Debt Financing and Initial Public Offerings

Abstract

We examine the effects of debt financing on initial public offerings (IPOs) of common stock using data on more than 6,000 IPOs during the period 1980-2002. We show that the characteristics of firms with high levels of debt financing are consistent with less uncertainty about firm value, and we find that debt financing is associated with significantly lower levels of underpricing of IPOs. Our results support the James and Wier (1990) theory that borrowing should have the effect of reducing underpricing. The results also confirm the James and Wier theory that as the level of debt financing increases, the degree of underpricing declines, a result that was not obtained in the empirical tests of James and Wier for the period 1980-1983. We also document that the characteristics of firms with debt financing are very different from those with venture capital financing, consistent with the theory of Ueda (2004). We find that the effects of debt financing differ over time and that firms with high levels of debt financing had much lower initial returns than low-debt firms during times of greater valuation uncertainty, especially during the bubble period of 1999-2000. We also examine the effects of debt financing on the long-term performance of firms following their IPOs. We find that higher levels of debt financing are associated with negative long-run performance, especially for firms without venture capital backing. We find these results using calendar time analyses that avoid pseudo-market timing effects and after taking into account the effects of size, book-to-market, and systematic risk.

Debt Financing and Initial Public Offerings

There have been numerous studies of initial public offerings (IPOs), but few have examined the role and effects of debt financing on the process of going public. James and Wier (1990) examine data over 1980-1983 and show that companies that have borrowing relationships when they go public tend to have lower initial returns (or, less underpricing) than firms without such relationships. Using a large sample of more than 6,000 IPOs during 1980-2002, we demonstrate that the effects of debt backing continue through recent times and in fact have become much stronger in recent periods. We also show, in contrast to James and Wier's results for the period 1980-1983, that larger amounts of debt (as a percentage of total assets) are associated with even larger reductions in underpricing since the 1990s. For the full period of our sample, firms in the highest quartile of debt financing averaged 18.3% lower first day returns than firms in the lowest quartile of debt financing. During the bubble period of 1999-2000, the difference was more than 40%.

We also contrast the underpricing of debt-backed and venture capital-backed IPOs. Ueda (2004) hypothesizes that venture capital-backed firms should have comparatively low collateral, high risk, high growth prospects, higher expected returns, and larger size than firms backed by bank debt. Our examination of firms without venture capital backing and with high debt financing, in contrast with venture-backed firms with low debt, generally confirm the expectations of her theory. The one exception is that the debt-backed firms tend to have larger size when measured by assets or revenues (but not when measured by market capitalization following their IPOs). We find that debt-financed firms had generally lower initial returns than venture capital-backed

firms, especially during the bubble period of 1999-2000, a period when venture-backed firms had very high initial returns. During that period, firms with venture capital backing and low debt financing averaged more than 60% higher initial returns than firms with high debt levels but without venture backing.

We also examine the effects of debt financing on the long-term performance of IPO firms. Brav and Gompers (1997) show that the negative long-term performance of IPOs (first identified by Ritter (1991)) is primarily associated with small firms that do not have venture capital backing. We find that firms with substantial debt financing tend to have especially low performance. Furthermore, we show that the firms characterized by Brav and Gompers as small (in market capitalization) and without venture capital are generally also firms with high debt financing. Thus, the characteristics of firms with extensive debt financing help to account for both the lower underpricing of such firms at the IPO and their negative, long-term performance following the IPO.

Lenders tend to examine carefully the safety associated with firms to which they make substantial loans. Unlike venture capitalists, the lenders do not generally share in the upside in equity value from the companies they finance, and so their tendency is to provide backing to firms with characteristics that make the lending relatively safe as opposed to characteristics focused upon high potential equity returns. Accordingly, we would expect firms with high levels of debt financing to have relatively large quantities of assets suitable for use as collateral, to show less volatility, and to be comparatively easier to value. These characteristics tend to be associated with less valuation uncertainty and, therefore, less underpricing at the IPO stage (see, for example, Rock (1986)). Those same characteristics may be associated with lower upside potential in equity value and

hence lower long-term equity performance on average. Our empirical results are consistent with both the IPO performance and aftermarket performance associated with the characteristics of major borrowers.

The remainder of the paper proceeds as follows: Section I provides a discussion of debt financing and the characteristics of firms that receive substantial debt backing. It also reviews key literature related to debt-backed and venture-backed firms and their performance during and following their IPOs. Section II describes the data examined in our study. Section III provides results on debt financing and the performance of debt-backed firms at the IPO stage. It also examines different periods of data and finds quite different results across time for some characteristics. Section IV provides results on the long-term performance of debt-backed and venture capital-backed firms and examines the effects of including adjustments for market, size, and book-to-market effects. Section V provides a summary of the main results of the paper and the conclusions derived from those results.

I. Debt Financing and Venture Capital Backing

When companies issue common stock in their initial public offerings, there is uncertainty on the part of the market about the value of the company. There may also be substantial information asymmetry between the firm and the market because of the limited disclosure that private firms are subject to, because of their relatively young age, and because of their lack of an established reputation in the public markets for debt and equity. In obtaining debt financing before going public, such companies have to provide information about their assets and operations, and the lenders then are able to serve a role

of "certifying" the company prior to its IPO. Moreover, lenders can take on a role of monitoring since they often have the ability to make choices about whether to renew maturing debt, and those choices may depend on the quality of the firm's investment choices, operating performance, and financial results. In fact, the monitoring role of bank or private lending can serve further to certify the quality of the offering.

Many prior studies have suggested that financial intermediaries help resolve problems of information asymmetry and moral hazard. Leland and Pyle (1977), Boyd and Prescott (1986), and Diamond (1984) emphasize the advantages of financial intermediaries in monitoring costs relative to other market participants. Campbell and Kracaw (1980), contrary to Leland and Pyle, argue that not just banks, but any market participant with large investments at stake can resolve problems of moral hazard. However, Fama (1985) hypothesizes that private lenders are better monitors not only because of their intrinsic organizational advantages but also because of their access to proprietary information about the borrower as a result of their on-going business relations. Thus, because of such informational advantages, banks are likely to have a competitive advantage in monitoring relative to other investors. We hypothesize that, all else equal, the incentive to monitor should be an increasing function of the amount of lending. Chemmanur and Fulghieri (1994) emphasize the banks' desire to establish reputations for making the right liquidation/renegotiation decision if the borrower is distressed, which induces them to invest in monitoring. Empirically, Mikkelson and Partch (1986), James (1987), and Lummer and McConnell (1989) find support for these theories by documenting positive announcement returns for bank loans, unlike other financing sources. Datta, Datta, and Patel (1999) document significantly lower costs of

debt for initial public bond issues for the firms with existing bank debt financing, controlling for other factors. Billett, et al. (2005), on the other hand, find long-term underperformance after bank loan announcements for already-public firms, and they interpret their evidence as contrary to the hypothesis that banks help resolve problems of information asymmetry.

Beunza and Garud (2005) argue that creditors face very different exposure than stockholders in the companies in which they invest. They face a large downside risk if the firm does not perform well and very limited upside potential, as the residual claims are earned by stockholders. Thus, they argue that creditors and debt analysts are more concerned about the potential downside risk than are shareholders and equity analysts.

James and Wier (1990) examine the role of borrowing relationships in the process of going public. Based on some of the above theories, they argue that "borrowing from intermediaries can reduce information costs for all of a firm's claimants by providing a credible signal about the firm's creditworthiness." They also argue that the monitoring effects of lenders can reduce agency costs associated with conflicts between insiders and outsiders. James and Wier develop a model of the IPO process that demonstrates that debt-financed firms can experience less underpricing (lower first-day returns) than firms without such financing, and their empirical results support that conclusion.

Ueda (2004) examines the comparative roles of banks versus venture capitalists in evaluating private companies. Her theory hypothesizes that venture capitalists are more adept at assessing the projects of entrepreneurs and therefore that there would exist greater information asymmetry between banks and borrowers as opposed to venture capitalists and the companies they back. This conclusion is consistent with Chan (1983),

who argues that venture capitalists can screen projects and increase welfare in a world with high information asymmetry.

In Ueda's model, to overcome the effects of information asymmetry lenders would tend to back companies with higher levels of collateral, lower risk, lower prospective returns and lower growth rates. She also concludes that the venture capitalists would tend to back larger firms. Thus, her model suggests that the characteristics of debt-backed companies, in contrast with venture capital-backed companies, would tend to result in lower uncertainty about the value of the firm. Myers (1977) hypothesizes that firms with high growth options will sometimes forego valuable (i.e., positive net present value) investments if they are financed with debt. This suggests that high-growth firms may be more likely to avoid debt financing. This is consistent with Ueda's hypothesis that debt-backed firms may have lower growth rates.

Building in part on Chemmanur and Fulghieri's (1994) results, Schenone (2004) examines firms that go public and have relationships with their underwriters prior to their IPO. Within the set of such relationships, she examines specifically firms that have lending relationships with their investment banks. She concludes that the lending relationship can reduce information asymmetries, and that such reduction is associated with lower underpricing.

The literature on lending relationships and IPOs generally focuses only on the initial returns, or underpricing, of the firms and not on their long-term performance in the aftermarket following the IPO. Eckbo and Norli (2005) examine long-run performance in relation to both liquidity (measured as stock turnover) and leverage. They conclude that both lower liquidity and lower leverage lead to lower expected returns on companies

following their IPOs. Eckbo and Norli argue that IPO firms in general tend to have relatively low leverage. As a result of the low leverage, they argue, the firms tend to have relatively lower exposure to risk factors. For example, equity betas within the Capital Asset Pricing Model are an increasing function of leverage. Therefore, all else equal, low-debt firms would tend to have low betas. The conclusion of Eckbo and Norli is therefore that some of the low, long-term performance of IPO firms is accounted for by their relatively low debt levels. Our results differ from that conclusion.

As previously mentioned, Ueda (2004) examines the contrast between characteristics of venture capital-backed versus debt-backed firms. Just as the presence of significant debt financing can provide a positive signal to the market about the value of a firm that is going public, Barry, Muscarella, Peavy and Vetsuypens (1990) and Megginson and Weiss (1991) examine the role of venture capital in IPOs. Barry, et al., describe the certification role that venture capitalists can offer to the process of going public, and Megginson and Weiss show that underpricing for venture-backed IPOs tends to be lower than that of firms without venture backing. Both studies are based on pre-1990s data. In contrast, Loughran and Ritter (2004) find average initial returns for venture-backed IPOs during the Internet bubble of 1999-2000 to be 82.2% as opposed to the 38.5% they find for firms without venture backing. In regressions of initial returns against a variety of explanatory variables, they find that their venture capital dummy variable is highly insignificant during the 1980-1989 period, negative during the 1990-1998 period (and significant at the 10% level), and highly positive (21.48%) and significant during the bubble period.[1]

[1] Since venture capitalists frequently backed Internet companies and since Internet stocks were especially prone to have high initial returns during the bubble period, it is not surprising that venture-backed IPOs

Ritter (1991) shows that IPO firms tend to have negative aftermarket performance over the three-to-five years following their IPOs. Much work that followed Ritter's continues to find negative aftermarket performance for IPO firms compared to market indices and to matched samples based on size, industry, and other characteristics of the IPO firms.[2]

Brav and Gompers (1997) investigate the aftermarket performance of IPO firms and conclude that venture capital-backed firms do not tend to have negative aftermarket performance following their IPOs. In reaching their conclusions, they account for size and book-to-market effects, which explain some of the negative performance previously observed. Brav and Gompers, however, do find negative aftermarket performance for small firms without venture capital backing. They describe small firms as those with market capitalizations below $50 million. Given that Ueda (2004) hypothesizes that venture capitalists tend to finance larger firms than those backed by debt financing, it is interesting to investigate further the relation among venture capital backing, debt financing, and the size of firms that are going public.

