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Capital Structure with Asymmetric Information about Value and Risk: Theory and Empirical Analysis

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Capital structure with asymmetric information about value and risk: theory and empirical analysis*

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Abstract

The paper presents a simple model arguing that the pecking order theory is an extreme when there is only asymmetric information about value. We show how asymmetric information about both, value *and risk*, transforms the adverse selection logic underlying the pecking order into a general theory of capital structure that accounts for both debt *and equity* issues. The model predicts that firms issue more equity and less debt if there is more asymmetric information about risk relative to value. We find robust empirical support for the prediction and document a strong link between risk and capital structure in a large unbalanced panel of publicly traded US firms from 1971 to 2001.

The pecking order theory of capital structure, 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 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 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 for the time series of debt finance for large mature firms. But 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 should face large asymmetric information problems, issue equity (Graham and Harvey (2001), Fama and French (2002) and Frank and Goyal (2003))

This paper argues that the original pecking order is an extreme when there is only asymmetric information about value. We illustrate how considering asymmetric information about both, value *and risk*, transforms the adverse selection logic into a theory of debt *and equity*. The main prediction is that firms issue more equity and less debt if there is more asymmetric information about risk relative to value. We find strong and robust support for the prediction in a large unbalance sample of publicly traded firms from the Compustat database.

The intuition for our result is best seen considering two extremes. Suppose first that there is only asymmetric information about the value of a firm's investment opportunity. Since the value of debt is independent of not knowing the value of an investment, we have the standard pecking order. Alternatively, suppose that there is only asymmetric information about the risk of an investment opportunity. Now the value of equity is independent of not knowing risk so that we have a reverse pecking order.[1] It is therefore natural to expect to have a general theory of debt and equity in between the two extremes. To see the intuition for the general theory in more detail, consider what happens if riskier projects are also more valuable. Pure equity does not avoid mispricing since equity from riskier (and more valuable) firms is more valuable than equity from safer (and less valuable) firms. In order to reduce the incentive for riskier firms to sell overpriced equity, investors require that some debt must be issued too. Debt from riskier firms is less valuable which reduces riskier firms' incentive to sell overpriced securities. Adding debt therefore reestablishes outside investors' indifference to not knowing the value and risk of firms' investment opportunities.

We follow the empirical strategy of Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) who propose to test the standard pecking using a pooled panel regression of changes in debt on the financing deficit. The argument is that the original pecking order predicts that firms issue debt whenever their internal cash flows are insufficient to finance real investments (and other uses of funds such as dividends). The financing deficit, i.e. uses of funds minus internal sources of funds, therefore drives debt issuance.

Frank and Goyal (2003) argue that the support for the standard pecking order in Shyam-Sunder and Myers depends critically on their sample selection. Shyam-Sunder and Myers consider only 157 firms that have no reporting gaps in their statement of cash-flows from 1971 to1989. Frank and Goyal show that the results do not extent to an unbalanced

[1] The possibility of a reverse pecking order is mentioned informally in Myers and Majluf (1984).

sample, i.e. when reporting gaps are allowed, and to the time period from 1990 to 1998. Frank and Goyal argue that the sample selection of Shyam-Sunder and Myers picks large mature firms and that the standard pecking order is not a good description of the capital structure decisions for the small, young firms in their larger sample.

Fama and French (2002) test the pecking order and compare it to the main alternative: the trade-off theory. They find that on the one hand that "the pecking order model beats the trade-off model: more profitable firms have less book leverage". But on the other hand, they state a little further 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."[2]

The survey by Graham and Harvey (2001) also finds mixed support. CFOs attach importance to avoid issuing undervalued securities, which is in line with the adverse selection logic of the pecking order, but at the same time they do not find evidence that small firms and dividends payers, i.e. firms that should face a lot of asymmetric information in external capital markets, follow the standard pecking order by preferring debt to equity.

Our theory of debt and equity explains this empirical puzzle by arguing that these issuers of equity, i.e. small, young nonpayers of dividends, face a lot of asymmetric information about risk relative to value. We test this claim by ranking firms in deciles according to their past volatility of the market value of assets. The argument is that an investor worries a lot more about not knowing the risk relative to the value of an investment if the firm

[2] This controvery sparked recent research that attempts to combine the standard pecking order and the trade-off theory empirically (Lemmon and Zender (2002), Mayer and Sussman (2002) and Hovikimian et al. (2003)).

that approaches him has had volatile assets in the recent past. Our variable is a more precise proxy for risk than size (Fama and French (2002)) or the volatility of earnings (Titman and Wessels (1988)).

The combination of a risk augmented adverse selection logic of capital structure and a precise measure of risk allows us, to document for the first time (to our knowledge) a convincing impact of risk on capital structure.[3]

We confirm the robustness of our results in a number of ways. First of all, we test a series of hypothesis. If our model is misspecified and/or if our theory is wrong (by arguing for example that equity is issued because firms run out of debt capacity or to time the market as in Baker and Wurgler (2002)), we argue that it would be very difficult to reconcile theory and evidence as consistently as we do with our (now supposedly wrong) model. Other robustness checks include testing for the correlation of residuals across firms and time, including the set of conventional leverage variables of Rajan and Zingales (1995), considering different time periods and using other controls for risk.

The organization of the paper is as follows. Section 1 presents the theoretical model of a general adverse selection theory of debt and equity. It also describes the empirical hypotheses that we derive from the theory and how we propose to test them. Section 2 describes our sample, the construction of our past asset risk variable and presents some descriptive statistics. Section 3 contains the main empirical results. Their robustness is verified in section 4 and section 5 concludes.

[3] The survey by Harris and Raviv (1991) shows mixed evidence when linking leverage to volatility. The comprehensive study of leverage by Rajan and Zingales (1995) does not focus on volatility since they argue that there are too few observations available to construct meaningful measures of volatility.

Theory

The model is a simplified version of Heider (2003). It analyzes a firm that needs to raise outside financing in order to undertake a profitable investment project. The capital structure decision is subject to an adverse selection problem since outside investors know less about the characteristics of the investment project than firm insiders. The model allows comparative statics on project characteristics. In other words, we will vary the extent to which outside investors do not know (or care about) project "risk" relative to "value".

The model

Each firm has access to a single project that needs financing *I*. If undertaken, the project either succeeds or fails. There are many project types indexed by *θ*. If it succeeds it returns $\sigma(\theta)\mu(\theta)$, if it fails, it returns nothing. The probability of success is $1/\sigma(\theta)$. The mean of a project therefore is $\mu(\theta)$ and its variance is $\mu(\theta)^2(\sigma(\theta)-1)$. Both σ and μ are positive functions of the project type *θ*, $\sigma'>0$ and $\mu'>0$. If μ' is large and σ' is small, then projects vary a lot in means but not in variances and vice versa. We therefore interpret $\mu(\theta)$ as a measure of "value" and $\sigma(\theta)$ as a measure of "risk". Alternatively, one can think of a project with a high $\sigma(\theta)$ as a "growth" project, i.e. a project that succeeds rarely but if it does, its return is large.[4]

[4] The analysis here is only an example using a mean-variance framework. We now from Rothschild and Stiglitz (1970) that the mean-variance framework is useful but not always precise. The more general analysis in Heider (2003) therefore uses more precise notions of "risk" and "value" such a stochastic dominance and mean-preserving spreads. The criticism that with a two point distribution there is no difference between debt and equity does not apply here since every type *θ* has a different return $\sigma(\theta)\mu(\theta)$. For example, with just two types A and B, both a debt and equity are defined over 3 possible returns (0, x_A, x_B).

