measure recognizes that equity is a call option on the value of firm assets with the exercise price being the value of the debt (Merton (1974)). From Ito's lemma, we have

$$\sigma_E = \sigma_V \frac{V_t}{E_t} \frac{\partial E_t}{\partial V_t} \tag{8}$$

where σ_E is the instantaneous variance of the rate of return on equity (the standard deviation of daily stock returns from CRSP), σ_V is the instantaneous variance of the rate of return on the firm (to be solved for), V_t is the market value of the firm and E_t is the market value of equity (both calculated as above).[8] The derivative of the market value of equity with respect to the market value of the firm in the Merton model is:

$$\frac{\partial E_t}{\partial V_t} = \Phi\left[\frac{\ln(V_t / B_t) + (r_f + \frac{1}{2}\sigma_V^2)T}{\sigma_V \sqrt{T}}\right] \tag{9}$$

where Φ is the cumulative distribution function of the standardized normal distribution *N(0,1)*, *T* is the time to maturity of the debt (we try both 10 and 20 years) and r_f is the risk free rate (from Kenneth French's website).

The Spearman rank correlation between the two measures of asset risk in our sample is 0.95. The rank correlation is the appropriate measure since we use asset risk mostly to rank firms into deciles. Given that both measures give virtually identical rankings, we

[7] We also try the definition of Baker and Wurgler (2001), which excludes convertible debt, and also try using just total liabilities. The results are not affected.

[8] An advantage of the Merton method is that we can use the CRSP return series that is adjusted for stock splits and dividends.

only report results using the simpler first measure (see also Jones et al. (1984) for a comparison of these two measures of asset volatility).

Discussion

Of course, using recent asset volatility to group firm into deciles is only going to be an imperfect conditioning on the role of risk in the adverse selection problem of external financing. In fact, any measure of asymmetric information will be indirect since something that is not known cannot be in the econometrician's information set. A number of reasons however suggest the usefulness of our measure. First of all, it seems reasonable to assume that risk plays a larger role in the asymmetric information problem that a firm faces when raising financing from an imperfectly informed outside capital market, if the firm's market value of assets has fluctuated a lot. Indeed, we will show that that the dispersion of asset risk is higher in higher asset risk deciles. Second, we will see that firms in higher risk have characteristics that may reasonably be associated with outside investors knowing less about the risk of these firms' investments. They are smaller, younger, have higher market-to-book ratios, pay less dividends, have more cash and less tangible assets on their balance sheets. Third, we present evidence that recent asset risk does not appear to inadvertently pick up mere bankruptcy risk. And fourth, we will show that the traditional pecking order works extremely well conditional on picking the firms from the lowest decile. In fact, we will show stronger support for the traditional pecking order than the original analysis of Shyam-Sunder and Myers (1999) irrespective of size, age or the time period that is being considered.

3. Data

Sample construction

We study a large, unbalanced panel of all firms from the merged CRSP-Compustat (CCM) database from 1971 to 2001. Our sample only starts in 1971 since we mostly use cash flow data. We make the following standard adjustments. We exclude financial firms (SIC codes 6000-6999), regulated utilities (SIC codes 4900-4999), and firms involved in major mergers and acquisitions (Compustat footnote code AB). Furthermore, we exclude firm/year observations that report cash flows data using format code (item 318) 4 or 6 (both undefined by Compustat) and 5 (for the Canadian file) or if the format code is missing.

To be able to link Compustat reliably to CRSP data we use only records with link type 'LC', 'LN', 'LO', 'LS', 'LU' or 'LX'. A small number of CRSP securities that link into more than one Compustat firm have also been deleted.

In order to remove outliers and misrecorded data, we remove observations for certain variables that have missing values or are in the extreme 0.5 % left or right tail of the distribution (see the appendix for the list of variables that have been treated this way). To ensure that the sample does not contain equity issues due to IPOs, we exclude observations for the year in which a firm's stock price becomes first available in the CRSP database. The maximum number of observations in our sample then is 103,351 firm-years.

Descriptive statistics

Table 1 shows balance sheets, cash flows and other descriptive statistics at the beginning and at the end of our sample period, 1971 and 2001, as well as for two intermediate dates, 1980 and 1990.

Table 1: Balance sheets, cash flows and other descriptive statistics over time

Panel A presents average balance sheets and panel B shows the average of the cash flows in the accounting identity (4). The key observation is that equity plays an important role in financing the deficit. It contradicts the standard argument that most external financing uses debt (see also Frank and Goyal (2003) and Fama and French (2003)).[9]

Note also the difference between the mean and the median of net debt and equity issues. The median is zero for both. A typical firm appears to stay out of the market for external finance most of the time, but if it does seek external finance, the magnitude of the market intervention is large relative to firm size.

4. Analysis

The traditional pecking order

An implication of the conditional adverse selection logic is that the traditional pecking order should *not* be a good description of debt issuance for all firms in the sample. It should only work well for those firms that have the smallest adverse selection cost of debt.

[9] The table confirms that dividends are a disappearing use of corporate cash flows (see Fama and French (2001) and also Baker and Wurgler (2003)). A comparison of the average and the median dividend indicates that typical firms stop paying dividends and that those who continue paying them, nevertheless reduce the amount paid.

The result from running regression (6) on the full sample is (pooled OLS standard error in brackets):

$$\Delta\hat{D}_{it} = -0.004 + 0.375 DEF_{it} \quad (10)$$

$$(0.000) \quad (0.002) \quad (R^2 = 0.36)$$

The coefficient on the financing deficit is much less than the 0.75 (R^2 of 0.68) reported by Shyam-Sunder and Myers (1999) on a sample of 157 firms with continuous reporting from 1971 to 1989.

Our coefficient is only slightly larger than the 0.28 (R^2 of 0.14) reported by Frank and Goyal (2003) using an unbalanced panel from 1971-89.[10] We therefore confirm the result of Frank and Goyal that the support for the traditional pecking order in Shyam-Sunder and Myers does not carry over to a broader sample of firms.

Our interpretation of this finding however is very different. While Frank and Goyal interpret it as evidence against an adverse selection logic of capital structure decisions, we argue that one cannot expect the traditional pecking order to work for all firms. It should only work conditionally, i.e. for those firms in the sample firms that have the smallest adverse selection cost of debt. And indeed, we will show shortly that this true irrespective of firm age, size or the time period.

Ranking by recent asset volatility

In order to apply the conditional adverse selection logic, we rank firms each year into deciles according to their asset volatility in the previous year. Table 2 shows balance sheets, cash flows and other descriptive statistics across deciles.

[10] The slight difference seems to come from the fact that our requirement about the availability of stock price data eliminates a number of small firms from the sample.

Table 2: Balance sheets, cash flows and other descriptive statistics across deciles

Firms in higher deciles have more cash on their balance sheet whereas differences in tangibles and intangibles are small (panel A). As far as liabilities are concerned, firms in higher deciles have roughly the same amount of short-term and less long-term debt as firms in lower risk deciles.

Comparing cash flows across deciles reveals a hump shaped pattern for dividends and internal cash flows (panel B). We also find that the median internal cash flow in the highest decile is larger than in the lowest decile (not shown in the table).

The average financing deficit of firms in higher deciles increases strongly, but the median financing deficit remains close to zero except for the three highest deciles. Average net debt and equity issues *both* increase for firms in higher deciles, although the increase is more dramatic for equity than for debt. Their medians however are mostly zero. This again indicates that a typical firm is reluctant to contact the external capital market, but if it does raise external capital, the size of the intervention is large.

Firms in higher asset volatility deciles are younger, smaller and have higher market-to-book ratios (panel C). Profitability and unlevered Altman's Z-scores (see MacKie-Mason (1990)) first increase and then decrease across risk deciles. Firms in higher asset volatility deciles are therefore *not* necessarily less profitable or more likely to go bankrupt than firms in lower deciles. Furthermore, there is a larger dispersion of past and, to a lesser extent, future asset volatilities in higher deciles.

To sum up, firms in higher deciles are younger, smaller, have a higher market-to-book ratio, have more cash, less long-term debt and issue more debt and more equity to finance larger deficits. There is larger variation of asset volatilities in higher deciles. However, there is no clear relationship between asset volatility and tangibility, profits or the unlevered Altman's Z score. Thus, it seems reasonable to expect that risk plays a larger role in the adverse selection problem of external financing for firms in higher deciles.

The central result

Table 3 contains the central result of our paper. It shows the results from running regressions (6) and (7) in each decile.[11]

Table 3: Financing the deficit across deciles

The table shows support for our hypothesis. Firms from higher deciles issue monotonically more equity and less debt to finance their deficit.

To illustrate the result, we plot the coefficients on the financing deficit and the associated R^2 from Table 3 in Figure 1.[12]

Figure 1: Financing the deficit across deciles

To get an idea of the economic significance, consider the impact of a one standard deviation change (9.3% of book assets) from the mean deficit (0.5% of book assets) on net debt issues in the lowest decile. New debt issues increase from 0.1% to 8.1% of book assets which is about one standard deviation. In the highest decile, a one standard

[11] The table reports OLS standard errors. We also computed White standard errors that correct for heteroscedasticity. The corrected errors are about three to four times larger.

[12] Note that the estimated intercept is close to zero across all deciles. This suggests that there is no factor that is common to all firms in a decile throughout the sample period that could affect the pattern of net debt issues. Furthermore, the estimated coefficients on the deficit from the net debt and the net equity regression add up to one across deciles. This indicates that we are not missing any significant cash-flows.

deviation change from the mean deficit increases net debt issues by about a third of a standard deviation.

Note that the traditional pecking order works extremely well in the lowest decile. The coefficient on the financing deficit in the lowest decile is 0.87 (R^2= 0.85). This is considerably larger than the 0.75 obtained by Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) when they look for the strongest support for the traditional pecking order. This supports the argument that the traditional pecking order is a special case of an adverse selection logic of external financing that is obtained when investment risk plays no role.

In Table 4 we show the proportion of companies that either issue debt, equity or do nothing in each decile.[13]

Table 4: Issue decisions across deciles

The proportion of debt issues decreases across deciles while the proportion of equity issues increases.