Billett, Flannery, and Garfinkel (2005) examine bank loans associated with already-public companies. They find that although bank loans are associated with positive announcement returns for the common stock of the borrowing firms, they tend to be followed by negative abnormal returns over the subsequent three years. Our results on

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would have higher initial returns during that period. However, Loughran and Ritter account for the Internet stock effect in their regressions (see Table V of their paper) and nevertheless find a large effect on initial returns associated with venture capital.

[2] Schultz (2003) demonstrates that the empirical methods often applied in examining long-run performance can lead to "pseudo market timing" that can explain much of the negative aftermarket performance observed for IPOs.

the long-term performance of firms with relatively high debt financing are consistent with their results on existing public firms that receive bank financing.

In this paper, we examine the characteristics of IPO firms with a wide range of levels of debt financing. We examine the effects of such financing on the initial returns of such firms, and we also examine their long-run performance. We identify firms with venture capital backing and varying levels of debt financing and contrast them with firms with varying levels of debt financing but without venture capital backing. First, we provide background on the data employed in our study.

II. Data

We use IPO data generously provided by Jay Ritter and used in Loughran and Ritter (2004).[3] Our sample starts with a list of 8,097 IPOs of common stock in the US during the period 1980-2002. The list contains data on offer date, firm identity, firm founding date, Carter-Manaster underwriter ranks, an indicator of venture capital backing, and a variable indicating whether the firm was Internet-related. We match the IPOs with firm and deal characteristics from Thomson Financial's SDC New Issues database. We exclude American Depository Receipts (ADRs), closed-end funds, real estate investment trusts (REITs), financial institutions (those in SIC codes 6000-6999), unit offerings, and IPOs with an offer price below $5.00 per share. We also require that the Center for Research in Securities Prices (CRSP) reports stock returns within one calendar month of the offering. The described procedure results in 6,147 IPOs.

[3] Some of the data were provided to Ritter by Laura Casares Field and was used in Field and Karpoff (2002).

We also add financial data from Compustat on the characteristics of the firms in the sample. We are able to obtain firm-level data from Compustat for 5,475 firms for the fiscal year ending prior to the IPO (year -1) and 5,835 firms for the fiscal year of the IPO (year 0). The variables based on Compustat data are measured as of the end of the last fiscal year prior to the IPO, with the exception of the market-to-book ratio, which is measured, following Brav and Gompers, using market value of equity at the IPO and book equity from the end of the fiscal year of the IPO. Due to the presence of extreme outliers, the following variables are Winsorized: total and long-term debt to total assets, at the 99th percentile, net profit margin, EBITDA/Total assets, EBITDA to sales, and operating cash flows to total assets, at the 1st and 99th percentile. The number of observations with specific variables changes due to data availability. Dollar levels throughout the paper are adjusted for inflation using the monthly CPI obtained from the FRED database, and are presented in December 2002 constant dollars.

Table I presents a description of the sample. The number of annual observations closely tracks that in Loughran and Ritter (2004). We calculate the initial day return as the percentage difference between the CRSP closing price on the first day for which prices are reported and the IPO offer price, reported by SDC. The results indicate unusually high initial returns in the 1999-2000 period of the Internet bubble. We calculate the ratio of total debt (or long-term debt) to total assets by excluding the amount of convertible debt that may be provided by equity investors, and thus, not playing the monitoring and certification role about which we hypothesized previously. During that period, the average debt-to-assets ratios (total debt or long-term debt) were the lowest

they had been in any year except for 1982, a year during the latter part of a recession and a period when interest rates were among the highest they have even been in the U. S.[4]

The years 1999-2001 also showed the highest percentages of venture-backed IPOs during the entire period of our sample. In 2001, after the Internet bubble burst (i.e., after the collapse of Internet stock indices), companies that went public were the largest in history, measured by revenues, issue size, or total assets. However, the last year of the Internet bubble, 2000, captured the largest average market capitalization of any year in the history of IPOs.

We also observe a pattern of decreasing firm age at the IPO across time from the start of our sample through the 1999-2000 period (not tabulated). Following the 1999-2000 bubble, the age of the average firm going public again rose compared to the average age during the bubble period.

III. Debt Financing and IPO Underpricing

Table II begins our examination of debt financing and IPO results. It also provides comparisons with venture capital backing. The results for leverage are broken down into four quartiles of debt, measured as long term debt plus current liabilities minus convertible debt divided by total assets. The first quartile provides results for the firms with the lowest Total Debt-to-Total Assets (debt-to-assets) ratios, and the fourth quartile encompasses those with the highest ratios. Venture capital results are based on a venture capital dummy variable, with the value "1" indicating venture backing, "0" otherwise.

[4] In 1981 and 1982, the Federal Reserve Bank of Saint Louis interest rate database (FRED) shows average annual AAA bond interest rates at levels of around 14%. In February 1982, they reached 15.27%, the highest rate in U. S. history. But 1981-1982 had debt levels (as a per cent of assets) for IPO firms at about the same level as in 1999-2000. However, AAA bond rates in 1999-2000 averaged about 7.33%. Thus, the low debt levels during the Internet bubble do not appear to be driven by interest rates.

Later results will also include the combination of venture capital and debt for firms since most venture-backed IPO firms have low debt ratios but some have high levels of debt. Table III provides tests of differences in such characteristics for firms that have venture capital backing and relatively low debt (quartiles 1 and 2) versus firms without venture backing but high debt (quartiles 3 and 4).

A. Characteristics of Debt-Financed and Venture-Backed IPO Firms

The debt-to-assets ratios run from an average value of about 2% for the first leverage quartile to about 78.5% for the fourth quartile. Thus, there are extreme differences in debt financing among the firms in the sample. For the entire sample (1980-2002), average and median initial returns are much lower for the firms with high debt levels than for those with low levels. This result is in contrast to results in James and Wier (1990) in which they found for the period of their sample, 1980-1983, that increasing levels of debt were not associated with differences in initial returns, although they did find that firms with debt financing had lower initial returns than those without debt financing. We also observe that venture capital-backed firms had much higher average and median initial returns than those without venture capital backing. That result holds for the full sample period, but as we will show later it also varies across subperiods of the sample.

In contrast with the conclusions of Ueda (2004) regarding venture financing versus debt financing and firm size, firms in the high-debt quartiles (quartiles 3 and 4) had much larger size (as measured by sales or assets) than did the lower-debt firms. That was also true of firms without venture capital backing compared to those with venture

backing. However, measuring size by market capitalization, the results are reversed and are then in agreement with Ueda's conclusions about size.

Table III provides tests of the differences in size characteristics for venture-backed, low-debt firms against non-venture-backed, high debt firms. The results near the top of the table provide comparisons for total assets, sales levels, and market capitalization (all measured in 2002 dollars). As the results show, the VC-backed, low-debt IPO firms have much lower levels of total assets and sales than do the non-VC-backed, high-debt firms. The differences are strongly significant whether the tests are based on differences in means (using t-scores) or based on the Wilcoxon test of the full sample results. On the other hand, our other size measure, market capitalization, is much higher for the VC-backed, low-debt firms than for the non-VC-backed, high-debt firms. These results confirm the significance of the differences observed in Table II but contrast venture capital-backed firms with low debt against high debt firms without venture capital backing.[5]

James and Wier (1990) argue that one reason for lower initial returns by debt-financed IPO firms compared to others is that debt-backed firms have lower levels of intangible assets. They argue that, "Perverse investment incentives are especially troublesome for firms with mostly intangible assets," and they argue that the growth options associated with intangible assets are likely to be associated with greater uncertainty about firm value. One way to measure the relative level of tangible assets is

[5] In Table III, we augment the analysis from Table II by reporting the joint effect of VC backing and debt use on initial return and the associated firm characteristics. We only report the two biggest contrasts as the most illustrative of this effect. The two groups that we do not report, i.e., the firms with VC-backing and high debt use, and the firms without VC backing and with low debt use, generally fall between the groups for which we reported results. Those two groups generally confirm the effects observed in the two extreme contrasts. For example, among the firms with VC backing, those with high debt have lower initial returns than those with low debt.

to use the ratio of Property, Plant and Equipment (PPE) divided by Total Assets (TA). PPE indicates a level of investment in real, hard assets that are especially suitable for collateral. The results in Table II show that high-debt firms have much higher levels of the PPE/TA ratio than firms with low debt, which is consistent with the idea that high debt levels require greater levels of collateral.[6]

Table III provides tests of the collateral and intangible levels for high debt firms without venture capital backing against venture-backed firms with relatively low debt. The PPE/TA ratio is about twice as high for the non-VC-backed, high-debt subset than for the VC-backed, low-debt subset, and the difference is highly significant. Thus, heavily debt-financed firms (without venture backing) have high levels of PPE assets that are useful for collateral.[7]

Consistent with James and Wier's conjecture about the uncertainty about firm value associated with high growth options, in Table II we show that Market-to-Book ratios are higher for firms with low debt levels than for firms with high levels of debt and for venture-backed firms than for firms without venture capital backing.[8] The results hold whether we examine equity values alone or total asset values. High Market-to-Book ratios are generally associated with high expected growth rates, and that is consistent with

[6] We also obtained the ratio of reported intangibles (Compustat item 33) to total assets. When we examine financially-reported levels of intangible assets divided by total assets, the high-debt firms in our sample show larger ratios of intangibles than do the low-debt firms. On the other hand, examining median values of intangible assets, the levels for all levels of debt are zero or nearly zero. Thus, most of the firms in our sample report no intangible assets

[7] On the other hand, the ratio of intangibles to total assets is nearly three times higher on average for the non-VC-backed, high-debt subset than for the VC-backed, low-debt subset, and the differences are again highly significant. Thus, the non-VC-backed, high-debt IPOs have higher levels of fixed assets as well as higher levels of intangible assets based on the Compustat definition.

[8] This result is also consistent with Myers (1977) hypothesis that firms with high growth options will sometimes forego valuable investments if they are financed with debt, which suggests that high-growth firms may be more apt to avoid debt financing.

the idea (as shown, for example, in Ueda (2004)) that venture capitalists tend to back high growth firms and that high growth firms have greater levels of uncertainty about their values. Table III shows that the Market-to-Book ratios are significantly higher for venture-backed, low-debt firms than for high-debt firms without venture backing.

Lenders are normally expected to prefer lending to firms with relatively solid levels of earnings and cash flow. Using the results based on the ratio of net income to assets or based on various EBITDA ratios, we observe in Table II that high-debt firms are consistently more profitable (or, less unprofitable) than low-debt firms. Venture-backed firms are also less profitable than those without venture capital backing. These figures reflect the performance of the firms in the fiscal year before their IPOs. Since the venture-backed and low debt firms have higher Market-to-Book ratios following their IPOs, then presumably the market has higher expectations of future growth and profitability for those firms than for those with high debt or without venture capital backing. These results are also consistent with higher risk levels for venture-backed IPO firms and, therefore, greater valuation uncertainty.

Table III shows that the differences in profitability between the VC-backed, low-debt and the non-VC-backed, high-debt firms are large, with high debt, non-VC firms showing much higher profitability levels or lower losses. The differences are highly significant.