A firm has no funds available so that the entire investment outlay I is raised from a competitive capital market by issuing a mix of debt and equity.[5] Debt is a zero-coupon bond with face value F and equity gives outsider an α % stake in the firm. The expected value of a combination of debt and equity ($F(\theta)$, $\alpha(\theta)$) that finances a project θ is:

$$V = \frac{1}{\sigma(\theta)}[F(\theta) + \alpha(\theta)(\sigma(\theta)\mu(\theta) - F(\theta))] \tag{1}$$

A project θ succeeds with probability $1/\sigma(\theta)$. In that case its return $\sigma(\theta)\mu(\theta)$ is used to repay the debt F. The equity part α is a claim on the project after the debt has be repaid, $\sigma(\theta)\mu(\theta)$ -F. When the project fails, both debt and equity are worthless.[6]

The key distortion is that an outside investor does not know what kind of project he is financing. He is therefore exposed to an adverse selection, or mispricing, problem. To illustrate this, consider the marginal rate of substitution of debt for equity of the expected value of a combination of debt and equity:

$$MRS_{F,\alpha} = -\frac{\partial V / \partial \alpha}{\partial V / \partial F} = -\frac{\sigma(\theta)\mu(\theta) - F}{1 - \alpha} \tag{2}$$

The marginal rate of substitution decreases in the project type θ. To make up for a given reduction of debt, the investor requires less equity from a firm with a high θ project. In other words, a firm with a more "valuable" or "riskier" project has equity that is worth more. This is intuitive given that levered equity is proportional to and convex in the underlying value of the project. An adverse selection problem arises when outside investors do not know the characteristics of an investment project. A firm with a low θ

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[5] The amount I therefore represents an investment need after internal sources of funds have been exhausted.
[6] The analysis can be extended to allow for inside cash, a positive pay-off when the project fails and assets-in place (see Heider (2003)). The key element is that the debt must not be 100% safe. Safe debt trivially solves the adverse selection problem of outside finance.

project, i.e. a safe or not so valuable project, has an incentive to issue overpriced equity. The "value" part is the part that motivated the original pecking order of Myers and Majluf (1984). Heider (2003) adds the "risk" part to the adverse selection problem of financing.

To solve the adverse selection problem, we ask the following natural question: are there combinations of debt and equity for which the investor does not care not being informed? Moreover, we ask: how do these *belief-independent* combinations of debt and equity depend on not knowing value relative to risk?

We formalize these questions as follows. Not knowing the characteristics of an investment project, an investor forms the expectation across possible project types θ in order to figure out how profitable the financing $(F(\theta),\alpha(\theta))$ is going to be:

$$\int \frac{1}{\sigma(\theta)}[F(\theta)+\alpha(\theta)(\sigma(\theta)\mu(\theta)-F(\theta))]f(\theta)d\theta \tag{3}$$

The density $f(\theta)$ describes an investor's *belief* that a project of type θ is being financed with a combination of debt and equity, $(F(\theta),\alpha(\theta))$. The question then is: is there a combination of debt and equity that, if used for all project types, makes beliefs irrelevant? That is, we look for the belief-independent combination of debt and equity $(\overline{F},\overline{\alpha})$ such that:

$$\frac{\partial}{\partial f}\int \frac{1}{\sigma(\theta)}[\overline{F}+\overline{\alpha}(\sigma(\theta)\mu(\theta)-\overline{F})]f(\theta)d\theta = 0 \tag{4}$$

Or simply,

$$\frac{1}{\sigma(\theta)}[\overline{F}+\overline{\alpha}(\sigma(\theta)\mu(\theta)-\overline{F})] = C \tag{5}$$

where C is an arbitrary constant. A combination of debt and equity that gives the same pay-off for every project type θ is clearly belief-independent.

To see how the belief-independent combination of debt and equity changes as we change the degree to which outside investors do not know the "value" and/or "risk" of investment projects, we take the derivative with respect to θ on both sides of (5):

$$\bar{\alpha}\mu' = \bar{F}(1-\bar{\alpha})\sigma' \tag{6}$$

Equation (6) is the central result of the model. If projects do not vary in risk, $\sigma' = 0$, so that investors are trivially uninformed about value only, the belief-independent financing contract is pure debt, $\bar{\alpha} = 0$. This is the essence of the original pecking order of Myers and Majluf (1984). It is an extreme: debt is robust to the adverse selection problem of financing if outside investors do not know the value, or do not care about the risk, of investment projects. [7] The other extreme is that equity is the robust security when investment projects differ only in risk, i.e. $\bar{F} = 0$ when $\mu' = 0$. This is the reverse pecking order.

To see the comparative statics in between the two extremes, i.e. when projects differ in both risk and value, more clearly, we write (6) as:

$$r = \frac{\mu'}{\sigma'} = \bar{F}\frac{1-\bar{\alpha}}{\bar{\alpha}} \tag{7}$$

The left hand side of (7) decreases if σ' increases and/or μ' decreases. If investors worry more about not knowing the risk relative to the value of investment projects, the capital

[7] The analysis in Myers and Majluf (1984) i) only considered safe investment projects and ii) only illustrated the adverse selection problem of equity finance. Nachman and Noe (1994) show that pure debt finance is optimal when risky investments can be ordered according to conditional first-order stochastic dominance (which corresponds to $\sigma'=0$ in our case). Asset A dominates asset B by first-order stochastic dominance iff non-satiated investors prefer asset A to asset B. The interpretation is that asset A is more "valuable" than asset B or that investors who care mostly about value (and not risk) prefer asset A to asset B.

structure that is robust to the adverse selection problem of outside financing involves more equity and less debt.

To see the intuition, suppose that investment returns are identical across projects except for random noise, i.e. investments differ only in pure risk. Then investors do not care about being imperfectly informed (about risk) if they hold pure equity, i.e. a linear claim. This does not work if investments with a bigger noise also have a higher expected return (now investors also do not know the value of a project). With pure equity, all investors wish they had financed those riskier but more valuable projects. In order to *"tilt the balance back"*, some debt must be issued too. The claim is then more concave (from the investors' point of view), i.e. it subtracts value if the investment is riskier, and investors are again indifferent about which kind of investment they finance. Depending on what investors do not know (or care about), we therefore arrive at a theory of leverage based on asymmetric information. As risk becomes more important, the contract that makes investors "immune" to adverse selection needs to be less concave, i.e. involve more equity.

Empirical hypothesis and testing

We follow Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) who test the standard pecking order using a pooled panel regression of net long-term debt issues ΔD on the financing deficit DEF:

$$\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it} \tag{8}$$

The deficit DEF is an aggregation of a firm i's uses of funds at time t minus its cash flow at the same period:

$$DEF_{it} = DIV_{it} + I_{it} + \Delta W_{it} - C_{it} = \Delta D_{it} + \Delta E_{it} \tag{9}$$

Note that (9) is an accounting identity. The deficit must be externally financed, either with debt ΔD or with equity ΔE.

The specification (8) captures the basic idea of the standard pecking order that a firm issues debt if its internal cash flow C is insufficient to cover its uses of funds: real investment I, dividends DIV and changes in working capital ΔW). According to the standard pecking order, equity is only issued as a last resort. If the standard pecking order was the only true determinant of capital structure, then one expects a=0 and b=1. Although the hypothesis b=1 is statistically rejected, Shyam-Sunder and Myers estimate b to be 0.75 and they show that the pecking order in their sample of 157 firms without a reporting gap from 1970 to 1989 is a good first order approximation (in the sense of having statistical power) of the time series of debt financing.

Our model however suggests that the standard pecking order is an extreme and that it should not work well for a broader sample of firms. Indeed, we replicate Frank and Goyal's finding that the result in Shyam-Sunder and Myers does not hold on a broader sample of firms. Frank and Goyal argue is that Shyam-Sunder and Myers introduce a selection bias by considering only a small number of firm that report continuously the necessary variables for the entire time period from 1971 to 1989. Our argument however is that there is no reason to expect the standard pecking order to work well for all firms. It should only work well when uninformed investors worry mostly about not knowing the value but not the risk of firms' investments.