Finally, we split the sample into two groups: firms with an S&P credit rating and firms without any credit rating. The hypothesis is that there is less of an asymmetric information problem for firms with a credit rating. The service provided by rating agencies bridges the informational gap between rated firms and the outside capital market. Moreover, these firms are scrutinized closely by investors and analysts. Since rated firms faces a smaller adverse selection cost of debt, we expect no, or at least a

[13] Issuing debt or equity is defined as a change in ΔD or ΔE that exceeds 1% of book assets. There are a lot of minor changes in equity due to the exercise of options or the conversion of other classes of stock into common stock.

weakened, monotonic relationship of the coefficient on the deficit across deciles. Table 5 and Figure 2 show that this is indeed the case.

Table 5: Financing the deficit of rated and unrated firms across deciles

Figure 2: Financing the deficit of rated and unrated firms across deciles

Overall, the data is consistent with our hypothesis about a conditional adverse selection logic of capital structure. For firms from higher deciles, where risk plays a larger role in the adverse selection problem, the variation in the financing deficit explains more the decision to issue equity and less the decision to issue debt. In addition, the proportion of firms issuing equity increases in higher deciles while the the proportion of firms issuing debt decreases. Moreover, there is no strong monotonic pattern in the coefficient on the financing deficit across deciles for firm with a credit rating, presumably because these firms face less asymmetric information problems. Finally, the traditional pecking order works very well for firms from the lowest decile. In fact, our support for the traditional pecking order conditional on (no) risk is *stronger* than the original support in Shyam-Sunder and Myers (1999).

5. Robustness

The pooled panel regressions (6) and (7) are the simplest possible tests of our hypothesis. We perform a series of robustness checks to see whether the simple model is mispecified and whether alternative theories of the issuing decision can explain our results. We test for correlation of residuals across firms and time, and include time and year fixed effects. Then we break the sample into different time periods as well as subgroups according to age, size and the market-to-book ratio. We also consider a subsample of firms that, according to their unlevered Z-score (see MacKie-Mason (1990)), are firms with investment grade debt capacity.

Our conditional adverse selection model of a firm's capital structure decision is based on an informational friction at the moment when firms contact the external capital market. It uses a different set of variables than conventional, mostly cross-sectional empirical research on the level of debt or leverage that is mostly rooted in the trade-off theory. The basic trade-off theory states that the level of leverage is determined by trading off the tax benefit of debt against the cost of financial distress (see for example the account given by Myers (1984)). Hence, firms with a high present value of tax benefits and/or a low present value of distress costs have a high debt capacity (see also the classification in the survey by Harris and Raviv (1991)). Rajan and Zingales (1995) narrow the list of conventional determinants down to four main variables: profits, size, tangibility of assets and the market-to-book ratio.

More tangible assets support debt because it means that firms can collateralize the debt which reduces bankruptcy costs. The market-to-book ratio is usually seen as a proxy for growth opportunities that should be negatively related to leverage. The argument is that leverage exposes firms to the "debt overhang" problem (Myers 1977). A recent alternative explanation for a negative relationship is market timing. Firms with a high market-to-book ratio are overvalued and hence issue equity to take advantage of it (Baker and Wurgler (2001)). Sales are usually positively associated with leverage. There is no clear theoretical foundation but one normally argues that larger firms have a higher reputation or are safer so they can borrow more. Profits show up regularly as a negative determinant of leverage. Traditionally this has been seen as the strongest empirical challenge for conventional trade-off models of leverage since they predict that more profitable firms should issue *more* debt. More profitable firms have a smaller risk of bankruptcy and have more taxable income to shield (see Titman and Wessels (1988) and Fama and French (2002)).

In order to nest the set of conventional determinants of leverage from the trade-off theory within our conditional adverse selection model, we follow Frank and Goyal (2001) and use first-differences instead of levels. Although this increases standard errors and biases the estimators towards zero, we nevertheless confirm the standard signs on the conventional variables in a regression without the financing deficit on the entire sample.

We also expect that recent asset volatility should not be added to the list of conventional determinants. If recent asset volatility proxies for the role of risk in the adverse selection problem of external financing, it should not be a direct determinant of the decision to issue debt. If it was, perhaps by inadvertently picking up the probability of default, it would belong to the list of conventional determinants of leverage whose roots lie in the trade-off and other theories that are orthogonal to adverse selection.

To see whether our conditional adverse selection model falsely omits the conventional determinants of leverage, we add changes of the conventional determinants to (6). Our regression in each decile *n* then becomes:

$$\begin{aligned}\Delta D_{it} &= a_n + b_n DEF_{it} + b_n^{TANG} \Delta TANG_{it} + b_n^{MTB} \Delta MTB_{it} + b_n^{PROF} \Delta PROF_{it} \\ &\quad + b_n^{LOGSALES} \Delta LOGSALES_{it} + \varepsilon \end{aligned} \qquad (11)$$

Unless our conditional adverse selection model (6) is misspecified, we expect the same monotonic ranking of the estimated coefficients on the financing deficit across deciles from (11).

In the remainder of this section, we show that all robustness checks are consistent with a conditional adverse selection logic of capital structure decisions. At the same time, other theories appear unable to account for our evidence. The results therefore do not appear to be driven by an inability to issue debt due to debt capacity constraints, market timing, omitting important determinants of leverage or a misspecified empirical model.

Fama-McBeth and fixed effects regressions

In order to address the potential problem of cross-sectional correlation in a pooled panel regression, we follow Fama and French (2002) and use the Fama-McBeth procedure (Fama and McBeth (1973)). The procedure consists of running a cross-sectional regression for each year, reporting the average of the cross-sectional coefficient estimates and using the time-series standard deviations of the cross-sectional estimates to calculate standard errors. [14] In addition, we also estimate our base model (6) using both firm and year fixed effects to control for time and firm invariant unobservable factors affecting debt and equity issuance.

The results of performing each procedure are shown in table 6.

[14] We also analyze the autocorrelation in the time series of the cross-sectional estimates. The first-order autocorrelation is sometimes as large as 0.8. Sometimes it is statistically insignificant from zero. We address the issue by fitting an AR(1) process to the time series of cross-section coefficients on the financing deficit and then inflate the standard errors using the information on the auto-correlation. The result is an increase of the standard errors by a factor 3 to 4.

Table 6: Financing the deficit across deciles: Fama-McBeth and fixed effects procedures

These statistical robustness checks confirm our earlier results. The coefficient of the financing deficit decreases monotonically across deciles and the traditional pecking order works very well for the safest firms in the sample.

Including conventional leverage variables

First we run regression (11) without the deficit on the entire sample to verify that the conventional determinants of leverage have the expected sign in our first-difference specification.

$$\underset{}{\Delta\hat{D}_{it}} = \underset{(0.000)}{0.007} + \underset{(0.004)}{0.029}\Delta TANG_{it} - \underset{(0.000)}{0.004}\Delta MTB_{it} - \underset{(0.002)}{0.074} PROF_{it} + \underset{(0.001)}{0.043}\Delta LOGSALES_{it} \quad (12)$$

All the conventional determinants have the expected sign: positive on tangibility and sales, negative on the market-to-book ratio and profitability. Although running a level regression in first-differences biases the estimator towards zero, all coefficients are statistically significant (R^2=0.04).

Next we add recent asset risk by itself to regression (12):

$$\begin{aligned}\Delta\hat{D}_{it} &= \underset{(0.000)}{0.006} + \underset{(0.004)}{0.029}\Delta TANG_{it} - \underset{(0.000)}{0.004}\Delta MTB_{it} - \underset{(0.002)}{0.074} PROF_{it} \\ &\quad + \underset{(0.001)}{0.043}\Delta LOGSALES_{it} + \underset{(0.007)}{0.012} ASSETVOL_{i,t-1}\end{aligned} \quad (13)$$

Once we control for the conventional determinants of leverage, the amount of recent asset volatility by itself is *not* a significant factor explaining debt issuance nor does it affect the estimated coefficients of the other variables (R^2=0.04).

We are now ready to run (11), the regression of net debt issues on the conventional determinants of leverage and the deficit, in each decile.

Table 7: Regression of net debt issues on conventional variables and the financing deficit across deciles

Table 7 shows that the inclusion of conventional leverage variables does not change our estimates of the coefficients on the financing deficit across deciles at all.

Are the results driven by well known empirical artifacts?

The descriptive statistics of our sample reveal that firms with a higher recent asset volatility are smaller and younger (see Table 2). Firm size usually shows up as a significant determinant of capital structure. Moreover, it is often used as a proxy for risk (for example in Fama and French (2002)). Size can however capture other effects such as bargaining power or reputation that may also be important for outside financing.

We now verify that our hypothesis about a conditional adverse selection logic still holds if we control for firm size by first ranking firms according to size and then by asset volatility. To ease the presentation of the results we use quintiles instead of deciles and run regression (6) in 25 size-asset risk groups. The results are shown in Table 8.

Table 8: Financing the deficit across size and risk quintiles

Figure 3 plots the coefficient on the financing deficit across risk deciles for each size group.

Figure 3: Financing the deficit across size and risk quintiles

Our results do not change. There is a monotone negative pattern of the coefficient on the financing deficit across risk quintiles for each size group.

Note that the negative relationship is stronger for smaller firms (except in the smallest size quintile). This lends further support for our hypothesis since we expect more asymmetric information about investment risk for smaller firms.

The standard pecking order still works best in the lowest risk quintile for all size groups. Except for the lowest size quintile, the coefficient on the financing deficit is between 0.83 and 0.87 in the lowest risk group. This does not support Frank and Goyal (2003)'s argument that the standard pecking order works less well for smaller firms. It is asymmetric information about risk and not size that weakens the support for the standard pecking order.[15]

Next, we repeat the robustness check above for age. Table 9 shows that the results from sorting by age are very similar to the results from sorting by size.

Table 9: Financing the deficit across age and risk quintile

Figure 4 plots the coefficient on the financing deficit across risk deciles for each age group.

[15] Even for the lowest size quintile, our coefficient in the lowest asset volatility group is 0.50 which is well above 0.16 found by Frank and Goyal (2003, table 6).

