Examining the Term Sheet of Venture Capital-Backed Investments

by

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Abstract

This paper examines provisions embedded within venture capital financing agreements. I look at five key terms: type of preferred stock, liquidation preference, multiple of the liquidation preference, anti-dilution protection, and pay-to-play penalties. Using a new database of financing rounds from 2000 to 2009, I find that these five provisions have statistically significant effects on the amount invested, the post-money valuation, the percentage equity stake acquired by investors, and the number of investors who join a VC syndicate.

Regression analysis shows that investor-friendly provisions are associated with both a lower investment amount and a lower valuation. I provide two possible explanations consistent with these observations: (1) a selection effect, which suggests risk is a key factor in determining investment and valuation decisions; (2) a quality effect, in which higher investment amounts and valuations are a reflection of bargaining power by founders, leading to fewer investor-friendly provisions granted. Furthermore, I find support for an incentive effect between VCs and entrepreneurs to earn a significant upside before exiting. I also provide evidence of an increasing number of investors in each progressive round of financing.

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1 Introduction

In the market for funds, venture capital (VC) serves a very specific purpose. Entrepreneurs who can no longer obtain bank loans or raise debt or equity through traditional financial markets turn to venture capital[1]. Venture capital funds generally invest in early stage companies seeking capital to grow, and often lead the company through successive rounds of financing until exiting through an initial public offering (IPO) or merger or acquisition.

Venture capitalists seek risky companies with growth potential. A great majority of companies held in VC firms' portfolios either fail or do not realize their projected revenues and exit targets. Because a majority of investments do not materialize, VCs often invest relatively small amounts into companies hoping for a large return to recoup the fund's other losses. VCs regularly pass up otherwise fine investment opportunities on the basis of companies not having the potential to produce substantial returns.

Although money is fungible, investment capital from venture capitalists is not— VCs provide services in addition to providing capital. Venture capitalists typically work closely with their portfolio companies in areas of business and professional development, mentoring entrepreneurs, formulating strategies, promoting synergies with other portfolio companies, and providing other value-added services. Some venture capital firms typically mandate that one of their partners join the portfolio company's board of directors in order to direct the company and provide managerial talent to the startup. By examining decisions made by entrepreneurs to take more expensive capital from more reputable venture capitalists, Hsu (2004) finds empirical evidence of the "extra-financial" value provided by VCs to their portfolio companies.

VC firms often specialize in investing in companies by geographic region (e.g., Northeast, Silicon Valley, Southern California), sector (e.g., Medical and Life Services, Biotechnology, Information Technology) or investment thesis (e.g., mobile devices or new v. old media). Gompers, Kovner, Lerner, and Scharfstein (2009) find a strong positive relationship between the amount of specialization by individual VCs and the performance of the firm and their funds.

Entrepreneurs seeking seed capital face tough odds in obtaining financing from venture capitalists. Using a case study approach, Fried and Hisrich (1994) find the investment decision making process to take on average 97.1 days and 129.5 hours of company evaluation, after passing through multiple stages before funding: origination, generic screen, first-phase evaluation, second-phase evaluation and due diligence, and closing.

[1]Although venture capital firms often manage multiple funds simultaneously, I refer to both in this paper interchangeably. By venture capitalists (VCs) or investors, I refer to the general partners at a venture capital or private equity firm who act on the behalf of their funds' limited partners.

Founders typically request a fixed investment amount necessary to reach their next milestone, at which the point the company will reevaluate growth targets and potentially seek follow-on financing. After agreeing to invest, entrepreneurs and investors negotiate the company's valuation, i.e. the price of investment. Entrepreneurs attempt to sell equity in their company at the highest reasonable valuation. Venture capitalists, however, try to bid the valuation down, securing the best possible value for their investment[2]. The two sides negotiate a valuation using a combination of standard financial valuation methods, such as discount cash flow analysis, comparable multiples, or industry valuation benchmarks such as subscriber value. After agreeing on the company's valuation, the VC firm must choose whether to lead the round of financing by themselves or, as happens more frequently, syndicate the deal with other venture capital firms.

Lerner (1994) finds that a majority of later-stage investments are syndicated. Sah and Stiglitz (1986) suggest such cooperative decision making occurs as a way of gathering information, particularly with regard to the value of a portfolio company. Wilson (1968) introduces the idea that a syndicate is often Pareto optimal in that it increases each individual's utility, provided each member of the syndicate is *risk averse*. Although syndicates are created and dissolved on a per-deal level, Pichler and Wilhelm (2001) report the tendency of members to cultivate mutually beneficial, long-lasting relationships.