We saw in the model that firms issue more debt relative to equity when the ratio describing the nature of asymmetric information $r=\mu'/\sigma'$ is high. But what is a good empirical proxy for the nature of asymmetric information? The main empirical innovation of this paper is to use a firm's past asset volatility to proxy for the nature of asymmetric information. We argue that uninformed investors think differently about a firm that approaches them for financing if its market value of assets has been volatile or stable in the recent past. If a firm had market value of assets that was not volatile recently, then outside investors do not worry much about not knowing the risk of the firm's investment opportunity. Instead, they worry mostly about its value. If on the contrary the market value of assets has been volatile, then uninformed investors also care a lot about not knowing the risk of an investment. We therefore argue that last year's asset volatility proxies for $1/r$.

To control for a firm's past asset risk, we sort firms each year into deciles according to their asset risk in the previous year. We then run the standard pecking order regression (8) in each decile and compare the intercept, the coefficient on the financing deficit and its explanatory power across risk deciles.

Our result that the standard pecking order is obtained when $\sigma'=0$ translates into the following empirical hypothesis.

Hypothesis 1: The standard pecking order should work well for firms that have the lowest asset risk.

The model also shows that as r decreases, firms issue less debt to overcome the adverse selection problem. This is our second empirical hypothesis

Hypothesis 2a: The standard pecking order should work less and less well for firms with higher and higher asset risk.

Instead of issuing debt to overcome the adverse selection problem, firms issue more equity as *r* decreases. The model modifies the standard pecking order into a theory of leverage, with a reverse pecking order in the extreme when *r=0*. We therefore have the following corollary of hypothesis 2a:

Hypothesis 2b: A reverse pecking order should work better and better for firms with higher and higher asset risk.

We test hypothesis 2b by running regression (8) with net equity issues as the dependent variable:

$$\Delta E_{it} = a + bDEF_{it} + \varepsilon_{it} \tag{10}$$

Since (9) is an accounting identity, checking whether fitted debt and equity issues from (8) and (10) add up to one across risk deciles, $\Delta\hat{D} + \Delta\hat{E} = 1$, is a useful test of the accuracy of our cash-flow data.

Hypothesis 2a and 2b are central to this study. The standard pecking order of Myers and Majluf (1984) cannot explain the issue of equity for a firm in normal operations. It can only accommodate equity as a mode of financing of last resort, i.e. firms are supposed to issue equity only if they have exhausted all other sources of financing.

Our theory of capital structure, as well as the standard pecking order, is based on an informational friction at the moment when the firm contacts external capital markets. Other conventional determinants of leverage such as profits, tangibility or the market to book ratio are supposed to be secondary. The following hypothesis formulates an important robustness check.

Hypothesis 3: The pattern in hypothesis 2a and 2b should be independent of other, conventional determinants of leverage.

To guide us in the selection of other, more conventional determinants of leverage, we follow Rajan and Zingales (1995) who have distilled a large body of empirical research on the determinants of leverage (for a review see Harris and Raviv (1991)) into a cross-sectional model with four main variables: profits, sales, tangibility of assets and the market to book ratio.

The conventional wisdom on the traditional leverage variables is that having more tangible assets supports debt because it means that firms can collateralize the debt. The market-to-book ratio is usually seen as a proxy for growth opportunities which should be negatively related to leverage. The argument is that leverage exposes firms to the "debt overhang" problem (Myers 1977). A recent alternative explanation of a negative relationship is market timing. Firms with a high market-to-book ratio are overvalued and hence issue equity to take advantage of overvaluation (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 the strongest empirical challenge for conventional trade-off models of leverage (see Titman and Wessels (1988) and Fama and French (2002)). The trade-off theory predicts that more profitable firms should issue more debt since they run a smaller risk of bankruptcy and have more taxable income to shield.

The conventional set of variables is used to explain the *level* of leverage. Our theory based on adverse selection however explains *changes* in leverage. We therefore follow Frank and Goyal (2003) and use changes in the conventional determinants of leverage which enables us to include the conventional leverage variables in regression (8) and estimate the following model:[8]

$$\begin{aligned}\Delta D_{it} &= a + b_{DEF} DEF_{it} \\ &+ b_{TANG} \Delta TANG_{it} + b_{MTB} \Delta MTB_{it} + b_{PROF} \Delta PROF_{it} + b_{LOGSALES} \Delta LOGSALES_{it} + \varepsilon_{it}\end{aligned} \tag{11}$$

We can then test our hypothesis 3 by asking whether the inclusion of traditional leverage variables alters the coefficient on the financing deficit b_{DEF} across risk deciles, and hence our support for hypothesis 2a and 2b.

A possible problem with the Shyam-Sunder and Myers (1999) regression of the standard pecking order (8) is the assumption that the financing deficit is exogenous. The assumption however is not ad hoc, it is motivated by theory. The standard pecking order and also our theory, argues that the capital structure decision is driven by the fact the external markets are imperfectly informed about a firm's future use of capital. The key friction therefore is that the firm has to contact an imperfectly informed market. The reason why the firm has a net requirement for external finance should not matter according to the theory.

We perform a series of robustness checks. We test for correlation of residuals across firms and time, we include the set of conventional leverage variables, we consider different time periods and pre-rank firms using other controls for risk, such as age and size, and the market to book ratio. We find that our hypotheses are robust.

[8] As noted by Frank and Goyal (2003), running a level regression in first-differences increases standard errors and biases the estimators towards zero. But similar to their findings, we find that this possible bias is not large enough to render our estimates statistically insignificant.

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 statement of cash flows data. 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 statement of 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 that have missing values or variables that are in the extreme 0.5 % left or right tail of the distribution (see the appendix for the list of variables used for trimming). 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.[9] The maximum number of observations in our sample then is 103,429.

[9] In fact the sample will contain only contain firms that have been publicly traded for at least 1.5 years since in addition to the exclusion of IPO years, our measure of past asset risk requires a firm's stock price data from the previous calendar year (which may overlap with a firm's fiscal year up to 6 months, see also footnote 10).

Construction of past asset risk variable

The key variable in our analysis is the measure of a firm's past asset risk. This is our measure of the extent to which uninformed outside investors care about not knowing value relative to risk, i.e. it is a proxy for the ratio *r*.

The measure for a firm i in year t is constructed as follows. We first calculate the daily market value of firm i's assets for each trading day in the previous calendar year.[10] The market value of assets is defined as in Fama and French (2002). It is the book value of debt plus the market value of equity. The book value of debt is total liabilities (#181) plus preferred stock (#10, #56 or #130 depending on availability and in that order).[11] The daily market value of equity is the number of common shares outstanding times the closing share price, both from CRSP. We then calculated daily returns to control for size and then compute the standard deviation of the daily returns over the trading days in the previous calendar year. If there are less than 90 days of stock price data, the firm/year observation is deleted from the sample.

Our measure of asset risk has two distinct advantages. First of all, its use is directly motivated by theory. This is not the case for other possible proxies for risk. For example it is not clear how exactly the volatility of earnings (Titman and Wessels (1988)) or the size of a firm (Fama and French (2002)) matter for capital structure. Second, it is a precise measure of asset risk based on many observations over a limited period. Rajan

[10] 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 qualitatively the same.
[11] We also try the definition of Baker and Wurgler (2001), which excludes convertible debt (#79), and also try using just total liabilities (#181). The result is not affected.

and Zingales (1995) for example do not consider risk because “there are too few observations to get a meaningful measure of earnings volatility.

Descriptive statistics

Table 1 shows balance sheets, cash flows and other descriptive statistics for our sample at various moments in time.