Figure 4: Financing the deficit across age and risk quintile

In each age group we observe the monotone negative pattern across risk quintiles. The negative relationship becomes less important with age which indicates that asymmetric information about investment risk is more relevant for younger firms. Finally, we see that for all age groups, the traditional pecking order still works best in the lowest risk decile.

In sum, the evidence in favor of a conditional adverse selection logic does not appear to be driven by a size or age effect. In fact, conditioning on size and age strengthens our results.

Are the results valid only for a specific period?

We now examine whether the sample period matters for our results. Table 10 shows the results of running (6) across risk deciles in each decade separately. Figure 5 plots the estimated coefficients on the financing deficit.

Table 10: Financing the deficit across deciles in the 70s, 80s and 90s

Figure 5: Financing the deficit across deciles in the 70s, 80s and 90s

The monotone negative pattern of the coefficient on the financing deficit across risk deciles is present in all decades. Note that it grows *stronger* as we move from the 70s to 80s, and from the 80s to the 90s.

The traditional pecking order works again best in the lowest (or second lowest) decile. The coefficient drops only from 0.916 in the 1970s to 0.829 in the 1990s. This is very different from the coefficient of 0.15 found by Frank and Goyal (2003) for *all* firms during the 1990s. Once we condition on risk, we do not find support for the claim that the traditional pecking order is driven by the 1970s.

Alternative explanation: market timing?

The descriptive statistics also show that firms with more volatile assets in the recent past have higher market-to-book ratios (Table 2). A possible alternative explanation for the equity issuance of riskier firms then is that those firms time the equity market, i.e. they issue equity because they are overvalued (Baker and Wurgler (2002)).

Our result however was not that firms in higher deciles issue more equity per se, but that they issue more equity to finance their deficit. In other words, these firms have a legitimate need for external capital. If market timing were the main explanation, then firms in higher risk deciles should issue equity irrespective of their need for external capital. This appears not to be the case.

Moreover, the median of net equity issues is zero (or close to zero) for all deciles. This indicates that a typical firm contacts the equity market rarely. Under market timing, we would expect firms in the higher deciles, i.e. those with higher market-to-book ratios, to issue equity frequently. Table 4 shows that in higher deciles, more and more firms do *not contact* the external capital market at all. Under market timing, one could also expect undervalued firms, i.e. firms with low market-to-book ratios, to *repurchase* equity. This does not happen either.

There are further indications that market timing cannot account for our results. Firms in higher deciles also issue more debt. This is inconsistent with firms' equity being overvalued, unless debt is overvalued too.

To be sure that the market-to-book ratio does not drive our results, we rank firms first according to their market-to-book ratio and then by asset volatility. Again, we use quintiles to ease the presentation of the results in Table 11 and Figure 6.

Table 11: Financing the deficit across market-to-book and risk quintiles

Figure 6: Financing the deficit across market-to-book and risk quintiles

The negative monotone negative pattern of the coefficient on the financing deficit across risk groups holds in all market-to-book quintiles. The relationship is stronger for firms with higher market-to-book ratios (except for the very highest market-to-book ratios – there could be market timing for the most overvalued firms). The results are very similar to the ranking of firms by size and age. Again, we expect asymmetric information about risk to be more relevant for firms with higher market-to-book ratios, i.e. those firms that have stronger growth options. The traditional pecking order again works best in the lowest risk quintile for all market-to-book groups, except the highest.

Alternative explanation: variation in debt capacity?

Lastly, we consider the argument that firms issue equity because they have exhausted their “debt capacity”.

Theories of debt capacity, or trade-off theories of leverage, are often seen as alternative explanations that compete with the adverse selection paradigm that underlies our arguments. The basic trade-off hypothesis states that the level of leverage is determined by trading off the tax benefit of debt against the cost of financial distress. Another classic explanation of debt capacity is Myers (1977)’s debt-overhang problem. Firms with valuable growth options and existing debt face the problem that the return of an extra unit of capital raised goes first to the existing debt-holders. The provider of the extra unit of capital bears the full cost but is only paid after the existing debt is serviced.

We now show that debt capacity concerns do not appear to drive the equity issues of firms in higher deciles. In a similar vein, Fama and French (2002) as well as Graham and Harvey (2001) find that equity issuance by young small firm cannot be explained using an argument about these firms having limited debt capacity.

From the description of average balance sheets and cash-flows across deciles (Table 2), as well as the proportion of debt issuance (Table 4), we know that firms in higher deciles do issue *more* debt. Moreover, the level of long-term debt relative to book assets decreases across deciles from 30% to 10%. This suggests that firms in higher risk deciles are able to issue debt and do not have extreme levels of leverage.

Neither profits nor the probability of bankruptcy vary monotonically across deciles. This suggests that a trade-off between the tax benefit and the bankruptcy cost of debt cannot account for the monotonic pattern of debt issuance across deciles. Moreover, we saw that asset volatility by itself, when added to the set of conventional leverage variables, is an insignificant determinant of debt issuance (equation (15)). Thus, asset volatility does not seem to inadvertently pick up variations in debt capacity.

Moreover, we saw that there was a large difference in higher deciles between firms with credit ratings and firms without (Table 3 and Figure 2). If firms in higher deciles really have lower debt capacities, one should not see firms in high deciles that have a rating issuing a lot of debt.

To further address doubts about debt capacity possibly driving our results, we rank firms first according to the tangibility of their assets, a traditional proxy for debt capacity, and by asset volatility. The results of this double sort are presented in Table 12 and Figure 7.

Table 12: Financing the deficit across tangibility and risk quintiles

Figure 7: Financing the deficit across tangibility and risk quintiles

Again, we find the monotone negative pattern of the coefficient on the financing deficit across risk quintiles for each tangibility group. The negative relationship is stronger for firms with fewer tangible assets. Again, asymmetric information about investment risk should be more relevant for those firms. Finally, the traditional pecking order again works best in the lowest risk group irrespective of the tangibility of assets.

Finally, we run regression (6) across risk deciles on a subsample of firms with investment grade debt, i.e. firms that should not be constrained by debt capacity concerns. Ideally, one would like to use credit ratings to construct such a sample. S&P ratings however are only available since 1985 in Compustat and even then, they are only available for a fifth of all firms. We therefore select firms that have an unlevered Z-score, a proxy for the probability of default, larger than 1.67 (see MacKie-Mason (1990) for further information about this modified Z-score). This cut-off corresponds to the median Z-score of those firms that do have an available S&P rating of BBB.

Table 13: Financing the deficit across deciles for firms with investment grade debt capacity

Table 13 shows exactly the same monotonic pattern for the coefficient on the deficit across deciles now on a subsample of firms that appear not to be constrained by standard debt capacity concerns.

5. Conclusion

The starting point for our analysis is the observation that the traditional pecking order seems to work well when it should not, i.e. for large mature firms, and seems not to work well when it should, i.e. for small young nonpayers of dividends. This is often perceived as a puzzle since it is argued that young nonpayers face more asymmetric information than large mature firms (see for example Fama and French (2002)).

Our argument is that young nonpayers do not face more but *different* adverse selection costs of external financing, the difference being driven by the degree of asymmetric information about the risk of these firms, investments. We show that debt has no adverse selections costs, which is the traditional pecking order, only if there is no asymmetric information about risk. The reverse is true, i.e. debt has a maximal adverse selection cost, if there is only asymmetric information about risk. In between these two extremes, we have an argument about firms' issuing decisions based on adverse selection that is conditional on risk.

We test our hypothesis that knowing less about risk increases the adverse selection cost of debt by analyzing firms' sensitivity of debt issuance with respect to the need for external financing conditional on having ranked firms into deciles according to their recent asset volatility. We show that although recent asset volatility is going to be an imperfect proxy for the role of risk in the adverse selection problem of external financing, there is evidence that suggests that our measure is a reasonable and useful one. We use two measures of asset volatility. First we use unlevered equity volatility. Second, we compute asset volatility using a Merton model.

The empirical results are consistent with the hypothesis about a conditional adverse selection logic of capital structure. For firms coming from higher risk deciles, the variation in the financing deficit explains more the decision to issue equity and less the decision to issue debt. Moreover, the traditional pecking order works very well (in fact better than in the original analysis of Shyam-Sunder and Myers (1999)) for firms from the lowest risk decile, irrespective of size, age or the time period under consideration.

A large number of robustness checks suggest that the results are not driven by an inability to issue debt due to debt capacity constraints, market timing, omitting important conventional determinants of leverage or a misspecified empirical model.

Appendix

<u>*Variable definitions*</u>

Investments: For firms reporting under formats 1 to 3, it equals Compustat item #128 + #113 + #129 + #219 - #107 - #109. For firms reporting under format 7, investments equal #128 + #113 + #129 - #107 - #109 - #309 - #310.

Change in net working capital: For firms reporting under format 1, it equals Compustat item #274 - #236 - #301. For firms reporting under format 2and 3, it equals #274 + #236 - #301, and for firms reporting under format 7, it equals - #302 - #303 - #304 - #305 - #307 + #274 - #312 - #301.

Internal cash flows: For firms reporting under formats 1 to 3, it equals Compustat item #123 + #124 + #125 + #126 + #106 + #213 + #217 + #218. For firms reporting under format 7, internal cash flows equal #123 + #124 + #125 + #126 + #106 + #213 + #217 + #314.

Market value of a firm: Book value of debt = #181 + #10 (or #56 or #130 depending on availability and in that order) + market value of equity = number of common shares outstanding times the closing share price (from CRSP)

<u>*Variables that are trimmed*</u>

In order to remove outliers and misrecorded data, observations that are in the extreme 0.5 % left or right tail of the distribution or have missing values are removed. This trimming has been applied to the following variables: current assets (Compustat item #4), current liabilities (#5), cash dividends (#127), investments (defined above), internal cash flows (defined above), change in net working capital (defined above), financial deficit, net debt issued (#111-#114), net equity issued (#108-#115), all as a percentage of total assets, as well as tangibility (#8/#6), market-to-book ratio, profitability (#13/#6), and log(sales) (natural logarithm of #12).

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Table 1
Balance sheets, cash flows and other descriptive statistics over time

The table reports average balance sheets for the sample. Financial firms, utilities and companies that could not be matched properly with CRSP are excluded. Unless labeled as median, each item in Panel A and Panel B is calculated as a percentage of the book value of total assets and then averaged across all firms of our sample in that year. Definitions of variables follow Frank and Goyal (2003) and Fama and French (2002). See text and appendix for details.