Firms with high debt levels in our sample also have faster cash burn rates. That is consistent with the need for debt financing but seems to be inconsistent with the notion that lenders prefer to lend to firms for which repayment of debt is more secure. On the other hand, the heavy borrowers have, on average, much greater collateral with which to

cover the debt amounts in the event of failure. Perhaps the two are offsetting. Venture-backed firms in our sample, on the other hand, have lower cash burn rates than non-venture-backed firms. These results are again confirmed by the comparison of the VC-backed, low-debt firms and the non-VC-backed, high-debt firms in Table III.

As Table II demonstrates, firms with high debt levels or without venture capital backing at the time of their IPO tend to be older firms. That is consistent with the generally accepted notion that venture capitalists are able to bring firms to the public market faster than are firms without venture capital backing. Those results are again supported and their significance shown in Table III.

The last five rows of Table II all deal with risk-related characteristics of the IPO firms, such as standard deviation of returns, residual standard deviation, and systematic risk (beta). We note that in general firms with high levels of debt financing tend to have lower values for all of the risk measures, and firms with venture capital backing have higher values of the risk measures than do firms without venture backing. Again, these results are consistent with the hypotheses developed in Ueda (2004). They are strongly supported by the comparisons in Table III which show that, no matter which risk measure we examine, risk is much greater for venture-backed firms with low debt than for high-debt firms without venture backing.

B. The Volatility of Firm Characteristics over Time

We would expect lenders to seek to provide funds to firms with more predictable levels of profitability and other characteristics associated with firm value, i.e., characteristics that are less volatile over time. Table IV examines the variability of

characteristics of debt-backed and venture capital-backed IPO firms across time. We measure the time-series standard deviations of firm characteristics across time using reported financial data for years –1, 0, +1 and +2 relative to the year of the IPO. Within each category, we calculate the average and the median of the firm standard deviations. Thus, for example, the average standard deviation of the PPE/Total Assets ratio for firms with the lowest debt levels (quartile 1) is 5.7% and the median is 3.9%.

As Table II shows, variability in profit measures (Net Income/Sales and the two EBITDA ratios) is especially low for the highest debt firms. This is consistent with the notion that heavily debt-backed firms tend to have relatively predictable levels of profit over time and are thus easier to value, resulting in lower initial returns (or, less underpricing) on average. The same holds true for firms without venture capital backing: venture-backed firms tend to have greater uncertainty about future profits. The higher standard deviations are also consistent with the idea that venture capital firms have to hit "home runs" in the sense of investing in a few firms that reach exceptionally high levels of profitability. When firms have little variation in profitability, the probability of extreme values on the upside tends to be lower. Venture capitalists generally prefer wider upper tails of the profit distribution, but achieving such tails also involves investing in firms with a significant risk of losing money or failing.[9] That is consistent with our finding that venture-backed IPO firms tend to have greater volatility.

[9] Huntsman and Hoban (1980), for example, demonstrate that venture-backed firms have a relatively high rate of failure but that they also include some firms with extreme upside potential. They examined a sample of 110 investments by three venture capital firms. They found an average rate of return for the venture capital funds of 18.9%, but when they removed just the top 10% of the sample investments, the average annual return fell to a negative value. Thus, they point out, venture capital depends on "outliers," or investments with prospects for extreme returns. Some in the industry describe this as depending on "home runs." Huntsman and Hoban show a failure rate of about one in six of the venture capital investments in their sample.

C. Regression Results: Characteristics that Affect Underpricing in Different Periods

Scholars examining the characteristics of IPO firms that are associated with levels of underpricing have previously included measures of firm size, whether the firm is technology-related, company age, the quality of the underwriter (usually measured by the Carter and Manaster (1990) ranks), proceeds of the offering and some other characteristics. Loughran and Ritter (2004) provide an example of such results and also provide references to earlier studies that examine such characteristics. Recent tests have tended to recognize that the Internet bubble period of 1999-2000 was quite different than other periods, and so some such studies incorporate "period" dummy variables. Some also incorporate dummy variables for venture capital backing (such as, for example, Brav and Gompers (1997)).

Table V provides regression results for initial returns, or underpricing, using a variety of variables that are commonly thought to be related to underpricing. The main point of Table V is to identify the effect of debt financing on underpricing while controlling for other variables that influence underpricing as well. The first two columns of results are for the entire period of our sample, 1980-2002, but they also include dummy variables for subperiods including 1990-1998, 1999-2000, and post-2000. We break our sample period into these four subperiods for several reasons. First, these subperiods roughly correspond to different IPO cycles, as characterized by the initial day returns or number of offerings per year. As Table I indicates, the 1980s were characterized by relatively lower underpricing and fewer offerings than the 1990s. During the 1990s, the "bubble" period of 1999-2000 stands out with an especially high level of underpricing, while the period following the bubble (2001-2002) is characterized

by comparatively low underpricing and few offerings. Secondly, we use these subperiods for comparison with prior studies, e.g., Loughran and Ritter (2004). Finally, James and Wier examined a period in the early 1980s, and we are interested in how the effect of debt financing may have changed over time.[10]

We observe that the level of debt (as measured by the ratio Total Debt/Total Assets) has a significant, economically important, negative effect on initial returns for the full sample period. An increase of one standard deviation of leverage is associated with almost 6% reduction in underpricing. However, examining the 1980-1989 results, we observe that the level of debt financing is not associated with the degree of underpricing, which is consistent with James and Wier's (1990) results covering their sample period of 1980-1983. However, subsequent periods have much more sizable, negative effects: increasing levels of debt financing are associated with lower levels of underpricing. For the bubble period of 1999-2000, the coefficient on debt levels is especially large, reaching almost 30% (which is to be multiplied by the percentage of total debt to assets).

In unreported analysis, we examined whether the documented effect of debt financing on underpricing may be confounded by the changing mix of the industry affiliation of the companies going public. We repeated the regressions from Table V with dummy variables using 2-digit SIC codes as a proxy for industry affiliations. Our results for debt financing are virtually unchanged in terms of the magnitude of the coefficient or the level of significance, except for the bubble period, where the t-value

[10] Since some authors have suggested that 1998 may be considered to be part of the bubble period, we reran our results including 1998 in the bubble period instead of the "nineties" period. We also ran a regression with year dummies, and another with year and industry dummies. Our results are qualitatively the same under each of the alternative regressions in terms of the significance of debt financing.

decreases to a value of -2.51, and the post-bubble period, where the t-value increases to 2.14. Overall, our results are not driven by industry effects.

To alleviate possible concerns that the effect of debt on underpricing may be simply capturing the effect of some other variables related to debt due to multicollinearity, e.g., firm age, size, or industry affiliation, we estimate a two-stage regression in which we first regress the ratio of total debt to total assets against log(total assets), log(firm age), log(sales), and industry dummies, and obtain the residuals for leverage.[11] Then, in the second stage we replace leverage with its residuals obtained in the first stage. Our results show that the effect of (residual) leverage on underpricing is still highly significant and economically meaningful, and is not caused by multicollinearity between leverage and other firm characteristics.

We also observe, as have others, that venture capital backing was strongly associated with increased underpricing during the bubble period, having an average effect of almost 23% on underpricing. Neither debt nor venture capital had such large effects in the post bubble period (2001-2002 in our sample), although they did have t-scores significant at the 10% level for their smaller effects despite having a relatively small sample size. Venture capital was not significantly associated with underpricing in the 1980-1989 or 1990-1998 periods, but it was for the overall sample. That was undoubtedly driven by the high level of the venture capital effect measured for the bubble period. Under more typical circumstances, venture capital has not been associated with higher levels of underpricing. On the other hand, contrary to results in Barry, et al. (1990) and Megginson and Weiss (1991), the measured effect for the overall period has been

[11] Frank and Goyal (2004) estimate that industry affiliation is the most important determinant of leverage and by itself explains a greater portion of the cross-sectional variation in leverage than a number of other robust factors taken cumulatively.

positive, i.e., venture capital is associated with greater underpricing for the overall period of our sample.

The fact that high levels of debt financing are associated with much less underpricing during the bubble period demonstrates the reduction of valuation uncertainty associated with the characteristics of firms that are able to rely on substantial amounts of debt financing. Their simpler valuation probably is a good news, bad news story for many investors: their values are relatively easier to measure, but their upside potential is probably much lower.

D. Variables that Influence the Effect of Leverage on Underpricing Across Time

The regression results in the previous section show that the effects of leverage on underpricing vary through time. Now we examine how the characteristics of the debt-backed and VC-backed issuers vary through time, and we relate them to the regression results. We specifically examine some of the firm characteristics that may proxy for the potential magnitude of information asymmetry and uncertainty about firm value. The characteristics are shown on a period basis in Table VI. Panel A shows results for low debt versus high debt levels (quartile 1 versus quartile 4 of the total debt to total asset ratios) and of venture-backed versus non-venture-backed firms. Panel B shows the results for the combinations of low debt and venture capital backing versus high debt without venture capital backing. The most dramatic difference that stands out is the comparison of low debt, VC-backed firms versus high debt, non-VC firms in the 1999-2000 period: the difference in average initial returns for the two groups was 61.8%.

During the periods with higher overall underpricing, including 1990-1998 and especially the bubble period of 1999-2000, IPO firms were much smaller in sales or assets, had a much lower proportion of fixed assets to total assets, a much higher proportion of firm value in growth options, were significantly younger, less profitable, and exhibited higher measures of total, systematic, and residual equity risk than in other periods. Conversely, after the collapse of the bubble, in 2001-2002 the IPO firms in our sample were historically the largest and oldest such firms, and their measures of fixed assets, growth options, and equity risk characteristics were similar to those in the 1980s. Revenue levels reached by far their highest levels of our entire sample, especially for the low debt firms and the non-VC firms. Furthermore, the differences in those characteristics between the high-debt firms and low-debt firms (those in quartiles 4 versus 1) were much larger during the 1990-1998 and 1999-2000 periods than in the other periods in our sample.

For example, consider the average sales figures for the low-debt, VC-backed firms versus those of the high-debt, non-VC-backed firms in Panel B of Table VI. For the 1980-1989 period, the average sales were $48 million versus $186 million for the two categories of firms, respectively. During the 1990-1998 period, the average sales values were $39 million and $267 million, respectively, and during the bubble the gap in sales widens as the average sales for the two classes of firms were $20 million and $362 million, respectively. For the same two categories of firms, the fraction of firms with negative EBITDA (not shown in the Table) was 25% and 11% during our first period, 47% and 16% during the second period, and 88% and 35% during the bubble. The average firm age for these two subsets was 8.3 years and 17.2 years, respectively, during

the 1980s, 7.9 years and 17.7 years during 1990-1998, and 5.7 years and 17.3 years during the bubble. These differences are confirmed (and in some cases found to be stronger) if we examine the median values instead of the means.

Thus, when overall measures of uncertainty and information asymmetry are greater, there is a greater effect of debt monitoring and certification resulting in a larger reduction in underpricing, as is found in our period regressions. In other words, the value created by debt certification in terms of less "money left on the table" was especially large when the potential levels of uncertainty were greatest.

IV. Debt Financing and the Aftermarket Performance of IPO Firms

Since high debt firms have lower initial returns, or less underpricing, what should we expect about long-term aftermarket performance? If aftermarket performance is associated with overpricing, as some claim, then the lower uncertainty in firm value that may be associated with high-debt IPO firms would seem to suggest less negative aftermarket performance. Bradley, et al. (2001) provide evidence that high technology stocks with venture capital backing are especially prone to negative aftermarket performance, in contrast to the results of Brav and Gompers (1997) regarding venture-backed IPOs. If the results of Bradley, et al., are right, then IPO firms with high debt backing (which tend not to be high technology, venture-backed firms) might behave quite differently in the aftermarket. On the other hand, Brav and Gompers (1997) find that small firms without venture capital backing dominate the set of negative aftermarket performers. In light of the characteristics of heavily debt-financed firms that we observe,

that suggests that high debt levels may be associated with negative aftermarket performance. That is what we find in our sample.