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

Panel A presents average common-size balance sheets for a number of years. We confirm the observation of Frank and Goyal (2003) that the assets side changes somewhat over time whereas the liability side is relatively stable. Cash, inventories and tangibles (net property plant and equipment) decline over the years, intangibles increase.

Our empirical specification in (8) uses the financing deficit as the dependent variable. The financing deficit itself is an aggregation of corporate cash flows. Panel B presents the common-size average of these cash flows and how they are financed at various moments in time.[12]

The key observation is that equity plays an important role in financing the deficit. This observation contradicts the standard argument that most external financing uses debt.

Note also the difference between the mean and the median of net debt and equity issues. The median is zero for both. Most firms appear to stay out of the market for external

[12] 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 most firms stop paying dividends and that those who continue paying them, nevertheless reduce the amount paid.

finance most of the time, but if they do seek external finance, the magnitude is large relative to the firm size.

Our cash flow numbers are more moderate than those documented by Frank and Goyal (2003). The average financing deficit and the average net equity issue are roughly one half of what they report. The difference results from having a more restricted sample due to the fact that our firms are publicly traded for at least 1.5 years when they enter the sample.

Panel C provides other descriptive statistics. The average firm becomes older and larger. Note that this contradicts Frank and Goyal's explanation of their finding that the standard pecking order appears to not work well in the 90s.

Analysis

The original pecking order

We argued that the original pecking order is an extreme and should therefore not work well for a large sample of firms. The following is the result of running regression (8) on the full sample (standard error in brackets).

$$\Delta \hat{D}_{it} = \underset{(0.000)}{-0.004} + \underset{(0.002)}{0.375} DEF_{it}$$

The R^2 is 0.36. The coefficient on financing deficit is much less than the 0.75 (R^2 of 0.68) originally reported by Shyam-Sunder and Myers (1999), and confirmed by Frank and Goyal (2003) on a subsample of firms with continuous reporting from 1971 to 1989.

Our coefficient is larger than the 0.28 (R^2 of 0.14) and 0.15 (R^2 of 0.22) reported by Frank and Goyal using an unbalanced panel from 1971-89 and 1990-98 respectively. We therefore confirm the criticism of Frank and Goyal, albeit in a more moderate form due to our more restrictive sample, that the support for the original pecking order in Shyam-Sunder and Myers does not carry over to a broader sample of firms. There is an important difference between our and Frank and Goyal's criticism. We explained why the standard pecking order should not work well for all firms, especially young and small ones. Frank and Goyal however expect the pecking order to work best for those firms since they should have the most severe asymmetric information problem.

Ranking by asset risk

In order to test our hypothesis 1 and 2, 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 risk deciles.

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

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

Comparing cash flows across deciles reveals a hump shaped pattern for dividends and internal cash flows (panel B). The median internal cash flow in the highest decile is larger than in the lowest decile (not shown in the table). Firms in the top 5 risk deciles invest more as a percentage of their book assets than firms in the bottom 5 risk deciles.

The average financing deficit of firms in higher risk deciles increases strongly, but the median financing deficit remains close to zero except for the three highest deciles.

Similarly, average net debt and equity issues both increase for firms in higher risk deciles, although the increase is more dramatic for equity than for debt. Their medians however are mostly zero. This again indicates that firms are reluctant to contact the external capital market, but if they do raise external capital, the size of the interventions is large.

Firms in higher risk deciles are younger, smaller and have higher market-to-book ratio (panel C). Profitability, credit ratings and modified Altman's z-scores first increase and then decrease across risk deciles. Firms in higher risk deciles are therefore not necessarily less profitable or more likely to go bankrupt than firms in lower risk deciles.

To sum up, firms in higher risk 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. They are however *not* less profitable or more likely to go bankrupt.

The central result

Table 3 contains the central result of our paper. It shows the results from running regressions (8) and (10) in each risk decile.[13]

Table 3: The standard and the reverse pecking order across risk deciles

The table confirms hypothesis 1 that the standard pecking should well in lowest risk decile. The coefficient on the financing deficit in the lowest risk decile is 0.87 (R^2= 0.85).

[13] The table reports OLS standard errors. We also computed Newey-West standard errors that correct for heteroscedasticity and serial correlation. They are about three to four times larger and thus do not change the statistical significance of our results.

This is considerably larger than the 0.75 obtained by Shyam-Sunder and Myers (1999) and by Frank and Goyal (2003) when they look for the strongest support for the original pecking order.

To illustrate the support for our hypothesis 2a and 2b, we depict the coefficients on the financing deficit and the associated R^2 from table 3 in Figure 1.

Figure 1: The standard and the reverse pecking order across risk deciles

The figure shows that the standard (reverse) pecking order works monotonically worse (better) as we move towards higher risk deciles.[14]

To get an idea of the economic significance of past asset risk, 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 risk decile. They increase from 0.4% to 8.5% of book assets. In the highest risk decile, a one standard deviation change from the mean deficit increases net debt issues from 1.8% to 5.5% of book assets.

As alternative to running regression (8) in each decile, we can also run the following variation on the entire sample:

$$\Delta D_{it} = a + bDEF_{it} + cDEF_{it} * RISK_{it-1} + \varepsilon_{it} \qquad (12)$$

The results is as follows (standard errors in brackets)

[14] Note that the estimated intercept is close to zero across all risk deciles. This suggests that there is no factor that is common to all firms in a risk decile throughout the sample period that could explain the pattern of net debt issues. Furthermore, the estimated coefficients on the deficit from the net debt and the net equity regressions add up to one across deciles. This indicates that the statement of cash flows data is accurate.

$$\Delta\hat{D}_{it} = \underset{(0.000)}{-0.004} + \underset{(0.002)}{0.518} DEF_{it} - \underset{(0.036)}{3.509} DEF_{it} * RISK_{it-1} \tag{13}$$

The result confirms that firms with a higher asset risk in the previous year have a lower coefficient on the deficit.

We therefore conclude that the data supports our hypothesis 1 and 2. First, the standard pecking order works well in describing the time series of debt financing for those firms that have the lowest asset risk. In fact, the pecking order performs better for those firms than in Shyam-Sunder and Myers' subsample of 157 firms. Second, the coefficient on the financing deficit of the standard pecking order regression (8) decreases monotonically as one increases the asset risk of firms.

Robustness

Fama-McBeth regression

In order to address the potential problem of cross-sectional correlation in a pooled panel regression such as ours, we follow Fama and French (2002) and use the Fama-McBeth procedure (Fama and McBeth (1973)). The procedure consist of running a cross-sectional regression for each decile/year combination, average the cross-sectional coefficient estimates for each decile and use the time-series standard deviations of the cross-sectional estimates to estimate the standard error of the average estimate. Table 4 shows the results of performing the Fama-McBeth procedure when running regression (8) across risk deciles.

Table 4: The standard pecking order across risk deciles: Fama-McBeth procedure

The Fama-McBeth procedure confirms our hypothesis 1. The standard pecking order works best for the lowest risk decile. The procedure also reconfirms our hypothesis 2. The pecking order works monotonically worse for higher risk deciles.[15]

Including conventional leverage variables

According to hypothesis 3, our hypothesis 2 and 3 should still hold if we add conventional determinants of leverage to the deficit as exogenous variables and run regression (11).

First we run regression (11) without the deficit on the entire sample (not reported) to confirm that the conventional leverage variables enter the regression all with the usual 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. Next we run the same regression without the deficit across in each risk deciles to see whether the coefficients on the conventional variables are stable across risk deciles.

Table 5: Regression of net debt issues on conventional variables across risk deciles

[15] We also analyzed 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 could follow Fama and French (2002) and correct for this by inflating our standard errors by a factor 2.5. But this does not affect our result that the coefficient on the deficit and the explanatory power decrease monotonically across risk deciles.