Year	1971	1980	1990	2001
Number of observations	1518	2925	3481	3810
Panel A: Balance sheet items				
Assets:				
+Cash (#162)	0.040	0.030	0.085	0.127
+Short term investments (#193)	0.035	0.045	0.031	0.056
+Receivables-total (#2)	0.194	0.217	0.205	0.154
+Inventories (#3)	0.247	0.245	0.186	0.126
+Current assets-other (#68)	0.014	0.020	0.029	0.037
+Current assets-total (#4)	0.539	0.575	0.544	0.501
+Net property plant and equipment (#8)	0.356	0.349	0.320	0.276
+Investments and advances - equity method (#31)	0.020	0.014	0.010	0.010
+Investments and advances - other (#32)	0.025	0.026	0.025	0.020
+Intangibles (#33)	0.036	0.020	0.049	0.128
+Assets - other (#69)	0.024	0.023	0.054	0.064
=Total assets (#6)	1.000	1.000	1.000	1.000
Liabilities				
+Debt in current liabilities (#34)	0.068	0.066	0.094	0.063
+Account payable (#70)	0.090	0.114	0.111	0.086
+Income taxes payable (#71)	0.020	0.018	0.008	0.006
+Current liabilities - other (#72)	0.061	0.087	0.097	0.118
=Current liabilities - total (#5)	0.239	0.286	0.312	0.274
+Long-term debt - total (#9)	0.199	0.200	0.192	0.184
+Liabilities - other (#75)	0.012	0.015	0.034	0.045
+Deferred taxes and ITC (#35)	0.020	0.026	0.020	0.016
+Minority interest (#38)	0.005	0.003	0.006	0.005
=Liabilities - total (#181)	0.476	0.529	0.564	0.524
+Preferred stock - carrying value (#130)	0.011	0.009	0.015	0.021
+Common equity - total (#60)	0.513	0.461	0.422	0.456
=Stockholders' equity - total (#216)=(#130)+(#60)	0.524	0.471	0.437	0.476
=Total liabilities and stockholders' equity	1.000	1.000	1.000	1.000
Panel B: Corporate cash flows				
+Cash Dividends (#127)	0.018	0.015	0.009	0.005
+Change in net working capital	0.022	0.024	-0.011	-0.022
-Internal cash flow	0.099	0.106	0.044	0.000
+Investments	0.082	0.102	0.071	0.058
=Financial deficit (Mean)	0.023	0.034	0.025	0.041
Financial deficit (Median)	0.001	0.003	-0.001	0.002
Net debt issues (#111-#114) Mean	0.012	0.017	0.004	0.001
Net debt issues (Median)	0.000	0.000	-0.001	0.000
Net equity issues (#108-#115) (Mean)	0.011	0.017	0.021	0.040
Net equity issues (Median)	0.000	0.000	0.000	0.001
Panel C: Other descriptive statistics				
Age (years since first appearance in CRSP)	7	11	12	13
Market value of assets (in millions of dollars)	503.233	464.232	966.102	2943.950
Book value of assets (#6) (in millions of dollars)	436.892	514.434	858.079	1550.136
Tangibility (#8/#6)	0.356	0.349	0.320	0.276
Log sales (log(#12))	4.73	4.74	4.45	5.25
Market-to-book ratio	1.52	1.40	1.54	1.90
Profitability=Operating income(#13) / Assets(/#6)	0.128	0.144	0.065	0.014

Table2

Balance sheets, cash flows and other descriptive statistics across deciles

The table reports average balance sheets, cash flow items and other descriptive statistics for each asset volatility decile. Firms are ranked in deciles according to the daily standard deviation of the return on market value of assets (book value of debt + market value of equity) in the previous calendar year. Rank 10 firms have highest standard deviation. Unless labeled as median, each item is calculated as a percentage of the book value of total assets and then averaged across all firms in a decile. Definitions of variables follow Frank and Goyal (2003) and Fama and French (2002). See text and appendix for details. Z-score equals 3.3*(#170, pretax income)+(#12, sales)+1.4*(#36, retained earnings)+1.2*[(#4, current assets)-(#5, current liabilities)]/(#6, assets) (see MacKie-Mason (1990)).

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Number of observations	10348	10331	10340	10332	10336	10335	10338	10334	10337	10320
Panel A: Balance sheet items										
Assets:										
+Cash (#162)	0.039	0.034	0.039	0.045	0.051	0.064	0.076	0.091	0.107	0.124
+Short term investments (#193)	0.024	0.021	0.024	0.027	0.034	0.042	0.055	0.070	0.082	0.082
+Receivables-total (#2)	0.182	0.189	0.195	0.197	0.201	0.204	0.210	0.208	0.203	0.184
+Inventories (#3)	0.191	0.205	0.210	0.208	0.205	0.202	0.195	0.188	0.176	0.157
+Current assets-other (#68)	0.025	0.027	0.028	0.028	0.028	0.028	0.029	0.028	0.028	0.026
+Current assets-total (#4)	0.474	0.483	0.505	0.515	0.532	0.551	0.578	0.602	0.614	0.592
+Net property plant and equipment (#8)	0.369	0.367	0.356	0.351	0.340	0.322	0.301	0.281	0.267	0.268
+Investments and advances - equity method (#31)	0.020	0.017	0.016	0.014	0.012	0.012	0.010	0.009	0.008	0.011
+Investments and advances - other (#32)	0.040	0.024	0.021	0.021	0.021	0.022	0.022	0.024	0.026	0.030
+Intangibles (#33)	0.052	0.061	0.059	0.057	0.055	0.054	0.050	0.043	0.043	0.050
+Assets - other (#69)	0.050	0.048	0.045	0.044	0.043	0.042	0.041	0.043	0.044	0.051
=Total assets (#6)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Liabilities										
+Debt in current liabilities (#34)	0.098	0.077	0.069	0.065	0.065	0.064	0.067	0.065	0.064	0.074
+Account payable (#70)	0.119	0.108	0.104	0.102	0.101	0.102	0.100	0.096	0.098	0.106
+Income taxes payable (#71)	0.010	0.011	0.012	0.013	0.013	0.013	0.013	0.012	0.011	0.008
+Current liabilities - other (#72)	0.090	0.092	0.093	0.093	0.095	0.095	0.096	0.095	0.097	0.096
=Current liabilities - total (#5)	0.321	0.290	0.280	0.274	0.275	0.275	0.277	0.269	0.270	0.285
+Long-term debt - total (#9)	0.304	0.270	0.239	0.217	0.193	0.172	0.151	0.131	0.112	0.098
+Liabilities - other (#75)	0.068	0.047	0.037	0.029	0.024	0.020	0.017	0.015	0.014	0.014
+Defered taxes and ITC (#35)	0.024	0.030	0.029	0.027	0.025	0.021	0.018	0.016	0.013	0.008
+Minority interest (#38)	0.010	0.006	0.005	0.005	0.004	0.004	0.003	0.003	0.003	0.004
=Liabilities - total (#181)	0.724	0.641	0.588	0.550	0.519	0.492	0.466	0.433	0.411	0.410
+Prefered stock - carrying value (#130)	0.017	0.013	0.011	0.008	0.009	0.010	0.011	0.012	0.016	0.017
+Common equity - total (#60)	0.259	0.345	0.401	0.441	0.471	0.498	0.524	0.554	0.573	0.574
=Stockholders' equity - total (#216)=(#130)+(#60)	0.276	0.359	0.412	0.450	0.481	0.508	0.534	0.567	0.589	0.591
=Total liabilities and stockholders' equity	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Number of observations	10348	10331	10340	10332	10336	10335	10338	10334	10337	10320
Panel B: Corporate cash flows										
+Cash Dividends (#127)	0.009	0.012	0.013	0.014	0.013	0.011	0.009	0.007	0.006	0.004
+Investments	0.066	0.074	0.081	0.088	0.094	0.097	0.098	0.096	0.093	0.086
+Change in working capital	0.004	0.008	0.011	0.013	0.015	0.019	0.020	0.019	0.004	-0.035
-Internal cash flow	0.075	0.087	0.093	0.097	0.099	0.095	0.085	0.063	0.019	-0.070
=Financial deficit (Mean)	0.005	0.008	0.012	0.017	0.022	0.030	0.042	0.060	0.085	0.125
Financial deficit (Median)	-0.001	-0.002	-0.001	0.000	0.000	0.001	0.003	0.006	0.010	0.014
Net debt issues (#111-#114) (Mean)	0.000	0.005	0.009	0.011	0.013	0.014	0.014	0.016	0.017	0.018
Net debt issues - Median	-0.002	-0.001	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Net equity issues (#108-#115) - Mean	0.005	0.002	0.003	0.005	0.010	0.017	0.028	0.044	0.068	0.107
Net equity issues - Median	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.004
Panel C: Other descriptive statistics										
Age (years since first appearance in CRSP)	13.7	15.3	14.7	13.5	12.1	10.7	9.4	8.3	7.2	6.6
Market value of assets (in millions of dollars)	2287.082	2206.197	1896.059	1523.325	1307.745	877.455	588.056	400.242	210.674	144.904
Book value of assets (#6) (in millions of dollars)	2468.440	1726.506	1273.871	883.251	636.009	430.103	257.375	176.327	90.361	62.547
Tangibility (#8/#6)	0.369	0.367	0.356	0.351	0.340	0.322	0.301	0.281	0.267	0.268
Log sales (log(#12))	6.096	5.988	5.797	5.466	5.130	4.726	4.305	3.812	3.181	2.169
Market-to-book ratio	1.127	1.160	1.256	1.343	1.447	1.582	1.750	1.964	2.213	2.694
Profitability=Operating income(#13)/Assets(/#6)	0.103	0.119	0.127	0.132	0.132	0.127	0.112	0.083	0.027	-0.088
Median asset STD in t-1	0.004	0.008	0.010	0.013	0.015	0.018	0.022	0.027	0.034	0.052
STD of asset STD in t-1	0.002	0.002	0.003	0.003	0.005	0.006	0.008	0.010	0.012	0.126
STD of asset STD in t+1	0.016	0.007	0.013	0.009	0.013	0.015	0.015	0.030	0.020	0.043
Median modified Z-score	1.797	2.126	2.291	2.369	2.402	2.374	2.278	2.109	1.712	0.658

Table 3
Financing the deficit across deciles

Pooled panel OLS regressions of net debt issues *ΔD* and net equity issues ΔE on the financing deficit *DEF* are estimated for each decile n=1,…10: $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$, $\Delta E_{it} = a + b_n^E DEF_{it} + \varepsilon_{it}$. Ranking based on the daily standard deviation of the return on market value of assets during the previous calendar year. Firms with rank 10 have highest standard deviation. Standard errors are reported below the coefficients, in *italics*. All coefficients on financial deficit are significant at the 1 % level.