Some recent papers rely on the concept established by Miller (1977) suggesting that purchasers of common stock during and soon after an IPO may be the most optimistic investors and that the aggregate opinions of the full market are not reflected in prices.[12] If so, the large first-day returns may reflect only the valuation opinions of optimists. If such valuations occur and are corrected over time, then buy-hold returns across time would be below market rates and below rates adjusted for the observable characteristics of the issued stock, including risk, size, market-to-book ratios and others. In such a setting, it may be difficult for arbitrageurs to step in and "correct" the overpricing because the lockup provisions on new issues make it relatively difficult to short the stock.[13] Since high-debt IPOs tend to have lower initial returns, if low aftermarket returns are driven by unduly optimistic market prices immediately after the IPO, then high-debt issues should not experience poor aftermarket performance.

Our results below demonstrate worse aftermarket performance for high debt firms than for low debt firms, whether or not we adjust for market effects, systematic risk (beta), and the Fama-French factors. Thus, high-debt firms on average experience relatively low returns in the aftermarket despite their less uncertain valuations at the time of the IPO and their lower underpricing. Their compound returns in the aftermarket and

[12] For example, Houge, Loughran, Suchanek, and Yan (2001) find evidence supporting the Miller concept of overpricing soon after the IPO, followed by poor returns in the aftermarket.

[13] Ofek and Richardson (2003) explain the collapse of the Internet bubble in the first quarter of 2000 by demonstrating that large numbers of Internet stocks had their lockup provisions expire in the February-March period. There are often observed price declines surrounding the end of the lockup period. Bradley, et al. (2001) find that venture-backed, high technology firms have especially large losses around the expiration of the lockup period. Field and Hanka (2001) find negative returns around the lockup expiration, and they find especially large, negative returns when the IPO firms are venture capital-backed.

their firm characteristics (including low market capitalization and the lack of venture capital) are consistent with the conclusions of Brav and Gompers (1997).

A. Results for Raw Returns and Market-adjusted Returns

In Table VII, we report the buy-and-hold returns over the 60 months after the IPO for the subsamples based on debt financing and venture capital backing. We also calculate the market-adjusted returns using the performance of the market as measured by the CRSP value-weighted index, the CRSP equal-weighted index (not reported in the table), and the CRSP size decile index.

For each security, buy-and-hold returns are calculated as $BHR_j = \prod_t (1 + r_{jt}) - 1$, where t is the month since the IPO, j is the security, and r is the respective monthly return. Then we obtain the average and the median buy-and-hold return across firms for each subcategory. We also calculate the monthly market-adjusted returns. For firm j in month t the market-adjusted return is calculated as $ar_{jt}=(1+r_{jt})/(1+r_{benchmark\ t})-1$. Then, for each firm we calculate the buy and hold period adjusted returns as $BHAR_j = \prod_t (1 + ar_{jt}) - 1$ over t = 60 months. Finally, we obtain the average buy-and-hold adjusted return across the firms in each subcategory. Note that the average market-adjusted return is equivalent to the "wealth relative" measure suggested by Ritter (1991), minus 1.

Figure 1 presents the buy-and-hold adjusted returns for the firms with VC backing and those without VC backing, and for the first and fourth quartiles of leverage. The first panel of the figure shows raw returns, and market-adjusted returns are shown in the lower two panels. The figure demonstrates the general tendency for low debt firms to

outperform high debt firms and for VC-backed firms to outperform those without VC backing.

The raw returns in Table VII show that the venture-backed firms have approximately twice the average returns of the non-venture-backed firms, and the difference is significant. When adjusted for the CRSP value-weighted and size decile indices, the VC-backed and non-VC-backed firms all show average returns that are negative with differences that are not significant at the 5% level. The medians for both groups are consistently, highly negative whether they are market-adjusted or not, and they do not differ meaningfully from each other. The medians indicate the high asymmetric risks that IPO investors face if they do not diversify their investments as broadly as possible.

Examining debt quartiles 1 (low debt) versus 4 (high debt), the low debt averages are consistently higher than those for the high debt firms, whether they are market-adjusted or not, but the differences are not statistically significant. The medians are again consistently negative and do not differ meaningfully. None of these results for the VC comparisons or for the debt comparisons adjust for the risk levels (as measured by beta), size (except for decile indices) or book-to-market effects.

B. The effects of debt on aftermarket performance for VC-backed and non-VC-backed IPO firms

Next we examine the joint effect of venture capital backing and debt financing on the long-run performance of the IPO firms. Results are shown in Table VIII. We group our sample into subsamples of firms with VC backing and low debt use (those with ratios of total debt to total assets lower than the sample median, which means that they include

debt quartiles 1 and 2), VC backing and high debt use (those with ratios of total debt to total assets higher than the median), no VC backing and low debt use, and no VC backing and high debt use. Table VIII presents the buy-and-hold and market-adjusted returns for the four groups of firms using calculations similar to those described above for Table VII.

The results for raw returns in Table VIII show maximum average returns for the venture-backed firms with high debt and the minimum average returns for the high debt firms that do not have venture backing. The t-scores shown for the raw returns demonstrate that the high debt, no-VC firms have significantly lower average returns than any of the other groups. None of the other pairs (i.e., none of the comparisons excluding high debt, no-VC) are significant in part because of the very large range of five-year returns observed in the sample, with minimum and maximum values overall of -100% and +19,000%, respectively.

The market-adjusted returns adjusted for the CRSP value-weighted index again show the high debt, no-VC firms consistently underperforming all the other groups of firms, and no pair that excludes the high-debt, no-VC firms has significant differences. Interestingly, in the size-decile-adjusted returns, the only statistically significant differences are for the high-debt, no-VC firms versus the low-debt, no-VC firms, although the high-debt firms with and without venture capital are different at the 10% level of significance.

The principle point of the results in Table VIII is that IPO firms with high debt and without venture capital backing tend to consistently underperform all the other groups of firms. Now we go on to examine the effects of adjusting for the principle

characteristics of firms that are recognized in much of the literature on long-term performance.

C. Results Adjusting for the Effects of Systematic Risk, Size, and Book-to-Market

Brav and Gompers (1997) find that much of the observed negative long-term performance of IPO firms disappears when the Fama-French factors are accounted for, especially for venture-backed IPO firms. We already have an indication that these additional factors matter from the market-adjusted returns – the underperformance is lowest, or for some of the subsamples, non-existent, when we used the CRSP size decile index. We examine the risk-adjusted long-term performance of debt-backed firms based on two methodological procedures. The first approach is to use the calendar-time-based Fama-French (1993) portfolio regressions. The model is based on the regression formula,

$$R_{pt} - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + sSMB_t + hHML_t + e_{pt},$$

where in each calendar month during the sample period we form portfolios based on the firms with IPO dates in that month . The dates for each firm start with the month after the IPO and continue for 60 months. R_{pt} is the monthly portfolio return in month t, R_m is the contemporaneous return on the market index, SMB_t is the average return on small market cap portfolios minus the average return on large market cap portfolios, HML_t is the average return on the high book-to-market portfolios minus the low book-to-market portfolios, and R_{ft} is the return on the one-month T-bill for the month. The regression is estimated on portfolio returns, and the overall sample-wide measure of abnormal return is α. We estimate two versions of this approach, one with equal-weighted portfolios, and one with value (equity market capitalization) weighted portfolios. This approach is

similar to the one used by Brav and Gompers (1997) in addition to their matched sample approach.[14]

The second approach combines Ibbotson's (1975) "Returns Across Time and Securities" (IRATS) with the Fama-French (1993) three-factor model. The regression formula is

$$R_{jt} - R_{ft} = \alpha_t + \beta_t(R_{mt} - R_{ft}) + s_t SMB_t + h_t HML_t + e_{jt,}$$

where R_{jt} is the monthly return on stock j in month t, R_m is the contemporaneous return on the market index, SMB_t is the average return on small market cap portfolios minus the average return on large market cap portfolios, HML_t is the average return on the high book-to-market portfolios minus the low book-to-market portfolios, and R_{ft} is the return on the one-month T-bill for the month. In each calendar month during the sample period, we estimate the regression across the stocks with IPO dates in that month. The dates for each firm start with the month after the IPO and continue for 60 months.[15] The regression is estimated using ordinary least squares (OLS) to test the null hypothesis that $\alpha_t = 0$. An α_t different from zero is an indication of significant abnormal returns. We then accumulate the α_t over the calendar months.

Both approaches take place in calendar time, and thus do not suffer from the pseudo-market timing problem identified by Schultz (2003). On the other hand, as Brav and Gompers point out, a disadvantage of these approaches is that they give the same

[14] The calendar-time approach eliminates problems associated with the pseudo-market timing identified in Schultz (2003). Gompers and Lerner (2003) use calendar-time portfolios in their examination of pre-Nasdaq IPOs and find that their performance is similar to that of the market when calendar time portfolios are applied. They also find that abnormal performance does not occur when they adjust for the Fama-French factors.

[15] We have CRSP returns ending in December 2004, which causes the most recent listings to appear in less than 60 months.

weight to a month in which few stocks went public as to a month with many listings. It is precisely that matter, however, that Schultz's (2003) pseudo-market timing identifies and that the calendar-time approach avoids.[16]

Table IX provides the results of these regressions. In Panel A, the intercept values shown are the monthly average alpha values. First, we consider the venture-backed and non-venture-backed firms. Whether we examine equal-weighted portfolios or value-weighted portfolios, using Fama-French calendar-time portfolio regressions the VC-backed firms have no significant abnormal returns (intercepts). Although the non-VC firms have larger negative intercepts, they also do not have significant t-scores. We also show t-scores derived from the differences in alphas between the VC-backed and non-VC-backed firms. As the Table shows, neither the equal-weighted nor value-weighted portfolios result in significant differences in abnormal returns between venture-backed firms and those without venture capital backing.

Panel A of Table IX shows quite different results when we examine the level of debt financing. We show results for quartiles 1 (the lowest debt quartile) and 4 (the highest debt quartile). Examining high-debt firms, we consistently observe significantly negative abnormal returns[17] with intercepts of -.0053 or -.0057 for the equal-weighted and value-weighted portfolios, respectively, and both have t-scores of 2.2. These abnormal returns are equivalent to annualized abnormal returns of about 6.5-7%.

Moreover, the t-tests of differences in abnormal returns between the low-debt and high-debt firms shows quite significant results in the case of the equal-weighted

[16] For robustness, we ran the Fama-French regressions using weighted least squares with the number of observations in each calendar month as weights. Our results are qualitatively unchanged.

[17] The negative abnormal returns are found whether we use OLS or heteroscedasticity-adjusted methods.

portfolios (with a t-score of 2.96). The difference in that case is 104 basis points, and that difference is based on monthly averages. In the case of value-weighted portfolios, the t-score falls to 1.77, which is only significant at the 10% level.

The results in Panel B show five-year cumulative abnormal returns using the Ibbotson RATS procedure. For those five-year cumulative returns, the highest abnormal performance is for low-debt firms, and the lowest is for high-debt firms. All four categories of firms have statistically significant abnormal returns.

Given the differences observed in the performance characteristics for venture capital-backed and non-VC-backed firms and for high-debt versus low-debt firms, we examine in Table X the performance characteristics of combined groups of firms. As in some earlier tables, the groups consist of VC-backed firms with either low debt (debt in the two lowest quartiles) or high debt (debt in the two highest quartiles), and non-VC-backed firms with low debt or high debt.