Except for the coefficient on tangibility in some deciles, all coefficients are statistically significant and have the usual sign across all deciles.[16] The patter of change of the coefficients across deciles is noteworthy. The positive relationship between sales and net debt issues weakens in higher risk deciles. This is not surprising since sales are an imperfect proxy for risk. Similarly, the strengthening of the positive relationship between tangibility and net debt issues in higher risk deciles indicates that collateral is more important for riskier firms.

The negative relationship between the market-to-book ratio and net debt issues also weakens in higher risk deciles. This is surprising since the standard interpretation of the negative relationship is either that high market-to-book firms have large growth options and are therefore subject to the debt overhang problem (Myers (1977)), or that firms issue more equity when their market-to-book ratio is high indicating market timing (Baker and Wurgler (2001)). One would expect both explanations to be more relevant for riskier firms but this is not the case.

Lastly, the weakening of the negative relationship between profits and net debt issues can be seen as weak support for our hypothesis 2. The negative relationship between profits and debt is usually interpreted using the standard pecking order. The argument is that more profitable firms can finance investments internally and therefore avoid the adverse selection problem of outside finance altogether. We showed that for firms with a higher asset risk, it is equity and not debt that comes second after internal cash in the pecking order of financing.

To test our hypothesis 3, we run the specification (11) in each risk decile.

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[16] The R^2 is very low because (among other things) running the conventional leverage regression in first differences magnifies problems with measurement errors in variables.

Table 6: Regression of net debt issues on conventional variables and the financing deficit across risk deciles

Table 6 shows that the inclusion of conventional leverage variables does not affect the pattern of the coefficients on the financing deficit.

Is it"risk" or just another well known empirical artifact?

The descriptive statics of our sample sorted into risk deciles showed that firms in higher deciles are smaller (see table 2). Firm size is often showed to be empirically important determinant for various corporate variables; moreover, it has also been used as a proxy for firm risk (for example in Fama and French (2002). Size however also captures other effects such as bargaining power or reputation that are important for outside financing. Since our measure is a more direct measure of risk and theoretically motivated, we check whether our hypothesis 2 and 3 still hold if we control for firm size. We first rank firms by size and then by asset risk. To ease the presentation of the results we use quintiles instead of deciles and therefore run regression (8) in 25 size-asset risk subsamples. The results are shown in Table 7.

Table 7: The standard pecking order across size and risk quintiles

Figure 2 plots the coefficient on the financing deficit as a function of the asset risk in each size group.

Figure 2: The standard pecking order across size and risk quintile

Our results do not change. The standard pecking order still works best in the lowest asset risk quintile and there is still the monotonic negative relationship between the coefficient on the financing deficit and asset risk.

Except for the lowest size quintile the coefficient on the financing deficit is between 0.83 and 0.87 in the lowest risk quintile. This does not support the argument of Frank and Goyal (2003) that the pecking order works less well for smaller firms. Even for the lowest size quintile, our coefficient in the lowest risk decile is 0.50 which is well above their 0.16 (see their table 6).

The negative relationship between the coefficient on the financing deficit and asset risk is stronger for smaller firms (except in the smallest size quintile). This indicates that our model has most bite for medium sized firms.

The descriptive statistics in table 2 also shows that firms in higher deciles are younger. Although we are not aware of any study that uses age as a variable explaining capital structure, it is reasonable to think of firm age as an imperfect proxy for firm risk similar to firm size. We therefore repeat the above robustness check and now sort firms first by age and then by asset risk. Table 8 shows that the results are very similar to the sorting by size.

Table 8: The standard pecking order across age and risk quintile

Figure 3 plots the coefficient on the financing deficit as a function of asset risk in each age group.

Figure 3: The standard pecking order across age and risk quintile

Again, we see that for all age groups, the standard pecking still works best in the lowest risk decile. Moreover, in each age group we observe the monotonic negative relationship between the coefficient on the deficit and asset risk. The difference across age groups is that the coefficient is lower and the negative relationship is stronger for younger firms.

Are the results valid only for a specific period?

Frank and Goyal (2003) argue that the result of Shyam-Sunder and Myers (1999) is not only driven by the requirement of having data with no reporting gaps but also by the time period they consider, i.e. 1971-1989. In a subsample of firm with no reporting gaps from 1990-1998, Frank and Goyal find only weak support for the pecking order. The coefficient on the financing deficit drops to 0.33. If they allow for reporting gaps, it drops even further to 0.15.

We examine whether the sample period matters for our results. In particular, we ask: is the support for hypothesis 1 and 2 different in the 1970s, 1980s or 1990s? Table 9 shows the results from running (8) across risk deciles in each decade separately. Figure 4 plots the estimated coefficients on the financing deficit.

Table 9: Pecking order across risk deciles in the 70s, 80s and 90s

Figure 4: Pecking order across risk deciles in the 70s, 80s and 90s

The standard pecking order still works best in lowest risk (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 for all firms during the 1990s. Once we recognize that the standard pecking order should only work well for firms with the lowest asset risk, we do not find support for the claim that the standard pecking order is driven by the 1970s.

The monotonic negative relationship between the coefficient on the financing deficit and asset risk is present in all decades. Note that it grows *stronger* as we look at more recent decades.

Alternative explanation: market timing?

The descriptive statistics across asset risk deciles (table 2) show that firms in higher risk deciles have a higher market to book ratio. A possible alternative explanation for the equity issuance of riskier firms is that those firms time the equity market, i.e. they issue equity when their market valuation is high (Baker and Wurgler (2002)).

Our result however was not that firms in higher risk 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 only explanation, then the firms in higher risk deciles should issue equity irrespective of their need for external capital. This is clearly not the case.

Moreover, the median net equity issue across deciles is zero (or close to zero). This indicates that firms contact the equity market rarely. Under market timing, we would expect firms in the highest risk decile, i.e. those with the highest market to book ratio, to issue equity more frequently. 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 other indications that market timing cannot explain our results.[17] First of all, firms in higher risk deciles also issue more debt. This is inconsistent with firms' equity being overvalued, unless for some reason, debt is overvalued too. Second, the regression of net debt issues on conventional leverage variables (table 5) does not support market timing. The regression showed that the negative relationship between net debt issues and the market-to-book ratio *weakens* in higher risk deciles.

To control for the market-to-book ratio, we rank firms first by their market-to-book ratio and then by asset risk. Again, we use quintiles to ease the presentation of the results in Table 10 and figure 5.

Table 10: The standard pecking order across market-to-book and risk quintiles

Figure 5: The standard pecking order across market-to-book and risk quintiles

The result of controlling for the market to book ratio is very similar to the result of controlling for size or age. The standard pecking order still works best in the lowest risk

[17] Frank and Goyal (2003b) find that stock market conditions matter but that the effect is not very strong. They also find that when the market as a whole rises, firms *increase* their leverage.

quintile. The coefficient on the financing deficit is above 0.80, except in the highest market-to-book quintile. The negative monotone relationship between the coefficient on the financing deficit and asset risk for all market to book quintiles, but it is strongest for firms with medium market-to-book ratios.

Alternative explanation: variation in debt capacity?

In this section we will consider the argument that if one "augments" the standard pecking order using the notion of "debt capacity", it is also possible to explain our results. The argument is that firms in higher asset risk deciles have a lower debt capacity and therefore issue more equity. We challenge this argument on several grounds.

First of all, there is no theoretical justification for such an augmentation of the adverse selection logic. Theories of debt capacity, so called trade-off theories of leverage, are outside the adverse selection paradigm (see also the classification of capital structure theories in Harris and Raviv (1991)). 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 (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. Another classic explanation of debt capacity is Myers (1977) agency cost of debt, the 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 debt is serviced.