Panel A: Dependent variable - Net debt issued

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Intercept	-0.004	-0.001	-0.001	-0.001	-0.003	-0.004	-0.005	-0.003	-0.002	-0.001
	0.000	*0.000*	*0.000*	*0.000*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
Financial deficit	0.868	0.822	0.807	0.764	0.708	0.570	0.457	0.326	0.230	0.147
	0.004	*0.004*	*0.004*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.004*	*0.004*
Adjusted R squared	0.849	0.802	0.787	0.728	0.665	0.542	0.419	0.293	0.209	0.129

Panel B: Dependent variable - Net equity issued

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Intercept	0.004	0.001	0.001	0.001	0.003	0.004	0.005	0.003	0.003	0.001
	0.000	*0.000*	*0.000*	*0.000*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
Financial deficit	0.126	0.175	0.192	0.235	0.291	0.430	0.542	0.673	0.770	0.853
	0.004	*0.004*	*0.004*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.004*	*0.004*
Adjusted R squared	0.109	0.157	0.173	0.203	0.251	0.402	0.504	0.638	0.747	0.832

Figure 1
Financing the deficit across deciles

Pooled panel OLS regressions of net debt issues ΔD and net equity issues ΔE on the financing deficit DEF are estimated for each decile $n=1,\ldots 10$: $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$, $\Delta E_{it} = a + b_n^E DEF_{it} + \varepsilon_{it}$. The figure plots coefficients on financial deficit and adjusted R-squared for each decile.

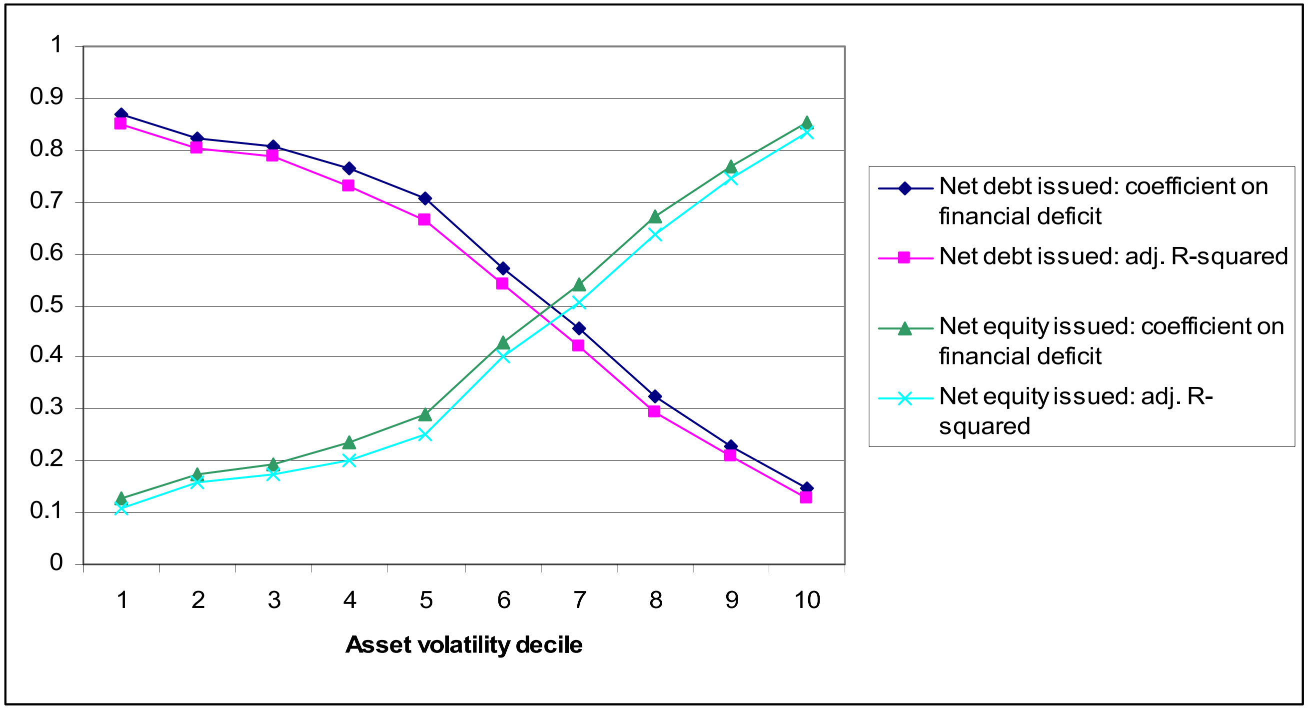

Table 4
Issue decisions across deciles

The table reports data on financing choices. '-' denotes net issues of debt/equity less than -1% of total assets (repurchases); '0' denotes net issues of debt/equity between -1% and 1% of total assets; '+' denotes net issues of debt/equity larger than 1% of total assets (significant outside financing). This produces 3x3=9 financing patterns. The table reports proportion of firms in each decile (in %) that follows a particular financing pattern. For example, the upper left corner cell shows that 3.28% of all firms in decile 1 (safe firms) repurchased more than 1% of total assets worth of both debt and equity. Ranking based on the daily standard deviation of market value of assets during the previous calendar year.

Debt	Equity	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
-	**-**	3.28	4.54	4.88	4.21	3.79	3.43	2.85	2.46	1.78	0.97
0	**-**	2.33	4.45	5.02	5.49	5.4	5.37	5.61	4.87	4.26	3.34
+	**-**	3.02	5.61	6.03	5.27	4.14	3.22	2.79	2.2	1.6	1.07
-	**0**	31.67	29.33	26.01	24.76	23.29	21.33	19.9	16.6	15.71	13.24
0	**0**	20.6	19.06	20.55	20.95	22.09	23.48	22.76	24.09	23.63	26.11
+	**0**	27.39	26.57	25.86	25.54	25.22	23.01	19.7	18.3	16.24	13.75
-	+	4.84	4.56	4.86	5.36	6.1	6.9	7.94	8.99	9.96	11.14
0	+	2.01	1.67	2.27	3.28	4.2	6.46	10.62	13.84	16.88	19.15
+	+	4.84	4.21	4.52	5.14	5.76	6.79	7.82	8.65	9.95	11.24

Table 5
Financing the deficit across deciles for firms with and without credit rating

Firms are split into 2 subsamples depending on availability of S&P issuer credit rating data. Pooled panel OLS regressions of net debt issues *ΔD* on the financing deficit *DEF* are estimated for each decile in each subsample: $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$. Ranking is done for the whole sample based on the daily standard deviation of the return on market value of firms assets during the previous calendar year. Firms with rank 10 have highest standard deviation. Standard errors are reported below the coefficients, in *italics*. All coefficients on financial deficit are significant at the 1 % level.

	Firms with S&P issuer credit rating data									
Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Intercept	-0.004	0.004	0.006	0.005	0.003	0.001	-0.001	-0.007	-0.009	-0.014
	0.001	*0.001*	*0.001*	*0.001*	*0.002*	*0.002*	*0.004*	*0.007*	*0.015*	*0.016*
Financial deficit	0.877	0.838	0.807	0.794	0.735	0.761	0.800	0.774	0.695	0.577
	0.006	*0.007*	*0.008*	*0.010*	*0.013*	*0.014*	*0.018*	*0.030*	*0.049*	*0.057*
Adj. R squared	0.873	0.823	0.802	0.787	0.738	0.786	0.812	0.719	0.652	0.617
Number of Observations	2822	2943	2380	1783	1186	789	446	253	106	65
	Firms without S&P issuer credit rating data									
Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Intercept	-0.005	-0.003	-0.003	-0.003	-0.004	-0.004	-0.005	-0.004	-0.003	-0.001
	0.000	*0.000*	*0.000*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
Financial deficit	0.865	0.813	0.804	0.751	0.700	0.544	0.427	0.306	0.221	0.145
	0.004	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.004*	*0.004*
Adj. R squared	0.841	0.794	0.781	0.709	0.648	0.510	0.387	0.273	0.201	0.126
Number of Observations	7526	7387	7960	8548	9150	9545	9892	10081	10228	10253

Figure 3
Financing the deficit across deciles for firms with and without credit rating

Firms are split into 2 subsamples depending on availability of S&P issuer credit rating data. Pooled panel OLS regressions of net debt issues *ΔD* on the financing deficit *DEF* are estimated for each decile in each subsample: $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$. Ranking is done for the whole sample based on the daily standard deviation of the return on market value of firms assets during the previous calendar year. Firms with rank 10 have highest standard deviation. The figure plots coefficients on financial deficit for each group and for each decile.