After a syndicate has formed, the lead VC firm will present the entrepreneur with a term sheet. The term sheet, or financing contract, lays out the important terms of the financing. In addition to the investment amount and valuation, the term sheet includes information on the financial structure of the investment, the number of shares granted, the form of preferred stock issued, liquidation preference granted, and dividends to be paid out. Other terms which may be included on the sheet are confidentially requirements, certain covenants for management, and changes to the board of directors, if any.

These financing agreements are particularly important in VC, as entrepreneurs and venture capitalists, and the limited partners whose funds they manage, may have conflicting interests. Entrepreneurs would like to build up their companies and exit to a strategic partner or IPO, while venture capitalists may prefer to exit when the return to their fund is in a target range. In addition, opportunistic behavior may arise as entrepreneurs have better access to information than VCs.

[2]Both entrepreneurs and venture capitalists occasionally face conflicting incentives: without alternative sources of financing, entrepreneurs may be forced to settle for a low valuation. On the other hand, venture capitalists may be in the process of raising a new venture fund, opting to invest in a portfolio company at an inflated valuation for marketing purposes. In this paper, I simplify these assumptions and assume entrepreneurs and investors react solely to traditional price incentives.

1.1 Previous studies

As VCs and entrepreneurs may have misaligned goals, various terms are negotiated to align interests properly. Much has been written about contract provisions and their attempt to alleviate market imperfections such as moral hazard, effort provision, agency issues, asymmetric information, and holdup problems.

Sahlman (1990) discusses VC financing contract provisions in the context of mitigating agency problems. Specifically, Sahlman explores the incentives that result in VCs staging financing over a company's lifetime, the compensation scheme for both founders and VCs, and the involvement of VCs in the companies they fund. Gompers (1995) likewise examines contract provisions with regard to the principal-agent problem, reporting the use of more stringent provisions when expected agency costs are greater.

Cornelli and Yosha (2003) further provide an explanation for the use of convertible securities in conjunction with stage financing over a mixture of debt and equity. By removing the option to abandon the investment, entrepreneurs become less concerned with improving short-term performance to avoid liquidation. Thus, convertible preferred stock allows entrepreneurs to focus on long-term performance goals and avoid "window dressing". The introduction of convertible preferred stock as the financial security of choice among VCs reflects the attempt to align incentives between investors and founders.

Venture capitalists face significant agency problems, yet have remarkable flexibility to tailor individual financing contracts to alleviate these issues. Kaplan and Strömberg (2003) attempt to model the principal-agent problem as it relates to venture capitalists and entrepreneurs. Indeed, the authors describe the two sides as great examples of the principal and agent of theory. Kaplan and Strömberg characterize VC financing contracts as unique in that they separately allocate cash flow rights, board rights, voting rights, liquidation rights, and other control rights. As a result, different provisions can be embedded into term sheets to mitigate specific concerns.

Bengtsson and Sensoy (2009) extend both Hsu (2004) and Kaplan and Strömberg (2003), providing evidence that more experienced VCs use financing contracts with weaker downside protection in lieu of non-contractual incentives. Bengtsson and Sensoy suggest that more experienced VCs do not necessarily require contractual incentives; they are able to better monitor their investment and credibly threaten to refuse follow-on financing, sending strong negative signals to other VCs. The authors further claim that downside protection is likely for the benefit of the entrepreneur's incentive problem rather than the VC's. Whereas Bengtsson and Sensoy (2009) examine VC contract design in its ability to alleviate agency problems, my paper evaluates the *effect* of contract term provisions on the terms of investment.

1.2 Motivation

The critical terms of investment (i.e., the investment amount, the post-money valuation, number of VCs in an investment syndicate) are generally considered to be determined before the term sheet is negotiated. Contract provisions embedded into the term sheet presumably align interests between VCs and entrepreneurs or mitigate certain issues such as agency or effort provision. However, in addition to behavioral covenants, VC contract terms may determine cash flow rights and control rights.

Certain term sheet provisions determine the allocation of proceeds upon a successful exit. The choice of financial security and liquidation preference may benefit either the investors or the founders. In the event of a sale or IPO, these financial provisions govern the distribution of the exit amount among the two groups. As a result, the negotiation of these provisions may have material effects on the returns to both VCs and entrepreneurs.