But since these concepts of debt capacity have little in common with the adverse selection logic of the pecking order, combining them in empirical studies often seems ad-hoc. For example, Shyam-Sunder and Myers (1999) argue that "if costs of financial distress are serious, the firm will consider issuing equity to finance real investments or pay down debt".[18] Lemmon and Zender (2002) take up this statement by saying "this […] suggests that costs of adverse selection are dominant for moderate capital structures but that tradeoff theory forces become primary motivators of capital structure at the extremes. We take an agnostic view, assuming that such debt levels exist for each firm but do not seek to specify then underlying determinants of debt capacity"

Our approach keeps the logical purity and simplicity of the original adverse selection logic that drives the standard pecking order. In fact, we could reinterpret our model in terms of an information based debt capacity. If there is little asymmetric information about risk relative to value then the debt capacity of investment opportunities is high. If the is a lot of asymmetric information about risk relative to value, then their debt capacity is low.

Besides being theoretically unappealing, our empirical evidence offers little support for augmenting the standard pecking order with a trade-off view of debt capacity. When we compared balance sheets and cash-flows across risk deciles (table 2), we found that firms in higher risk deciles issue *more* debt (but they issue even more equity). Moreover, the level of long-term debt relative to book assets decreases in higher risk deciles. This suggests that firms in higher risk deciles do not have extreme levels of leverage. Neither profits nor the probability of bankruptcy vary monotonically across risk deciles. This suggests that the trade-off between the tax benefit and the distress cost of debt cannot account for the monotonic pattern of the coefficient on the financing deficit in figure 3.

[18] Graham (2000) and Lemmon and Zender (2001) find that a large fraction of firms seem to forgo large tax benefits associated with debt financing. At the same time, there is little evidence of sizable bankruptcy costs.

Finally, the proportion of tangibles (property, plant and equipment) and intangibles relative to assets is roughly constant across risk deciles. Together with the weakening of the negative relationship between changes in the market-to-book ratio (usually taken as a proxy for growth options) and net debt issues in table 5, this shows little support for the debt overhang view of debt capacity.

Conclusion

The starting point for our analysis is the empirical puzzle that the 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.

We argue that the original pecking order is an extreme when there is only asymmetric information about value. Our model illustrates how considering asymmetric information about both, value *and risk*, transforms the adverse selection logic into a theory of debt *and equity*. The main prediction is that firms issue more equity and less debt if there is more asymmetric information about risk relative to value. If small young nonpayers of dividends (our high risk firms) face more asymmetric information about risk relative to value than large mature firms, our model offers an explanation of the initial puzzle.

To test our prediction in more detail, we follow the empirical strategy of Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) who propose to test the standard pecking using a pooled panel regression of changes in debt on the financing deficit. The argument is that the original pecking order predicts that firms issue debt whenever their internal cash flows are insufficient to finance real investments (and other uses of funds such as dividends).

The key to our analysis is that we test the comparative statics of our theory by ranking firms in deciles according to their past asset risk. The argument is that an investor worries a lot more about not knowing the risk relative to the value of an investment if the firm that approaches him has had volatile assets in the recent past. The past asset risk is computed as the standard deviation of the daily market return on assets over the calendar year prior to a debt or equity issue. We use daily stock price data from CRSP in order to obtain a measure for risk that is more precise than proxies such as size or the volatility of earnings.

The combination of a risk augmented adverse selection logic of capital structure and a precise measure of risk allows us, to document for the first time (to our knowledge) a convincing impact of risk on capital structure.

We confirm the robustness of our results in a number of ways. First of all, we test a series of hypothesis. If our model is misspecified and/or if our theory is wrong, we argue that it would be very difficult to find a source or misspecification that delivers the same comparative statics as our (now supposedly incorrect) model. Other robustness checks include testing for correlation of residuals across firms and time, including the set of conventional leverage variables from trade-off theories, considering different time periods and using other controls for risk.

Appendix

Variable definitions

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.

Variables using in trimming

In order to remove outliers and extremely 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 our 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 each firm of our sample in that year.

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[19]	0.022	0.024	-0.011	-0.022
-Internal cash flow[1]	0.099	0.106	0.044	0.000
+Investments[1]	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[20] (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

[19] Definitions follow Frank and Goyal (2003). See appendix for details.
[20] Equals book value of debt plus market value of equity. Definitions follow Fama and French (2002).

Table2

Balance sheets, cash flows and other descriptive statistics across risk deciles

The table reports average balance sheets, cash flow items and other descriptive statistics for each risk decile. Firms are ranked in deciles according to daily standard deviation of the 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 risk decile.

Risk decile	1 (Safe)	2	3	4	5	6	7	8	9	10 (Risky)
Number of observations	10426	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

Risk decile	1 (Safe)	2	3	4	5	6	7	8	9	10 (Risky)
Number of observations	10426	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[21]	0.066	0.074	0.081	0.088	0.094	0.097	0.098	0.096	0.093	0.086
+Change in working capital[1]	0.004	0.008	0.011	0.013	0.015	0.019	0.020	0.019	0.004	-0.035
-Internal cash flow[1]	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[22] (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 S&P Domestic issuer credit rating	BB+	BBB	BBB	BBB	BBB-	BB	BB-	B+	B+	B+
Median modified Z-score[23]	1.797	2.126	2.291	2.369	2.402	2.374	2.278	2.109	1.712	0.658

[21] Definitions follow Frank and Goyal (2003). See appendix for details.
[22] Equals book value of debt plus market value of equity. Definitions follow Fama and French (2002).
[23] 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).

Table 3
Standard and reverse pecking order across risk deciles

Pooled panel OLS regressions of net debt issues *ΔD* and ΔE on the financing deficit *DEF* are estimated for each decile: $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$, $\Delta E_{it} = a + bDEF_{it} + \varepsilon_{it}$
Ranking based on the daily standard deviation of 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 *italic*. All coefficients on financial deficit are significant at the 1 % level.

Panel A: Dependent variable - Net debt issued

rank	1 (Safe)	2	3	4	5	6	7	8	9	10 (Risky)
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

rank	1 (Safe)	2	3	4	5	6	7	8	9	10 (Risky)
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

Standard and reverse pecking order across risk 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: $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$, $\Delta E_{it} = a + bDEF_{it} + \varepsilon_{it}$ .The figure plots coefficients on financial deficit and adjusted R-squared for each risk decile.