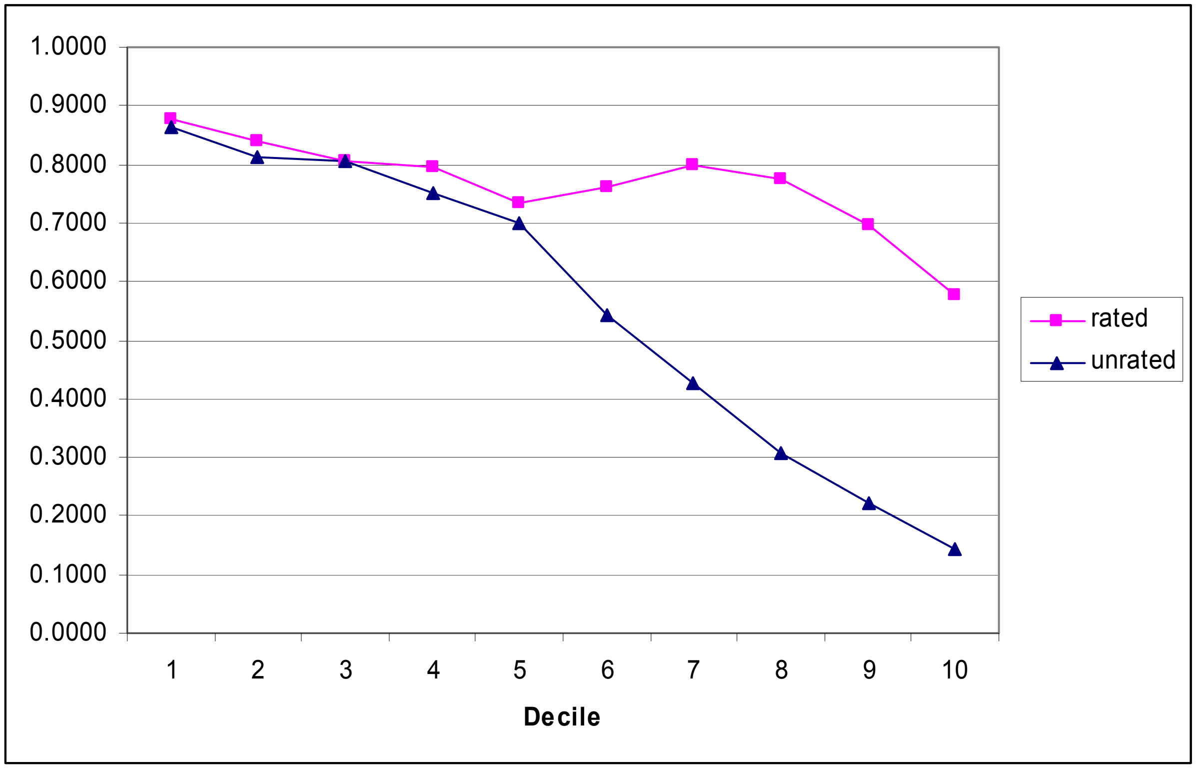

Table 6
Financing the deficit across deciles: Fama-McBeth procedure and fixed effects

Firms are ranked into deciles according to daily standard deviation of the return on market value of assets in the previous calendar year. The regression $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$, is estimated for each decile/year combination. The table reports in panel A, for each decile, time-series means of cross sectional regression intercepts, slopes and the t-statistic using the time-series standard errors (in italics). Panel B and panel C report the coefficient on the financing deficit, and the t-statistic in italics, using fixed year and fixed firm effects respectively. All coefficients on financial deficit are significant at the 1 % level.

Panel A: Fama-McBeth procedure

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Intercept	-0.004	-0.002	-0.001	-0.002	-0.003	-0.004	-0.005	-0.005	-0.005	-0.004
	-6.575	*-1.576*	*-1.129*	*-1.870*	*-3.539*	*-4.089*	*-5.214*	*-5.407*	*-4.827*	*-3.277*
Financial deficit	0.872	0.838	0.821	0.792	0.759	0.668	0.590	0.522	0.423	0.307
	72.570	*56.658*	*51.779*	*53.221*	*32.862*	*19.494*	*14.940*	*10.611*	*8.537*	*6.962*

Panel B: Year fixed effect

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Financial deficit	0.867	0.819	0.805	0.764	0.708	0.571	0.464	0.338	0.242	0.157
	243.10	*205.03*	*195.63*	*166.61*	*143.28*	*110.54*	*87.36*	*67.40*	*54.38*	*40.74*

Panel C: Firm fixed effect

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Financial deficit	0.885	0.859	0.840	0.805	0.795	0.670	0.533	0.380	0.274	0.178
	218.99	*183.90*	*164.54*	*134.47*	*130.56*	*92.39*	*69.87*	*48.57*	*41.02*	*31.96*

Table 7
Regression of net debt issues on conventional variables and financing deficit across deciles.

The regression $\Delta D_{it} = a_n + b_n DEF_{it} + b_n^{TANG} \Delta TANG_{it} + b_n^{MTB} \Delta MTB_{it} + b_n^{PROF} \Delta PROF_{it} + b_n^{LOGSALES} \Delta LOGSALES_{it} + \varepsilon$ is estimated for each decile. ΔD is net debt issued. Tangibility is defined as property, plant & equipment over total assets. Market-to-book is defined as in Fama and French (2002). LogSales is the natural logarithm of net sales. Profitability is operating income before depreciation over total value of assets. Firms are ranked into deciles according to daily standard deviation of the return on market value of assets in the previous calendar year. OLS standard errors reported below the coefficients.

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Intercept	-0.004	0.000	0.000	-0.001	-0.004	-0.005	-0.006	-0.006	-0.005	-0.004
	0.000	*0.000*	*0.000*	*0.000*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
Δ Tangibility	0.006	0.037	0.024	0.037	0.056	0.068	0.129	0.101	0.142	0.102
	0.006	*0.007*	*0.008*	*0.009*	*0.010*	*0.010*	*0.011*	*0.011*	*0.011*	*0.010*
Δ Market-to-Book	-0.012	-0.014	-0.012	-0.012	-0.009	-0.006	-0.003	-0.003	-0.001	-0.002
	0.001	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.000*	*0.000*
Δ Logsales	0.000	-0.001	-0.004	-0.001	0.004	0.003	0.010	0.010	0.009	0.015
	0.001	*0.002*	*0.002*	*0.002*	*0.002*	*0.002*	*0.002*	*0.002*	*0.002*	*0.002*
Δ Profitability	-0.010	-0.017	-0.020	-0.022	-0.045	-0.031	-0.024	-0.040	-0.015	-0.003
	0.006	*0.007*	*0.007*	*0.006*	*0.006*	*0.006*	*0.006*	*0.006*	*0.005*	*0.004*
Financial deficit	0.866	0.833	0.805	0.761	0.706	0.574	0.452	0.328	0.236	0.151
	0.004	*0.004*	*0.004*	*0.005*	*0.005*	*0.005*	*0.006*	*0.005*	*0.005*	*0.004*
Adj. R-squared	0.851	0.814	0.789	0.733	0.678	0.556	0.430	0.312	0.231	0.155
Number of Observations	9893	9996	10046	10023	10043	10032	10040	9959	9869	9559

Table 8
Financing the deficit across size and asset volatility quintiles

The regression $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$ is estimated for each size/asset volatility group. The table reports coefficients of the financial deficit. Firms are sorted in quintiles according to book assets, and then within each size quintile, firms are ranked in 5 groups based on daily standard deviation of the return on market value of assets during the previous calendar year. OLS standard errors reported below the coefficients in *italics*.

Asset volatility quintile	1 (Low)	2	3	4	5 (High)
Size quintile 1 (Small)	0.505	0.309	0.235	0.143	0.127
	0.008	*0.008*	*0.007*	*0.006*	*0.005*
Size quintile 2	0.836	0.624	0.456	0.291	0.189
	0.007	*0.008*	*0.008*	*0.008*	*0.007*
Size quintile 3	0.866	0.771	0.676	0.490	0.265
	0.006	*0.008*	*0.008*	*0.008*	*0.008*
Size quintile 4	0.873	0.821	0.798	0.703	0.519
	0.006	*0.007*	*0.007*	*0.007*	*0.008*
Size quintile 5 (Big)	0.839	0.823	0.788	0.750	0.713
	0.006	*0.006*	*0.006*	*0.007*	*0.007*

Figure 3
Financing the deficit across size and asset volatility quintile

The regression $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$ is estimated for each size/ asset volatility group. Firms are sorted in quintiles according to book assets, and then within each size quintile, firms are ranked in 5 groups based on daily standard deviation of the return on market value of assets during the previous calendar year. The figure plots coefficients on financial deficit for the size quintiles.

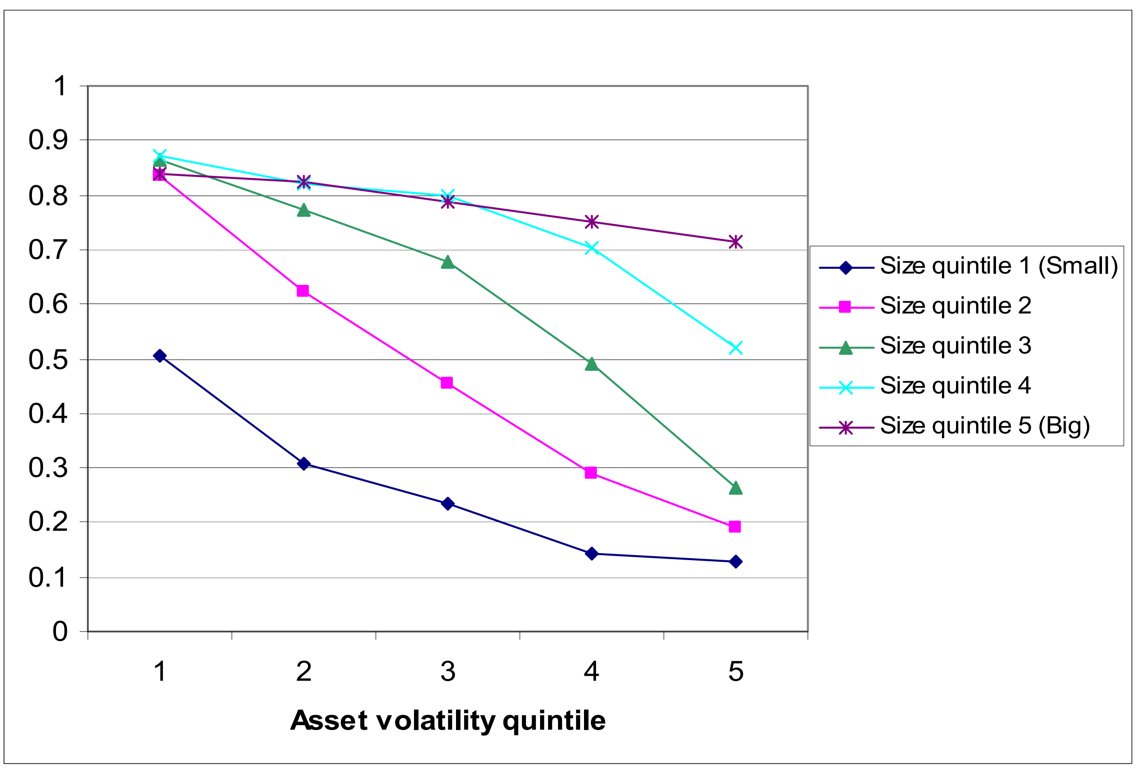

Table 9
Financing the deficit across age and asset volatility quintiles

The regression $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$ is estimated for each age/ asset volatility group. The table reports coefficients of the financial deficit. Firms are sorted in quintiles according to age (years since it first appeared in CRSP), and then within each age quintile, firms are ranked in 5 groups based on daily standard deviation of the return on market value of assets during the previous calendar year. OLS standard errors reported below the coefficients in *italics*.