The group of firms with consistently significant (and negative) abnormal returns is the group comprised of high-debt firms without venture capital backing. They show significantly negative monthly abnormal returns in the Panel A results and significantly negative five-year returns in Panel B. It is the only group with significantly negative five-year returns. In fact, in contrast, the VC-backed, low-debt firms show significantly positive five-year returns. The VC-backed firms with high debt, in contrast with the VC-backed firms with low debt, do have significantly negative abnormal returns based on the value-weighted portfolios.

We compare the abnormal returns of the VC-backed, low-debt firms and the high-debt firms without venture capital backing. In the case of the equal-weighted portfolios,

the differences are 101 basis points and are significant at the 1% level. In the case of the value-weighted portfolios, the differences are 80 basis points and are marginally significant at the 5% level.

A related point from Panel A of Table X is that there are sharp differences in size-related effects among the venture-backed firms depending on their levels of debt. For example, considering the VC-backed, low debt firms, we see that equally-weighted portfolios have larger abnormal return measures than the value-weighted portfolios and are marginally significant (i.e., significant at the 10% level) in the case of the equally-weighted portfolios. That would suggest that the smaller firms have larger abnormal returns within this group. In contrast, VC-backed firms with high debt have significantly negative abnormal returns when value-weighted, but not when equally weighted. That again suggests that the smaller firms within this group have larger abnormal returns on average than the larger firms in the group. This result seems to contrast with the results that Brav and Gompers (1997) find for non-VC-backed firms in which they find negative performance for small, non-VC-backed firms but not for large, non-VC-backed firms.

D. Conclusions on Aftermarket Performance

Overall, IPO firms with high levels of debt financing tend to underperform the market in the long run following their IPOs. Debt financing and/or the characteristics of firms that have access to substantial debt financing appear to have an appreciable effect on the market performance of firms that go public. Our results are generally consistent with the Brav and Gompers (1997) results for the long-term performance of IPO firms except that our results suggest an added dimension in the nature of that performance. For

example, we examine the firms characterized by Brav and Gompers as small (in market capitalization) and without venture capital, and find that they tend to be firms with high debt financing. Thus, the characteristics of firms with extensive debt financing help to account for both the lower underpricing of such firms at the IPO and their negative, long-term performance following the IPO.

Our results are also based on leverage measures based on total debt to total assets, i.e., they are based on book measures of leverage. Fama and French (1992) find that their book measure of leverage (based on total assets and the book value of equity) are associated with large, significant negative returns across time. Thus, our findings about leverage and the performance of IPO firms are consistent in broad terms with the findings of Fama and French.[18]

V. Summary and Conclusions

In this paper, we examine the role of debt financing in the performance of companies that go public. We find that companies with substantial amounts of debt financing tend to have lower initial returns, or, less underpricing, than firms with lower levels of debt financing. These results hold for our overall sample (1980-2002), but they vary widely over various subperiods of our sample. We find no association of debt financing with underpricing during the 1980-1989 period, but we find significant effects during 1990-1998 and very strong effects during the bubble period of 1999-2000. For example the difference in initial returns between our highest and lowest debt quartiles during the 1999-2000 period is more than 40%. We also find that the level of debt

[18] Fama and French (1992) interpret the coefficient on leverage as another manifestation of the book-to-market ratio. However, our results are obtained after controlling for book-to-market, beta, and size.

financing and the presence or absence of venture capital backing have additional effects. For example, the difference in initial returns during the bubble for firms with venture capital backing and low levels of debt versus those for firms without venture capital backing but with high levels of debt is more than 60%. Thus, debt financing is significantly associated with underpricing, and higher levels of debt financing are associated with lower levels of underpricing. Our results confirm the findings of James and Wier (1990) that debt financing is associated with lower initial returns, and it expands their results to show that higher levels of debt financing are associated with even lower underpricing.

Our results on underpricing are consistent with the notion that the characteristics of debt-financed firms facilitate valuation, so that uncertainty about the value of firms with significant debt financing tends to be lower than the uncertainty about the value of low-debt firms. We also find that the characteristics of the firms we examine with high levels of debt financing, in contrast with those that are backed by venture capital, are generally consistent with the theory of Ueda (2004) about bank-financed versus venture capital-backed firms. Those characteristics include higher risk and higher growth rates for venture capital-backed firms compared to those financed with bank debt. The one exception we find is that the debt-financed firms tend to have larger size, as measured by asset size or revenues, unlike the suggested results of Ueda. However, when size is measured by market capitalization immediately following the IPO, the size results are consistent with Ueda's theory.

We also examine the aftermarket performance of firms backed by high levels of debt financing versus those with little debt financing. We include in those analyses the

presence of venture capital, and we examine other common factors that are usually included in tests of long-run performance. Overall, we find that high levels of debt financing are associated with negative aftermarket performance.

High-debt firms have appreciably poorer long-term performance after adjusting for market, risk, size and Book-to-Market characteristics. While the abnormal performance demonstrates a statistically meaningful anomaly, on the other hand it may suggest that the characteristics of firms that are able to obtain substantial debt financing are one area that has been somewhat neglected in developing methods for examining the performance of portfolios. In other words, there may be additional considerations that need to be accounted for in performing tests of abnormal performance of IPO-based portfolios as well as for other types of portfolios. Since lenders can suffer from the downside risk of the firm but do not participate in the upside potential of equity, it may be natural that the characteristics of their borrowers are not associated with higher long-term performance. The recent Billett, Flannery, and Garfinkel (2005) paper suggests similar results since they find negative abnormal performance for public firms in the three years after they announce that they have received additional debt financing. Such results can suggest that markets are not efficiently processing the information implicit in such announcements, or they might suggest that existing methodologies in performance measurement do not account for firm characteristics that are associated with debt financing.

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Table I. Sample Description

The table presents selected characteristics for a sample of 6,147 (IPOs) in the US during 1980-2002. We exclude American Depository Receipts (ADRs), closed-end funds; real estate investment trusts (REITs), financial institutions (those in SIC codes 6000-6999), unit offerings, IPOs with an offer price below $5.00 per share, and those offerings that do not have CRSP data within one month of the offer date. Medians are presented in parentheses. All dollar values are converted into December 2002 constant dollars using the monthly Consumer Price Index (CPI). Market Capitalization of Equity is calculated as the number of shares reported by CRSP times the first day closing price. Total assets, sales, total debt, and long-term debt are as of the end of the fiscal year preceding the offer.

Year	N	Total Proceeds ($ millions)	Average Issue Size ($ millions)	Average Initial Return, %	Market Capitalization of Equity ($ millions)	Total Assets ($millions)	Sales ($ millions)	Fraction VC-backed	Total Debt / Total Assets	Long-term Debt / Total Assets
1980	65	1,792	27.6 (18.9)	17.9 (10.5)	179.5 (80.9)	64.3 (32.7)	98.7 (50.7)	0.34	0.31 (0.30)	0.23 (0.15)
1981	187	4,521	24.2 (16.6)	7.3 (1.9)	110.9 (66.5)	37.7 (16.9)	54.9 (28.2)	0.30	0.29 (0.26)	0.20 (0.15)
1982	74	1,834	24.8 (13.3)	12.6 (5.4)	129.0 (66.0)	38.8 (22.6)	55.5 (24.1)	0.28	0.24 (0.22)	0.14 (0.05)
1983	417	15,183	36.4 (21.3)	11.4 (3.8)	169.0 (84.3)	77.6 (22.1)	111.6 (28.8)	0.28	0.30 (0.29)	0.19 (0.13)
1984	164	3,426	20.9 (14.0)	4.5 (1.3)	89.8 (50.8)	70.5 (23.2)	92.1 (37.4)	0.28	0.35 (0.34)	0.22 (0.17)
1985	172	4,776	27.8 (17.8)	7.0 (3.1)	117.7 (62.4)	53.1 (27.8)	100.6 (38.8)	0.27	0.32 (0.31)	0.19 (0.15)
1986	345	15,314	44.4 (19.7)	7.7 (2.2)	158.3 (66.6)	81.9 (26.1)	122.0 (38.6)	0.26	0.36 (0.30)	0.23 (0.18)
1987	257	13,335	51.9 (23.0)	6.4 (1.8)	179.3 (81.2)	183.4 (30.8)	225.2 (42.1)	0.28	0.36 (0.33)	0.23 (0.13)
1988	101	5,309	52.6 (25.7)	5.1 (2.2)	289.6 (115.0)	259.2 (40.7)	232.6 (44.0)	0.34	0.33 (0.27)	0.21 (0.13)
1989	110	5,941	54.0 (26.4)	8.4 (4.7)	223.5 (97.1)	177.1 (35.1)	286.0 (49.4)	0.35	0.34 (0.23)	0.22 (0.13)
1990	105	4,687	44.6 (30.7)	10.7 (4.9)	195.6 (105.2)	172.6 (34.0)	349.0 (40.7)	0.45	0.35 (0.36)	0.24 (0.16)
1991	259	12,932	49.9 (35.6)	12.1 (7.5)	196.2 (120.5)	369.3 (30.7)	207.4 (45.9)	0.53	0.36 (0.32)	0.25 (0.18)
1992	363	17,995	49.6 (29.8)	10.0 (3.6)	179.1 (98.3)	117.1 (24.7)	158.1 (37.8)	0.48	0.38 (0.31)	0.26 (0.16)
1993	482	23,633	49.0 (30.0)	12.3 (5.8)	207.9 (99.6)	124.4 (27.0)	155.4 (42.6)	0.47	0.40 (0.35)	0.25 (0.14)
1994	401	16,569	41.3 (25.3)	9.1 (4.5)	164.0 (81.4)	154.0 (22.8)	183.6 (37.0)	0.35	0.38 (0.33)	0.24 (0.15)
1995	427	23,626	55.3 (35.8)	20.5 (12.5)	248.7 (125.5)	158.2 (19.7)	187.1 (29.2)	0.43	0.33 (0.25)	0.19 (0.08)
1996	645	37,891	58.7 (36.5)	17.5 (10.5)	263.2 (122.5)	135.4 (17.4)	180.2 (24.4)	0.42	0.36 (0.30)	0.22 (0.10)
1997	427	24,631	57.7 (35.3)	13.0 (8.0)	246.3 (118.2)	196.5 (22.3)	172.1 (29.9)	0.31	0.37 (0.29)	0.21 (0.09)
1998	251	27,561	109.8 (42.3)	23.1 (10.0)	387.8 (184.0)	315.8 (25.4)	278.7 (32.6)	0.31	0.34 (0.27)	0.19 (0.07)
1999	427	50,831	119.0 (60.3)	74.7 (42.5)	1,115.8 (456.8)	256.1 (19.0)	275.8 (12.6)	0.61	0.29 (0.13)	0.17 (0.04)
2000	335	48,165	143.8 (72.9)	56.6 (28.1)	1,437.6 (527.7)	283.4 (29.5)	120.6 (11.1)	0.64	0.23 (0.13)	0.15 (0.03)
2001	70	24,261	346.6 (102.1)	13.4 (10.0)	1,201.9 (450.5)	1733.9 (127.7)	1858.1 (87.0)	0.54	0.35 (0.30)	0.28 (0.19)
2002	63	11,716	186.0 (97.6)	7.7 (6.3)	683.7 (332.2)	470.0 (162.0)	673.4 (168.2)	0.32	0.39 (0.38)	0.31 (0.31)
1980-2002	6,147	395,928	64.4 (32.7)	19.0 (6.3)	352.7 (116.4)	193.8 (24.0)	204.7 (31.0)	0.40	0.34 (0.27)	0.21 (0.11)

Table II. IPO and Firm Characteristics by Use of Debt and Venture Backing

Characteristics for a sample of 6,147 initial public offers (IPOs) in the US during 1980-2002 by leverage quartile and venture backing. Dollar values are in December 2002 constant dollars. Market Capitalization is the number of shares reported by CRSP times the first day closing price. Total debt is equal to long-term debt plus debt in current liabilities minus convertible debt. Equity market-to-book is the market capitalization of equity divided by book value. Asset market-to-book is the sum of market capitalization of equity at the offering and total debt, divided by the sum of book equity and total debt. The first cash burn is calculated for the firms with negative operating cash flows as the inverse of the ratio of cash divided by the absolute value of operating cash flows. In the second cash burn rate, operating cash flows are reduced by the amount of investments. All accounting variables are from the fiscal year before the offering, except book value of equity, which is from the fiscal year of the offering. The return standard deviation, beta, and the standard deviation of the market model residuals are calculated over the 250 days following the IPO. "VW" and "EW" indicate "Value-Weighted" and "Equal-Weighted," respectively.