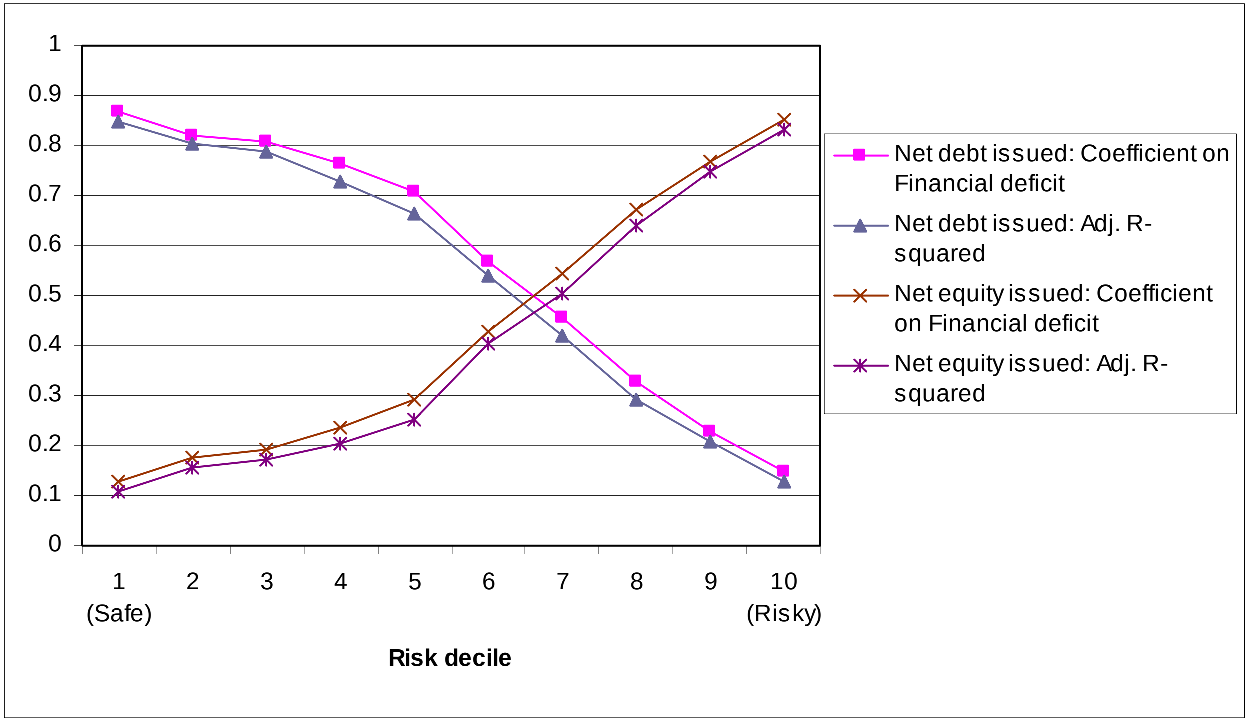

Table 4

The standard pecking order across risk deciles: Fama-McBeth procedure

Firms are ranked into deciles according to daily standard deviation of market value of assets in the previous calendar year. The regression $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$ is estimated for each decile/year combination. The table reports, for each decile, time-series means of cross sectional regression intercepts and slopes, their time-series standard errors (in italic) and t-statistics. All coefficients on financial deficit are significant at the 1 % level.

Risk decile	1 (Safe)	2	3	4	5	6	7	8	9	10 (Risky)
Intercept	-0.004	-0.002	-0.001	-0.002	-0.003	-0.004	-0.005	-0.005	-0.005	-0.004
Standard Error	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
t(Mn)	-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
Standard Error	*0.012*	*0.015*	*0.016*	*0.015*	*0.023*	*0.034*	*0.040*	*0.049*	*0.050*	*0.044*
t(Mn)	72.570	56.658	51.779	53.221	32.862	19.494	14.940	10.611	8.537	6.962

Table 5
Regression of net debt issues on conventional variables across risk deciles.

The regression $\Delta D_{it} = a + b_{DEF} DEF_{it}$

$$+b_{TANG}\Delta TANG_{it} + b_{MTB}\Delta MTB_{it} + b_{PROF}\Delta PROF_{it} + b_{LOGSALES}\Delta LOGSALES_{it} + \varepsilon_{it}$$

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 book value of assets. Firms are ranked into deciles according to daily standard deviation of market value of assets in the previous calendar year. OLS standard errors reported below the coefficients.

Risk decile	1 (Safe)	2	3	4	5	6	7	8	9	10 (Risky)
Intercept	-0.002	0.000	0.001	0.004	0.005	0.005	0.007	0.010	0.013	0.013
	0.001	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
Δ Tangibility	0.001	0.015	-0.088	-0.029	0.016	0.041	0.041	0.024	0.089	0.069
	0.016	*0.016*	*0.016*	*0.016*	*0.016*	*0.015*	*0.014*	*0.014*	*0.012*	*0.011*
Δ Market-to-Book	-0.014	-0.015	-0.012	-0.018	-0.014	-0.009	-0.008	-0.005	-0.002	-0.003
	0.003	*0.003*	*0.002*	*0.002*	*0.002*	*0.001*	*0.001*	*0.001*	*0.001*	*0.000*
Δ LogSales	0.058	0.094	0.099	0.073	0.068	0.063	0.049	0.034	0.022	0.021
	0.003	*0.004*	*0.004*	*0.003*	*0.003*	*0.003*	*0.003*	*0.002*	*0.002*	*0.002*
Δ Profitability	-0.177	-0.319	-0.305	-0.200	-0.173	-0.138	-0.090	-0.073	-0.026	-0.011
	0.014	*0.014*	*0.014*	*0.011*	*0.010*	*0.009*	*0.007*	*0.007*	*0.005*	*0.004*
Adj. R-squared	0.043	0.093	0.087	0.072	0.069	0.061	0.047	0.032	0.019	0.028
Number of Observations	9893	9996	10046	10023	10043	10032	10040	9959	9869	9559

Table 6
Regression of net debt issues on conventional variables and financing deficit across risk deciles.

The regression $\Delta D_{it} = a + b_{DEF} DEF_{it}$

$$+ b_{TANG} \Delta TANG_{it} + b_{MTB} \Delta MTB_{it} + b_{PROF} \Delta PROF_{it} + b_{LOGSALES} \Delta LOGSALES_{it} + \varepsilon_{it}$$

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 market value of assets in the previous calendar year. OLS standard errors reported below the coefficients.

Risk decile	1 (Safe)	2	3	4	5	6	7	8	9	10 (Risky)
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 7
Standard pecking order across size and risk quintiles

The regression $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$ is estimated for each size/risk group. The table reports coefficients on financial deficit from pecking order regressions of net debt issued on 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 market value of assets during the previous calendar year. OLS standard errors reported below the coefficients in *italic*.

Risk quintile	1 (Safe)	2	3	4	5 (Risky)
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 2
Standard pecking order across size and risk quintile

The regression $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$ is estimated for each size/risk 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 market value of assets during the previous calendar year. The figure plots coefficients on financial deficit for the size quintiles.

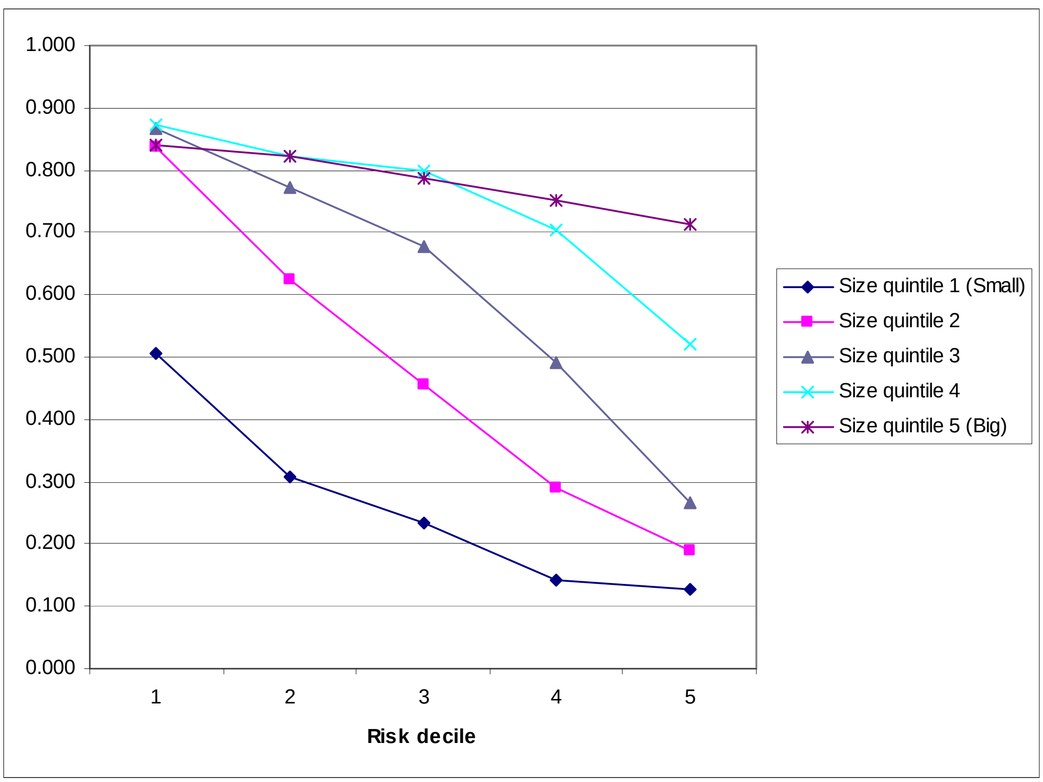

Table 8
Standard pecking order across age and risk quintile

The regression $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$ is estimated for each age/risk group. The table reports coefficients on financial deficit from pecking order regressions of net debt issued on 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 market value of assets during the previous calendar year. OLS standard errors reported below the coefficients in *italic*.