Asset volatility quintile	1 (Low)	2	3	4	5 (High)
Age quintile 1 (Young)	0.771	0.615	0.374	0.250	0.155
	0.006	*0.007*	*0.007*	*0.006*	*0.005*
Age quintile 2	0.841	0.705	0.531	0.292	0.157
	0.006	*0.009*	*0.009*	*0.008*	*0.007*
Age quintile 3	0.856	0.785	0.607	0.397	0.180
	0.007	*0.008*	*0.008*	*0.009*	*0.007*
Age quintile 4	0.879	0.795	0.703	0.521	0.277
	0.005	*0.006*	*0.007*	*0.008*	*0.007*
Age quintile 5 (Old)	0.889	0.844	0.795	0.760	0.504
	0.007	*0.008*	*0.009*	*0.010*	*0.010*

Figure 4
Financing the deficit across age and asset volatility quintile

The regression $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$ is estimated for each age/ asset volatility group. Firms are sorted in quintiles according to age (years since it first appeared in CRSP), and then within each age quintile, firms are ranked in 5 groups based on daily standard deviation of the return on market value of assets during the previous calendar year. The figure plots coefficients on financial deficit for the age quintiles.

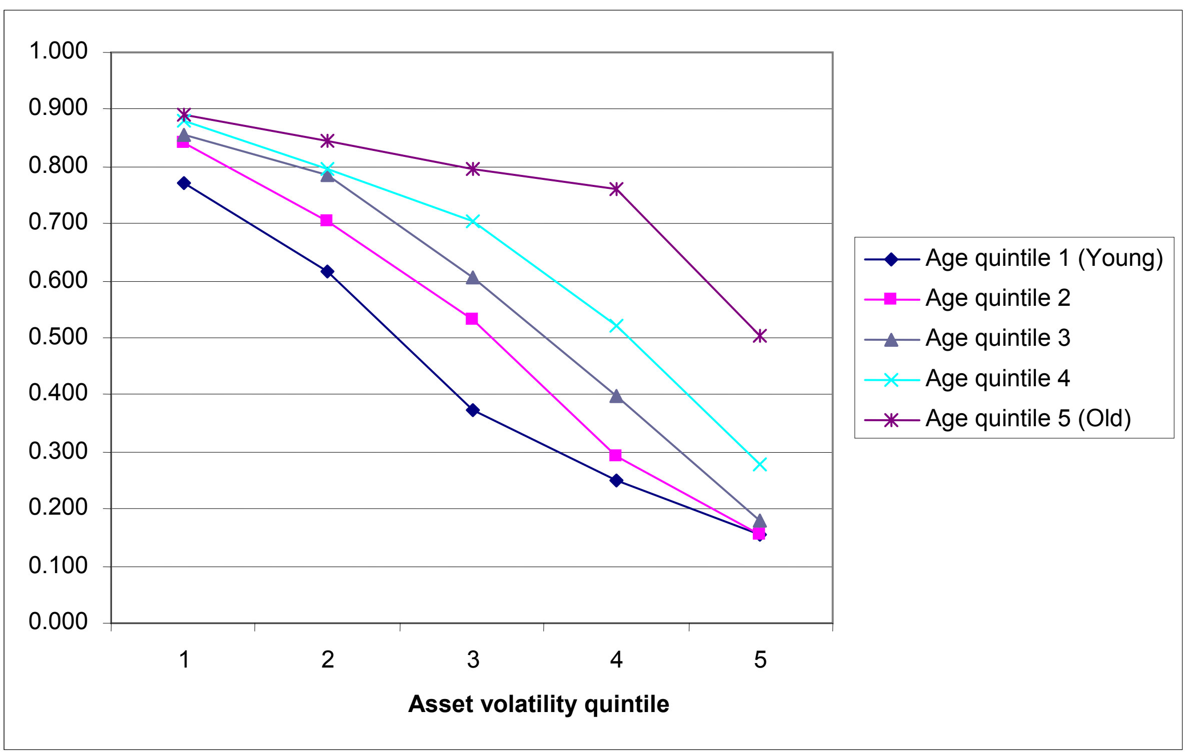

Table 10
Financing the deficit across asset volatility deciles in the 70s, 80s and 90s

Pooled panel OLS regressions of net debt issues *ΔD* on the financing deficit *DEF* are estimated for each decile in each period separately: $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$. Ranking based on the daily standard deviation of the return on market value of firms assets during the previous calendar year. Firms with rank 10 have highest standard deviation. OLS standard errors are reported below the coefficients, in *italics*.

Panel A: 1971-1980

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Intercept	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	0.001
	0.001	*0.001*	*0.000*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
Financial deficit	0.916	0.838	0.900	0.862	0.887	0.842	0.798	0.788	0.725	0.534
	0.007	*0.007*	*0.006*	*0.007*	*0.007*	*0.007*	*0.008*	*0.008*	*0.009*	*0.010*
Adj. R squared	0.880	0.861	0.898	0.848	0.869	0.847	0.789	0.781	0.709	0.504

Panel B: 1981-1990

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Intercept	-0.005	-0.004	-0.001	-0.002	-0.004	-0.006	-0.008	-0.008	-0.009	-0.005
	0.001	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.002*	*0.002*
Financial deficit	0.891	0.792	0.824	0.802	0.758	0.720	0.623	0.531	0.356	0.210
	0.006	*0.008*	*0.007*	*0.007*	*0.008*	*0.009*	*0.009*	*0.010*	*0.009*	*0.008*
Adj. R squared	0.889	0.765	0.813	0.782	0.711	0.686	0.578	0.485	0.327	0.186

Panel C: 1991-2001

Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Intercept	-0.006	0.001	0.000	-0.002	-0.004	-0.005	-0.006	-0.005	-0.005	-0.004
	0.001	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.002*	*0.002*
Financial deficit	0.829	0.837	0.771	0.717	0.648	0.454	0.337	0.209	0.150	0.100
	0.006	*0.006*	*0.007*	*0.008*	*0.008*	*0.008*	*0.008*	*0.007*	*0.006*	*0.005*
Adj. R squared	0.804	0.809	0.741	0.667	0.600	0.423	0.298	0.181	0.136	0.089

Figure 5
Financing the deficit across asset volatility deciles in the 70s, 80s and 90s.

Pooled panel OLS regressions of net debt issues *ΔD* on the financing deficit *DEF* are estimated for each decile in each period separately: $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$. Ranking based on the daily standard deviation of the return on market value of firms assets during the previous calendar year. Firms with rank 10 have highest standard deviation. OLS standard errors are reported below the coefficients, in *italics*.

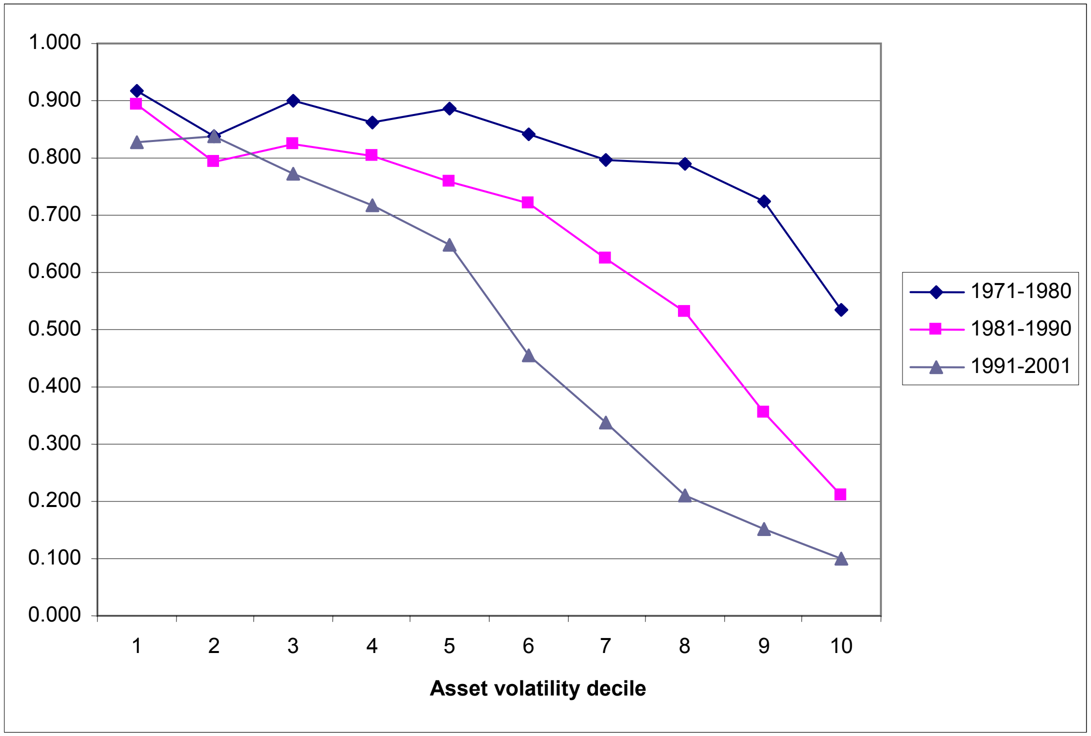

Table 11

Financing the deficit order across market-to-book ratio and asset volatility quintiles

The regression $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$ is estimated for each MTB/asset volatility group. The table reports coefficients of the financial deficit. Firms are sorted in quintiles according to market-to-book ratio MTB ((market value of equity+book value of debt)/book value of assets), and then within each MTB quintile, firms are ranked in 5 groups based on daily standard deviation of the return on market value of assets during the previous calendar year. OLS standard errors reported below the coefficients in *italics*.