	Leverage Quartile				VC Backing		Leverage Quartile				VC Backing	
	1	2	3	4	1	0	1	2	3	4	1	0
	Means						Medians					
Total Debt / Total Assets	0.020	0.170	0.395	0.785	0.287	0.384	0.007	0.167	0.390	0.691	0.179	0.340
Initial Day Return, %	30.7	23.2	13.4	12.4	27.6	13.8	11.1	8.0	5.7	4.2	9.4	5.0
Total Assets	102.6	166.9	241.0	254.9	68.3	284.2	15.5	20.0	33.1	47.0	21.5	27.7
Sales	132.6	195.1	256.3	223.9	79.5	295.3	17.7	26.1	51.0	50.2	21.4	44.4
Market Capitalization	466.5	422.9	285.3	271.9	425.2	317.8	161.1	131.5	103.0	117.1	161.8	92.7
Offering Proceeds	64.3	72.2	67.3	63.9	52.8	74.4	37.1	32.8	30.3	38.0	38.5	27.5
Asset Market-to-Book	4.578	3.917	2.714	2.687	4.117	3.027	3.704	3.016	2.124	2.009	3.177	2.364
Equity Market-to-Book	4.821	4.363	3.373	4.281	4.821	3.816	3.746	3.306	2.595	3.019	3.601	2.891
PPE / Total Assets	0.158	0.225	0.305	0.361	0.224	0.293	0.112	0.179	0.258	0.304	0.159	0.220
Intangibles / Total Assets	0.035	0.043	0.075	0.120	0.063	0.070	0.000	0.000	0.000	0.005	0.000	0.000
Investments / Total Assets	0.091	0.100	0.112	0.122	0.100	0.111	0.064	0.071	0.065	0.056	0.065	0.063
Net Income / Sales	-1.442	-0.952	-0.312	-0.779	-1.541	-0.416	0.031	0.036	0.032	0.009	-0.013	0.038
EBITDA / Total Assets	-0.102	-0.014	0.083	-0.028	-0.165	0.079	0.082	0.141	0.167	0.134	0.061	0.171
EBITDA / Sales	-1.250	-0.815	-0.154	-0.546	-1.306	-0.269	0.067	0.081	0.100	0.116	0.054	0.110
Operating CF / Total Assets	-0.152	-0.130	-0.020	-0.123	-0.221	-0.028	-0.026	0.003	0.052	0.036	-0.060	0.063
Fraction with Negative EBITDA	0.415	0.319	0.163	0.243	0.448	0.175	0.000	0.000	0.000	0.000	0.000	0.000
Fraction with Negative Operating Cash Flow	0.520	0.495	0.353	0.375	0.584	0.319	1.000	0.000	0.000	0.000	1.000	0.000
Current Ratio	3.782	2.068	1.530	1.311	2.736	1.725	2.242	1.615	1.341	1.098	1.759	1.323
Quick Ratio	1.247	1.179	1.217	0.990	1.069	1.209	1.040	1.099	1.126	0.871	0.960	1.080
Cash / Total Assets	0.365	0.213	0.090	0.085	0.287	0.115	0.322	0.122	0.039	0.029	0.197	0.045
Cash / Operating Cash Flow*	-2.749	-1.944	-1.417	-1.261	-2.246	-1.329	-1.446	-0.870	-0.448	-0.200	-0.990	-0.344
Cash / (Free Cash Flow)*	-1.931	-1.410	-0.973	-0.986	-1.401	-1.240	-1.170	-0.683	-0.336	-0.190	-0.756	-0.282
Cash Burn Rate 1	1.368	2.126	3.196	4.604	2.410	3.817	0.052	0.000	0.000	0.000	0.223	0.000
Cash Burn Rate 2	2.510	3.809	7.154	11.378	4.472	8.787	0.293	0.509	0.424	0.393	0.629	0.000
Years since firm founded	9.438	12.778	16.821	15.713	9.758	16.038	6.000	7.000	9.000	7.000	6.000	8.000
Return Standard.Deviation	0.052	0.048	0.042	0.043	0.051	0.042	0.047	0.043	0.038	0.038	0.046	0.037
Residual Standard Deviation., VW	0.050	0.047	0.041	0.042	0.050	0.041	0.046	0.042	0.037	0.037	0.045	0.036
Beta, VW	1.164	1.070	0.817	0.778	1.196	0.771	1.023	0.956	0.732	0.702	1.125	0.699
Residual Standard Deviation., EW	0.049	0.046	0.041	0.042	0.049	0.040	0.045	0.041	0.036	0.036	0.044	0.036
Beta, EW	1.870	1.746	1.395	1.345	1.930	1.328	1.704	1.640	1.310	1.234	1.820	1.254

* Only for those firms with negative Operating or Free CF.

Table III. Characteristics for Subsamples by Use of Debt and Venture Backing

The main sample consists of 6,147 initial public offers (IPOs) in the US during 1980-2002 by leverage and venture backing. Firms are grouped into four subsamples based on whether they are backed by venture capital and whether their ratio of total debt to total assets is higher or lower than the median for the sample. The table presents the subsamples with VC backing and below-median leverage and no VC backing and above-median leverage. Dollar values are in December 2002 constant dollars. Market Capitalization is the number of shares reported by CRSP times the first day closing price. Total debt is equal to long-term debt plus debt in current liabilities minus convertible debt. Equity market-to-book is the market capitalization of equity divided by book value. Asset market-to-book is the sum of market capitalization of equity at the offering and total debt, divided by the sum of book equity and total debt. The first cash burn is calculated for the firms with negative operating cash flows as the inverse of the ratio of cash divided by the absolute value of operating cash flows. In the second cash burn rate, operating cash flows are reduced by the amount of investments. All accounting variables are from the fiscal year before the offering, except book value of equity, which is from the fiscal year of the offering. The return standard deviation, beta, and the standard deviation of the market model residuals are calculated over the 250 days following the IPO. "VW" and "EW" indicate "Value-Weighted" and "Equal-Weighted," respectively.

	VC-backed, low debt use		Not VC-backed, high debt		T-values for equality of means	Wilcoxon p-values for equality of medians
	Mean	Median	Mean	Median		
Total Debt / Total Assets	0.088	0.072	0.585	0.519	-70.700	0.000
Initial day return, %	0.355	0.125	0.110	0.043	13.470	0.000
Total assets	32.193	17.423	305.076	38.866	-5.610	0.000
Sales	37.098	15.599	282.250	57.144	-8.870	0.000
Equity Market capitalization	515.527	189.717	260.880	92.813	6.140	0.000
Proceeds	49.209	38.542	68.053	29.516	-3.570	0.000
Asset Market-to-Book ratio	4.794	3.715	2.529	1.993	21.570	0.000
Equity Market-to-Book ratio	5.190	3.849	3.602	2.693	11.130	0.000
PPE / Total Assets	0.171	0.133	0.348	0.300	-25.050	0.000
Intangibles / Total Assets	0.029	0.000	0.085	0.000	-11.340	0.000
Investments / Total Assets	0.093	0.069	0.120	0.061	-5.930	0.230
Net Income / Sales	-1.936	-0.057	-0.362	0.031	-9.440	0.000
EBITDA / Total Assets	-0.200	-0.067	0.088	0.161	-16.470	0.000
EBITDA / Sales	-1.748	0.001	-0.217	0.112	-9.780	0.000
Operating CF / Total Assets	-0.241	-0.147	-0.012	0.057	-13.460	0.000
Fraction with negative EBITDA	0.533	1.000	0.153	0.000	23.780	0.000
Fraction with negative Operating CF	0.652	1.000	0.307	0.000	18.040	0.000
Current Ratio	3.498	2.183	1.362	1.204	17.020	0.000
Quick Ratio	1.082	0.947	1.123	1.036	-1.380	0.012
Cash / Total Assets	0.388	0.362	0.069	0.028	40.680	0.000
Cash / Operating CF*	-2.576	-1.304	-1.125	-0.248	-5.980	0.000
Cash / (Free CF)*	-1.702	-1.089	-1.077	-0.218	-4.630	0.000
Cash burn rate, 1	1.566	0.352	4.017	0.000	-4.750	0.000
Cash burn rate, 2	2.287	0.573	10.198	0.156	-7.010	0.203
Years since firm founded	7.434	6.000	17.674	9.000	-17.920	0.000
Returns st. dev.	0.056	0.050	0.041	0.037	19.450	0.000
Residual st.dev., VW	0.053	0.049	0.040	0.036	18.350	0.000
Beta, VW	1.358	1.283	0.714	0.656	25.290	0.000
Residual st.dev., VW	0.053	0.048	0.040	0.035	18.160	0.000
Beta, EW	2.145	2.068	1.245	1.172	27.210	0.000

Table IV. Time-Variability of Firm Characteristics, by Use of Debt and Venture Backing

The table presents means and medians of time-series standard deviations of firm characteristics for a sample of 6,147 initial public offers (IPOs) in the US during 1980-2002, by leverage quartile and venture backing. For each firm we calculate the standard deviation for each variable across years -1 to +2 relative to the fiscal year of the IPO. Then we calculate the cross-sectional means and medians by the firms' quartile of total debt to total assets as of the fiscal year prior to the IPO, and by whether the firm was venture backed at the IPO. Total debt is equal to long-term debt plus debt in current liabilities minus convertible debt. PPE is "Property, Plant and Equipment." EBITDA is Earnings Before Interest, Taxes, Depreciation and Amortization.