Risk quintile	1 (Safe)	2	3	4	5 (Risky)
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 3
Standard pecking order across age and risk quintile

The regression $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$ is estimated for each age/risk 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 market value of assets during the previous calendar year. The figure plots coefficients on financial deficit for the age quintiles.

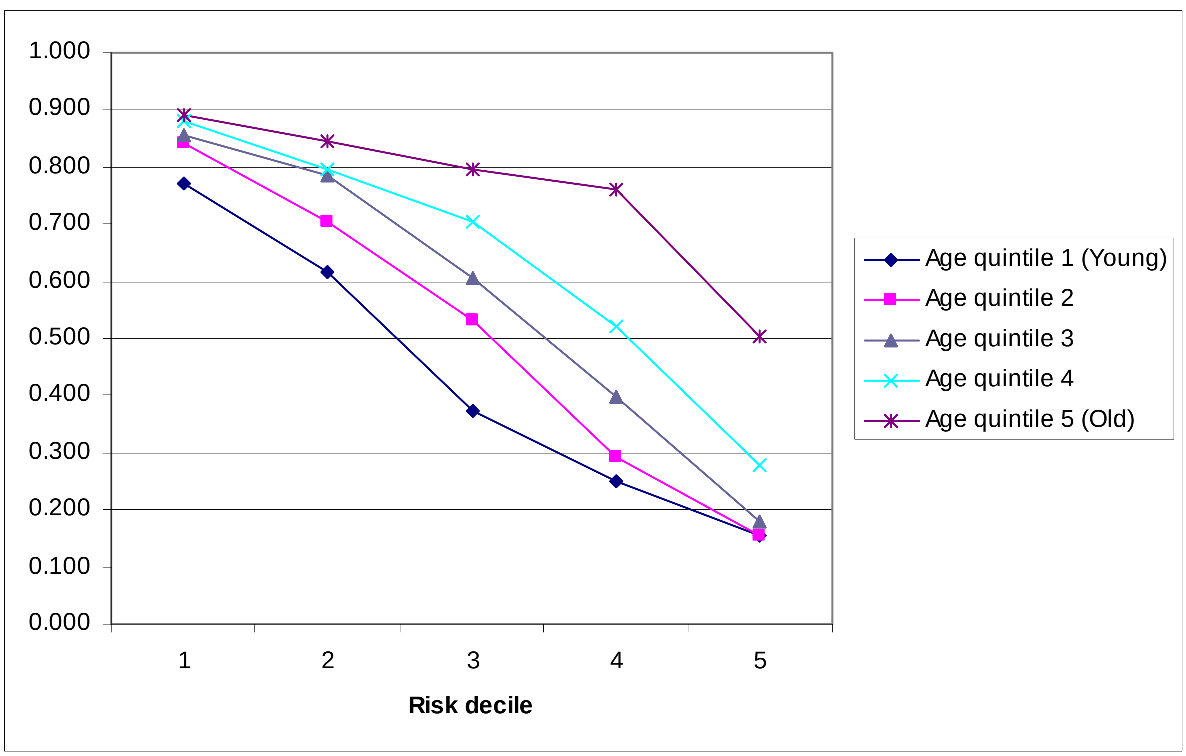

Table 9

Pecking order across risk 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: $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$. Ranking based on the daily standard deviation of 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 *italic*. All coefficients on financial deficit are significant at the 1 % level.

Panel A: 1971-1980

Risk decile	1 (Safe)	2	3	4	5	6	7	8	9	10 (Risky)
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

Risk decile	1 (Safe)	2	3	4	5	6	7	8	9	10 (Risky)
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

Risk decile	1 (Safe)	2	3	4	5	6	7	8	9	10 (Risky)
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 4
Pecking order across risk 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: $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$. Ranking based on the daily standard deviation of 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 *italic*. All coefficients on financial deficit are significant at the 1 % level.

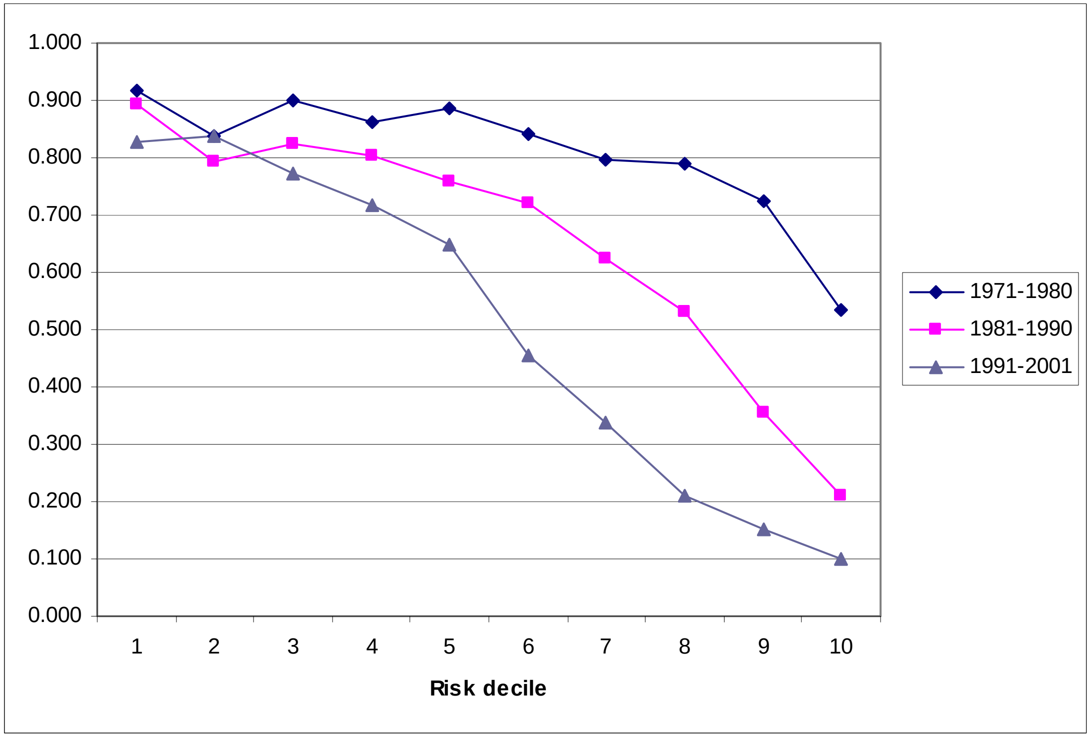

Table 10
Standard pecking order across market to book and risk quintiles

The regression $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$ is estimated for each size/risk group. The table reports coefficients on financial deficit from pecking order regressions of net debt issued on financial deficit. Firms are sorted in quintiles according to market-to-book ratio ((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 market value of assets during the previous calendar year. OLS standard errors reported below the coefficients in *italic*.

Risk quitile	1 (Safe)	2	3	4	5 (Risky)
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 5
Standard pecking order across market to book and risk quintiles

The regression $\Delta D_{it} = a + bDEF_{it} + \varepsilon_{it}$ is estimated for each size/risk group. Firms are sorted in quintiles according to market-to-book ratio ((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 market value of assets during the previous calendar year. The figure plots coefficients on financial deficit for the market-to-book quintiles.