Asset volatility quintile	1 (Low)	2	3	4	5 (High)
MTB quintile 1 (Low)	0.880	0.891	0.888	0.774	0.388
	0.005	*0.005*	*0.005*	*0.007*	*0.008*
MTB quintile 2	0.903	0.886	0.863	0.797	0.603
	0.005	*0.005*	*0.006*	*0.007*	*0.008*
MTB quintile 3	0.833	0.801	0.777	0.695	0.476
	0.006	*0.007*	*0.007*	*0.008*	*0.008*
MTB quintile 4	0.799	0.684	0.572	0.444	0.292
	0.007	*0.008*	*0.009*	*0.009*	*0.008*
MTB quintile 5 (High)	0.518	0.261	0.194	0.141	0.099
	0.009	*0.008*	*0.007*	*0.006*	*0.005*

Figure 6

Financing the deficit across market to book and asset volatility quintiles

The regression $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$ is estimated for each size/ asset volatility group. Firms are sorted in quintiles according to market-to-book ratio MTB ((market value of equity+book value of debt)/book value of assets), and then within each market-to-book quintile, firms are ranked in 5 groups based on daily standard deviation of the return on market value of assets during the previous calendar year. The figure plots coefficients on financial deficit for the market-to-book quintiles.

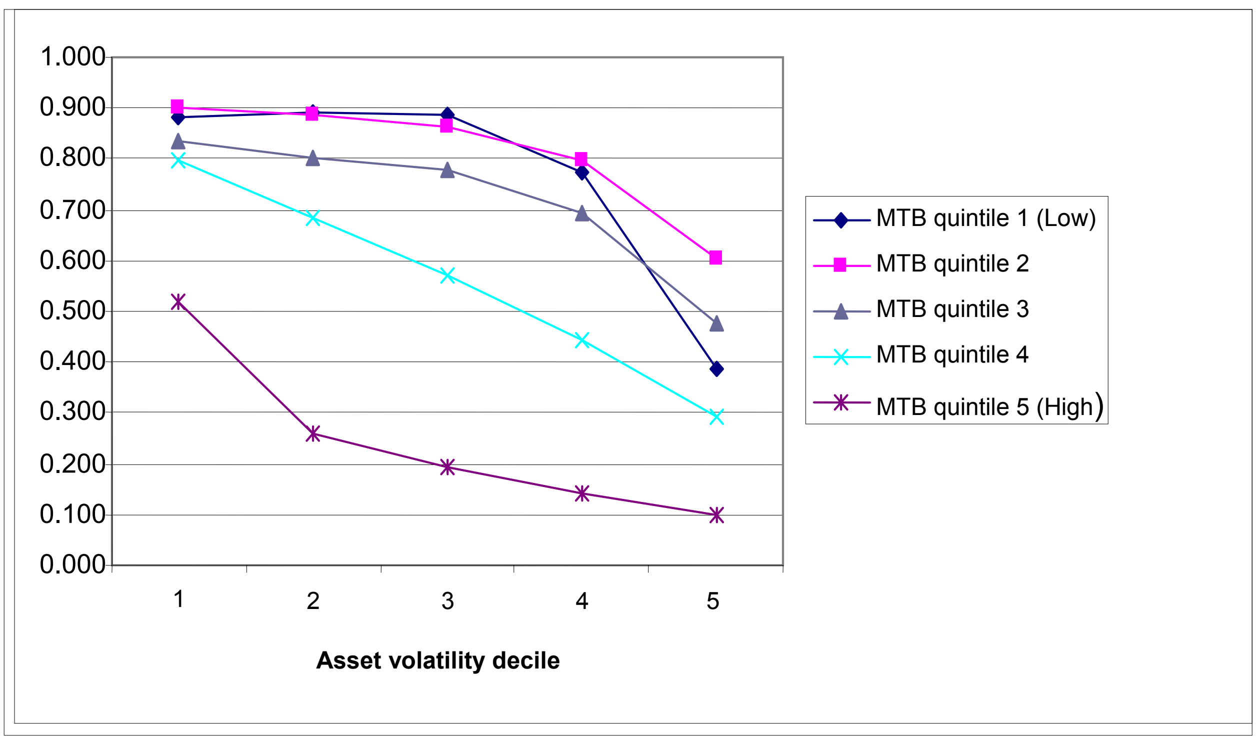

Table 12
Financing the deficit across tangibility and asset volatility quintiles

The regression $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$ is estimated for each tangibility/ asset volatility group. The table reports coefficients of the financial deficit. Firms are sorted in quintiles according to tangibility (Compustat item8/Compustat item6), and then within each tangibility quintile, firms are ranked in 5 groups based on daily standard deviation of the return on market value of assets during the previous calendar year. OLS standard errors reported below the coefficients in *italics*.

Asset volatility quintile	1 (Low)	2	3	4	5 (High)
Tangibility quintile 1 (Low)	0.764	0.568	0.271	0.156	0.110
	0.007	*0.008*	*0.007*	*0.006*	*0.005*
Tangibility quintile 2	0.844	0.743	0.428	0.294	0.132
	0.006	*0.008*	*0.008*	*0.007*	*0.006*
Tangibility quintile 3	0.830	0.780	0.691	0.458	0.187
	0.006	*0.007*	*0.008*	*0.008*	*0.006*
Tangibility quintile 4	0.855	0.817	0.754	0.567	0.278
	0.006	*0.006*	*0.007*	*0.008*	*0.007*
Tangibility quintile 5 (High)	0.866	0.849	0.790	0.685	0.445
	0.006	*0.006*	*0.007*	*0.008*	*0.008*

Figure 7
Financing the deficit across tangibility and asset volatility quintile

The regression $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$ is estimated for each size/asset volatility group. Firms are sorted in quintiles according to tangibility (item8/item6), and then within each tangibility quintile, firms are ranked in 5 groups based on daily standard deviation of the return on market value of assets during the previous calendar year. The figure plots coefficients on financial deficit for the size quintiles.

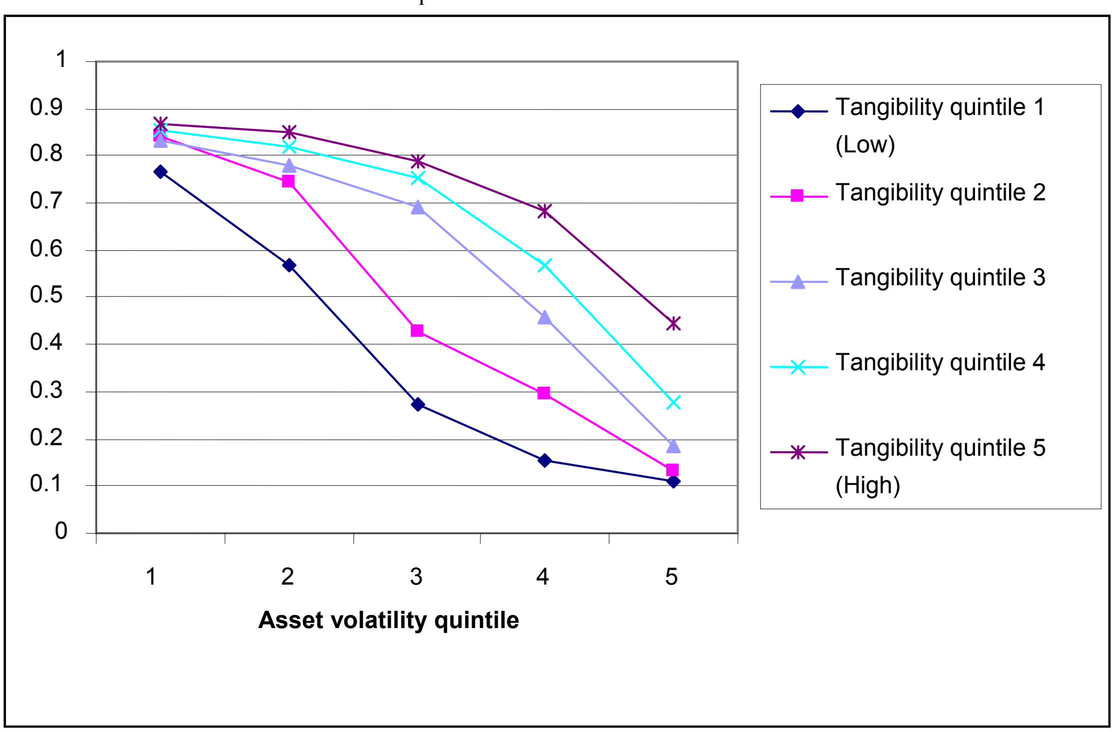

Table 13
Financing the deficit across asset volatility deciles for firms with investment grade debt

Pooled panel OLS regressions of net debt issues *ΔD* on the financing deficit *DEF* are estimated for each decile: $\Delta D_{it} = a + b_n^D DEF_{it} + \varepsilon_{it}$,

Ranking based on the daily standard deviation of the return on market value of firms assets during the previous calendar year. Firms with rank 10 have highest standard deviation. Sample consists of firms with Z-score higher than 1.671. This cut-off value is the median Z-score for companies with S&P Domestic Issuer credit rating of BBB. Standard errors are reported below the coefficients, in *italics*. All coefficients on financial deficit are significant at the 1 % level.

	Dependent Variable: Net debt issued									
Decile	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Intercept	-0.001	0.002	0.002	0.002	0.001	-0.001	-0.002	-0.002	-0.002	-0.002
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
Financial deficit	0.899	0.828	0.822	0.775	0.756	0.676	0.634	0.539	0.454	0.386
	0.004	*0.005*	*0.006*	*0.006*	*0.006*	*0.007*	*0.007*	*0.007*	*0.007*	*0.007*
Adj. R squared	0.870	0.803	0.780	0.714	0.713	0.630	0.588	0.492	0.406	0.361
Number of Observations	6249	6230	6237	6230	6231	6239	6234	6233	6233	6220