	Leverage Quartile				VC backing	
	1	2	3	4	1	0
Means						
PPE / Total Assets	0.057	0.060	0.061	0.071	0.061	0.065
Investments / Total Assets	0.044	0.047	0.050	0.058	0.045	0.055
Net Income / Sales	1.135	0.672	0.308	0.552	1.019	0.443
EBITDA / Total Assets	0.160	0.141	0.102	0.109	0.152	0.112
EBITDA / Sales	1.007	0.570	0.269	0.477	0.904	0.377
Operating Cash Flow / Total Assets	0.155	0.145	0.106	0.115	0.152	0.115
Current Ratio	3.313	2.011	1.323	1.643	2.530	1.797
Quick Ratio	0.504	0.470	0.493	0.458	0.437	0.518
Cash / Total Assets	0.157	0.134	0.097	0.092	0.137	0.109
Cash / Operating Cash Flow	4.895	5.677	4.782	3.495	5.429	3.837
Cash / Free Cash Flow	3.746	3.782	2.713	2.128	3.618	2.631
Medians						
PPE / Total Assets	0.039	0.046	0.044	0.048	0.044	0.044
Investments / Total Assets	0.029	0.032	0.032	0.031	0.031	0.031
Net Income / Sales	0.134	0.073	0.038	0.055	0.130	0.042
EBITDA / Total Assets	0.111	0.094	0.065	0.054	0.096	0.067
EBITDA / Sales	0.115	0.067	0.037	0.044	0.101	0.042
Operating Cash Flow / Total Assets	0.107	0.103	0.074	0.058	0.104	0.072
Current Ratio	1.766	1.146	0.712	0.657	1.408	0.733
Quick Ratio	0.323	0.327	0.341	0.316	0.315	0.329
Cash / Total Assets	0.145	0.122	0.072	0.050	0.129	0.081
Cash / Operating Cash Flow	2.055	1.646	1.219	1.079	1.892	1.150
Cash / Free Cash Flow	1.601	1.477	0.876	0.708	1.460	0.845

Table V. Initial Returns, Use of Debt and Venture Backing, and IPO and Firm Characteristics

The dependent variable is the initial day returns on for a sample of 6,147 initial public offers (IPOs) in the US during 1980-2002. The initial day return is calculate as the percentage difference between the CRSP closing price and the IPO offer price. Dollar values are in December 2002 constant dollars. Total debt is equal to long-term debt plus debt in current liabilities minus convertible debt. Total debt, total assets, and sales are from the fiscal year before the offering.

	1980-2002		1980-1989		1990-1998		1999-2000		2001-2002	
Variable	Estimate	T-value	Estimate	T-value	Estimate	T-value	Estimate	T-value	Estimate	T-value
Intercept	0.008	0.31	0.067	3.58	0.078	3.54	-0.540	-2.56	0.071	0.79
Total debt/Total Assets	-0.076	-4.50	0.006	0.36	-0.055	-4.12	-0.297	-3.17	-0.100	-1.87
VC-backed	0.030	2.55	0.005	0.58	0.000	-0.04	0.228	3.06	0.060	1.69
Ln(Total assets)	-0.057	-7.27	-0.047	-6.47	-0.049	-7.47	-0.157	-4.21	-0.018	-0.84
Ln(Age)	-0.010	-1.67	-0.006	-1.35	-0.009	-1.89	-0.033	-0.70	-0.027	-1.27
Ln(Proceeds)	0.081	8.63	0.048	6.86	0.056	7.12	0.303	5.38	0.016	0.59
Ln(Sales)	0.011	1.77	0.014	2.34	0.012	2.45	0.043	1.50	0.025	1.57
Top tier underwriter	0.020	1.49	-0.043	-4.60	0.037	3.23	0.207	2.23	0.003	0.07
Technology dummy	0.406	17.16	0.052	0.36	0.345	12.46	0.351	5.11	0.047	0.79
1990-1998 dummy	0.020	1.54								
1999-2000 dummy	0.304	13.48								
2001-2002 dummy	-0.056	-1.50								
N	5,157		1,366		2,957		715		119	
Adjusted R-squared	0.273		0.076		0.111		0.156		0.038	

Table VI. Firm Characteristics by Period.

The sample period is broken into the following periods: 1980-1989, 1990-1998, 1999-2000, 2001-2002. In panel A, the firms are grouped into subsamples of VC backed, non-VC backed and those in quartiles one and four of leverage. In panel B, we present the subsamples with VC backing and below-median leverage and no VC backing and above-median leverage. Dollar values are in December 2002 constant dollars. Market Capitalization is the number of shares reported by CRSP times the first day closing price. Total debt is equal to long-term debt plus debt in current liabilities minus convertible debt. Equity market-to-book is the market capitalization of equity divided by book value. Asset market-to-book is the sum of market capitalization of equity at the offering and total debt, divided by the sum of book equity and total debt. All accounting variables are from the fiscal year before the offering, except book value of equity, which is from the fiscal year of the offering. The return standard deviation, beta, and the standard deviation of the market model residuals are calculated over the 250 days following the IPO. "VW" and "EW" indicate "Value-Weighted" and "Equal-Weighted," respectively.

	1980-1989				1990-1998				1999-2000				2001-2002			
Panel A	debt q1	debt q4	VC	Non-VC	debt q1	debt q4	VC	Non-VC	debt q1	debt q4	VC	Non-VC	debt q1	debt q4	VC	Non-VC
Initial Day Return, %	0.093	0.065	0.092	0.082	0.203	0.106	0.161	0.138	0.819	0.410	0.825	0.408	0.158	0.099	0.146	0.078
Sales	118.1	198.0	80.5	177.3	93.3	232.2	95.6	250.2	73.4	160.1	23.9	525.6	1,640.2	509.6	162.6	2,229.2
Market Capitalization	197.2	131.0	174.5	162.0	261.9	223.0	211.31	253.2	1,227.8	892.5	1,293.0	1,216.6	1,007..3	600.0	580.0	1,263.9
Asset Market-to-Book	3.579	2.335	3.150	2.687	4.157	2.622	3.559	2.941	6.977	4.088	6.964	4.853	4.086	2.832	3.403	3.155
PPE / Total Assets	0.178	0.424	0.261	0.316	0.163	0.343	0.228	0.289	0.123	0.315	0.173	0.235	0.176	0.358	0.224	0.293
EBITDA / Total Assets	0.157	0.107	0.092	0.185	-0.073	-0.044	-0.134	0.061	-0.444	-0.324	-0.511	-0.220	-0.158	0.095	-0.194	0.063
Firm age	10.750	15.749	9.448	15.797	9.625	16.498	11.082	16.240	6.745	10.347	6.141	13.838	16.813	16.438	12.672	24.576
Return St.Dev.	0.034	0.036	0.036	0.033	0.047	0.042	0.047	0.044	0.081	0.069	0.083	0.068	0.048	0.041	0.050	0.039
Residual St. Dev. VW	0.033	0.035	0.035	0.032	0.046	0.042	0.046	0.043	0.077	0.066	0.079	0.065	0.046	0.040	0.048	0.038
Beta, VW	0.856	0.710	0.958	0.708	1.143	0.754	1.162	0.763	1.563	1.188	1.610	1.165	0.976	0.523	0.846	0.599
Residual St. Dev. EW	0.032	0.034	0.034	0.032	0.046	0.042	0.045	0.043	0.075	0.065	0.077	0.064	0.045	0.040	0.048	0.037
Beta, EW	1.485	1.276	1.617	1.256	1.802	1.302	1.844	1.308	2.492	1.949	2.608	1.876	1.510	0.909	1.352	1.006

Panel B	VC, low debt	Non-VC, high debt	VC, low debt	Non-VC, high debt	VC, low debt	Non-VC, high debt	VC, low debt	Non-VC, high debt
Initial Day Return, %	0.104	0.077	0.200	0.112	0.889	0.271	0.190	0.075
Sales	48.2	186.4	38.5	266.5	20.3	361.8	99.0	1,668.3
Market Capitalization	206.3	148.3	210.1	231.3	1,390.2	747.8	615.2	1,128.5
Asset Market-to-Book	3.668	2.405	4.138	2.465	7.382	3.631	4.019	2.768
PPE / Total Assets	0.195	0.377	0.178	0.339	0.139	0.294	0.153	0.308
EBITDA / Total Assets	0.102	0.153	-0.165	0.071	-0.512	-0.082	-0.301	0.086
Firm age	8.263	17.150	7.896	17.698	5.693	17.304	9.069	25.286
Return St.Dev.	0.036	0.034	0.049	0.042	0.084	0.062	0.056	0.038
Residual St. Dev. VW	0.035	0.033	0.048	0.042	0.080	0.060	0.054	0.038
Beta, VW	1.068	0.689	1.342	0.705	1.650	0.996	1.004	0.507
Residual St. Dev. EW	0.034	0.032	0.048	0.042	0.078	0.059	0.054	0.037
Beta, EW	1.777	1.233	2.061	1.229	2.656	1.594	1.573	0.876

Table VII. Long-term Performance

This table presents the average and median buy-and-hold raw and market adjusted returns for subsamples of IPO firms with and without VC backing and those with low debt (first quartile) and high debt (fourth quartile). For each security, buy-and-hold (BH) returns are calculated as $BHR_j = \prod_t (1 + r_{jt}) - 1$, where t is the month since the IPO (and the product is calculated over months 1 through 60), j is the security, and r is monthly return. Then we obtain the average buy-and-hold return across firms for each subcategory. The market monthly market-adjusted return for each firm j in month t is $ar_{jt}=(1+r_{jt})/(1+r_{benchmark\ t})-1$. Then, for each firm we calculate the buy and hold period adjusted returns as $BHAR_j = \prod_t (1 + ar_{jt}) - 1$ over 60 months after the IPO. Finally, we obtain the average buy-and-hold adjusted return across the firms in each subcategory. We use two benchmarks – the CRSP value-weighted (VW) index, and the CRSP Size Decile Index. The average market-adjusted return is equivalent to the "wealth relative" measure suggested by Ritter, minus 1. In the "t-values" row we also report the t-values for the test for equality of the 60-month means for VC-backed vs. non-VC-backed firms and low-debt vs. high-debt firms.

	VC=1			VC=0			Debt quartile=1			Debt quartile=4		
	Raw BH Returns	CRSP VW index adjusted returns	CRSP size decile index adjusted returns	Raw BH Returns	CRSP VW index adjusted returns	CRSP size decile index adjusted returns	Raw BH Returns	CRSP VW index adjusted returns	CRSP size decile index adjusted returns	Raw BH Returns	CRSP VW index adjusted returns	CRSP size decile index adjusted returns
Means	49.7%	-17.6%	-7.0%	24.8%	-26.9%	-18.2%	47.5%	-14.4%	-6.4%	30.2%	-24.8%	-14.0%
t-values	2.27	1.89	1.69				1.35	1.66	0.89			
Medians	-36.3%	-63.1%	-61.9%	-32.1%	-64.0%	-58.3%	-36.1%	-61.9%	-61.1%	-30.0%	-63.6%	-59.1%

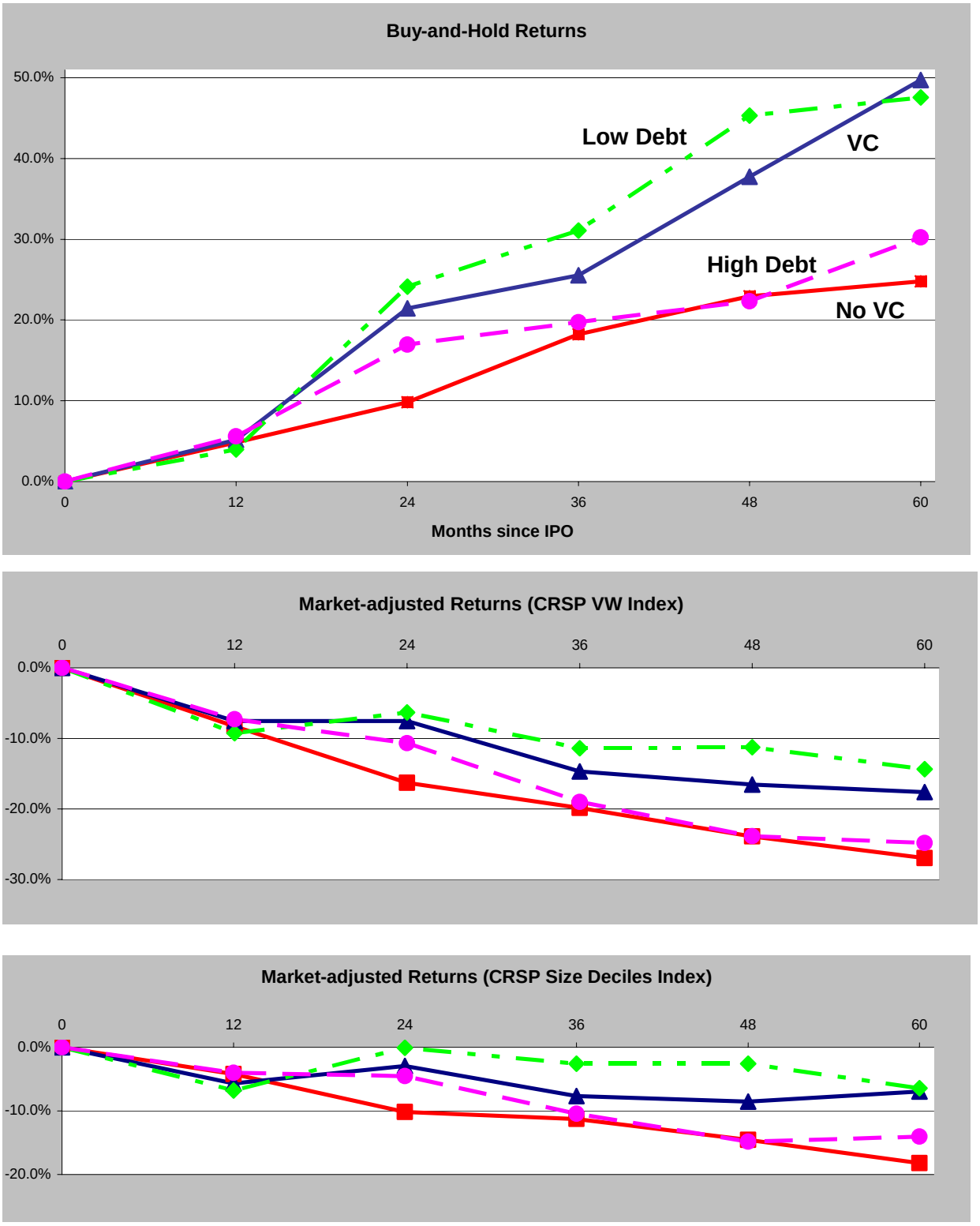

Figure 1. Raw and market-adjusted performance. The top panel presents the average buy-and-hold returns for subsamples of IPO firms with and without VC backing and those with low debt (first quartile) and high debt (forth quartile). The middle panel presents the market-adjusted returns using the CRSP VW index.. The bottom panel presents the market-adjusted returns using the CRSP Size-Decile index returns.

Table VIII. Long-term Performance by Venture Capital Backing and Debt Financing

This table presents the average buy-and-hold raw and market adjusted returns for subsamples of IPO firms with and without VC backing, with low debt (first and second quartiles) and high debt (third and fourth quartiles). For each security, buy-and-hold (BH) returns are calculated as $BHR_j = \prod_t (1 + r_{jt}) - 1$, where t is the month since IPO (and the product is calculated over months 1 through 60), j is the security, and r is the monthly return. Then we obtain the average buy-and-hold return across firms for each subcategory. The market monthly market-adjusted return for each firm j in month t is $ar_{jt}=(1+r_{jt})/(1+r_{benchmark\ t})-1$. Then, for each firm we calculate the buy and hold period adjusted returns as $BHAR_j = \prod_t (1 + ar_{jt}) - 1$ over 60 months. Finally, we obtain the average buy-and-hold adjusted return across the firms in each subcategory. We use two benchmarks – the CRSP value-weighted (VW) index, and the CRSP Size Decile Index. The average market-adjusted return is equivalent to the "wealth relative" measure suggested by Ritter (1991), minus 1.

	Low Debt VC-backed	Low Debt Not-VC-backed	High Debt VC-backed	High Debt Not-VC-backed
		Raw Returns		
Means	38.8%	41.0%	70.8%	17.1%
Medians	-43.9%	-30.5%	-26.5%	-35.3%
N	1,395	1,283	880	1,797
Pair-wise t-values				
Low debt, VC		-0.20	-1.21	2.45
Low debt, Not VC			-1.12	2.59
High debt, VC				2.10
		Market Adjusted Returns		
		Adjusted for CRSP VW index		
Means	-21.7%	-16.9%	-9.6%	-31.1%
Medians	-66.3%	-58.1%	-55.4%	-64.8%
N	1,395	1,283	880	1,797
Pair-wise t-values				
Low debt, VC		-0.77	-1.12	2.09
Low debt, Not VC			-0.66	2.73
High debt, VC				2.10
		Adjusted for CRSP size decile index		
Means	-14.8%	-7.9%	6.7%	-22.4%
Medians	-65.8%	-51.8%	-52.5%	-57.8%
N	1,389	1,281	876	1,790
Pair-wise t-values				
Low debt, VC		-0.98	-1.29	1.46
Low debt, Not VC			-0.86	2.44
High debt, VC				1.79

Table IX. Long-term Performance of IPOs by Venture Capital Backing or Debt Financing

The sample is split into subsamples of firms with VC backing, without VC backing, and those in the first and fourth quartiles of total debt to total assets. In Panel A, we estimate calendar-time Fama-French (1993) portfolio regressions of the form $R_{pt} - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + sSMB_t + hHML_t + e_{pt}$, where on each calendar month during the sample period we form a portfolio from the returns of the IPO firms with an event dates in that month . The dates for each firm start with the month after the IPO and continue for 60 months. R*pt* is the monthly portfolio return in month *t*, R*m* is the contemporaneous return on the market index, SMB*t* is the average return on small market cap portfolios minus the average return on large market cap portfolios, HML*t* is the average return on the high book-to-market portfolios minus the low book-to-market portfolios, and R*ft* is the return on the one-month T-bill for the month. The regression is estimated on portfolio returns and the overall sample-wide measure of abnormal return is α. We estimate two versions of this approach, one with equal-weighted portfolios, and one with value (equity market capitalization) weighted portfolios. T-values are corrected for heteroscedasticity.

In panel B, we estimate Ibbotson (1975) Returns Across Time and Securities (IRATS) with Fama-French factors: $R_{jt} - R_{ft} = \alpha_t + \beta_t(R_{mt} - R_{ft}) + s_tSMB_t + h_tHML_t + e_{jt}$, where R*jt* is the monthly return on stock *j* in month *t*, with the rest of the variables as above. In each calendar month during the sample period, we estimate the regression across the stocks with event date in that month. The dates for each firm start with the month after the IPO and continue for 60 months. The regression is estimated using OLS to test the null hypothesis that $\alpha_t = 0$. We then cumulate the α_t over the calendar months.

	VC		Not VC		Debt Quartile 1		Debt Quartile 4	
Panel A: Fama-French Calendar-Time Portfolio Regressions								
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Equal-weighted portfolios								
Intercept (Abnormal Return)	0.0015	0.65	-0.0029	-1.38	0.0051	2.00	-0.0053	-2.20
b(p)	1.284	16.69	1.1504	20.26	1.2487	16.37	1.1883	20.94
s(p)	1.2369	11.35	1.0798	9.02	1.179	9.55	1.0934	8.30
h(p)	-0.6934	-6.87	-0.0263	-0.27	-0.6314	-5.57	0.011	0.11
R-squared	0.8584		0.8111		0.8118		0.7686	
t-scores: Intercepts for VC versus non-VC and Debt Q1 versus Debt Q4	1.41				2.96			
Value-weighted portfolios								
Intercept (Abnormal Return)	-0.0013	-0.41	-0.0023	-1.18	0.0012	0.41	-0.0057	-2.20
b(p)	1.5029	12.97	1.2302	24.02	1.3887	13.64	1.3432	19.04
s(p)	1.1435	7.13	0.8004	9.08	1.0221	7.16	0.9808	9.10
h(p)	-0.9123	-5.82	-0.1606	-2.08	-0.8775	-6.71	-0.1514	-1.34
R-squared	0.7992		0.8435		0.8012		0.7682	
t-scores: Intercepts for VC versus non-VC and Debt Q1 versus Debt Q4	0.27				1.77			
Panel B: Ibbotson RATS with Fama-French factors								
Cumulative excess return, months 1-60	19.44%	4.563	-24.97%	-7.724	32.87%	5.551	-29.26%	-5.039

Table X. Long-term Performance of IPOs by Venture Capital Backing *and* Debt Financing

The sample is split into subsamples of firms with VC backing and low debt (those in the first two quartiles of leverage), without VC backing and with low debt, with VC backing and high debt (those in the top two quartiles of leverage), and those without VC backing and with high debt. In Panel A, we estimate calendar-time Fama-French (1993) portfolio regressions of the form $R_{pt} - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + sSMB_t + hHML_t + e_{pt}$, where on each calendar month during the sample period we form a portfolio from the returns of the IPO firms with an event dates in that month . The dates for each firm start with the month after the IPO and continue for 60 months. R*pt* is the monthly portfolio return in month *t*, R*m* is the contemporaneous return on the market index, SMB*t* is the average return on small market cap portfolios minus the average return on large market cap portfolios, HML*t* is the average return on the high book-to-market portfolios minus the low book-to-market portfolios, and R*ft* is the return on the one-month T-bill for the month. The regression is estimated on portfolio returns and the overall sample-wide measure of abnormal return is α. We estimate two versions of this approach, one with equal-weighted portfolios, and one with value (equity market capitalization) weighted portfolios. T-values are corrected for heteroscedasticity.

In panel B, we estimate Ibbotson (1975) Returns Across Time and Securities (IRATS) with Fama-French factors: $R_{jt} - R_{ft} = \alpha_t + \beta_t(R_{mt} - R_{ft}) + s_tSMB_t + h_tHML_t + e_{jt}$, where R*jt* is the monthly return on stock *j* in month *t*, with the rest of the variables as above. In each calendar month during the sample period, we estimate the regression across the stocks with event date in that month. The dates for each firm start with the month after the IPO and continue for 60 months. The regression is estimated using OLS to test the null hypothesis that $\alpha_t = 0$. We then cumulate the α_t over the calendar months.

	VC, low debt		**Non-VC, low debt**		**VC, high debt**		**Non-VC, high debt**	
Panel A: Fama-French Calendar-Time Portfolio Regressions								
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Equal-weighted portfolios								
Intercept (Abnormal Return)	0.0046	1.90	0.0015	0.63	-0.0032	-1.27	-0.0055	-2.88
b(p)	1.3209	15.51	1.1524	20.85	1.218	17.23	1.1156	21.07
s(p)	1.2714	11.92	1.0617	8.74	1.0859	8.44	1.0174	8.64
h(p)	-0.8972	-8.56	-0.1966	-1.82	-0.421	-3.74	0.085	0.97
R-squared	0.8594		0.7728		0.7851		0.8134	
t-score: Intercepts for VC w/ low debt versus Non-VC w/ high debt	3.28							
Value-weighted portfolios								
Intercept (Abnormal Return)	0.0018	0.50	0.0006	0.27	-0.0068	-2.19	-0.0062	-3.33
b(p)	1.5634	12.05	1.2095	22.02	1.4031	14.55	1.212	21.92
s(p)	1.1764	6.88	0.7864	8.16	0.975	6.73	0.7226	7.02
h(p)	-1.0719	-6.55	-0.2769	-3.16	-0.6365	-4.35	0.0398	0.49
R-squared	0.7852		0.7832		0.7539		0.8089	
t-score: Intercepts for VC w/ low debt versus Non-VC w/ high debt	1.97							
Panel A: Ibbotson RATS with Fama-French factors								
Cumulative excess return, months 1-60	37.64%	6.429	3.13%	0.566	-2.14%	-0.316	-36.22%	-8.054