Other contract terms represent mechanisms through which a portfolio company may either protect or punish investors in future rounds of financing. The level of anti-dilution protection affects the conversion price for preferred stock. Pay-to-play penalties may affect investors' commitment to the portfolio company in the future. The control rights embedded in these two provisions would appear to have value. As before, certain contract provisions may affect the amount investors are willing to commit to portfolio companies, and the price of that investment (i.e., the valuation).

If contract provisions were immaterial to the terms of investment, VC term sheets would likely evolve differently over time. Since the 1970s, venture capital has seen tremendous innovation. However, term sheets have *not* evolved into standard boilerplate contracts where terms merely align the interests of both founders and investors. In fact, certain terms vary tremendously between investor-friendly and founder-friendly provisions. I hypothesize that these provisions may affect the terms of investment.

1.3 Outline

My paper adds to the literature regarding the effects of provisions on the term sheet on key variables such as the amount invested, the valuations granted, the percentage stake acquired by investors, and the number of investors syndicating venture capital deals.

Previous studies have found several factors that affect the post-money valuation. Hochberg, Ljungqvist, and Lu (2007) report that better-networked venture capitalists are able to acquire stakes in companies at a lower price. Hsu (2004) finds that VCs who have a high reputation are able to obtain equity in portfolio companies at a 10-14% discount. Hsu reports that entrepreneurs who are offered alternative sources of funding pay this premium

to obtain funding from higher-quality VCs. To the best of my knowledge, this is the first paper to analyze the role of term sheet provisions on the valuations granted in venture capital-backed investments.

In my analysis, I control for the company's industry and geographic region as well as the year financing was raised, the round of financing, and whether the round was an up round or a down round. I find that the investment amount is negatively associated with investor-friendly provisions, implying either a selection effect or a quality effect. A selection effect would suggest that one omitted variable in the analysis may be risk. Smaller investment amounts may allude to riskier companies, for which investors require more friendly provisions in addition to committing less capital. A competing explanation may be that quality is the omitted variable. Higher investment amounts may imply stronger companies, capable of raising financing from a number of alternative sources. In this scenario, entrepreneurs would be more likely to receive provisions that favor them.

Examining the determinants of post-money valuation, I find that certain VC-friendly provisions are associated with a lower valuation. That is, investors receive both a lower price and more advantageous terms. This is consistent with both the quality effect and risk effect described previously. Notably, a desire for participating preferred stock over conventional convertible preferred stock is associated with a lower price.

I next analyze the determinants of the percentage stake acquired by investors in the round of financing. Not surprisingly, investor-friendly provisions are correlated with smaller stakes. This suggests that investors face a trade-off between the percentage of equity received and more beneficial terms. VCs receive one or the other, rather than both.

In addition, I find that participating preferred stock has a positive relationship with the percentage stake held by investors. As I discuss later, this has the effect of discouraging entrepreneurs from selling at relatively small valuations. Also, I find that investors have taken smaller stakes in companies after the financial crisis of 2007.

Finally, I provide an analysis of factors that affect the number of investors joining a VC syndicate. Interestingly, I find that the lack of pay-to-play penalties is negatively associated with the size of the syndicate. I also provide evidence that each successive round of financing (Series A, Series B, Series C, Series D, Series E and greater) commands an increasing number of investors.

The rest of the paper is organized as follows. Section 2 describes the data and defines the terms of interest. Section 3 analyzes the effect of term provisions and other factors on the quantitative variables. Section 4 concludes the paper and discusses the results.

2 Data

I examine a sample of 1528 rounds of financing raised by 1073 companies from 2000 to 2009.

2.1 Constructing the sample

I obtain data from two sources. First, Thomson Financial's Venture Economics (VE) database is a comprehensive source of data regarding venture capital firms, their investment funds, and the portfolio companies in which they invest. The VE database has collected data points for VC-funded companies since the early 1960s. Gompers and Lerner (2004) discuss data selection and quality issues, finding incomplete or questionable data for pre-1975 investments.

Individual financing data was obtained from VC Experts' *Valuation & Deal Term Database* (VDTD) in November 2009. This database is based on financing contracts filed with the Secretary of State in the state a company is incorporated. The database provides specific contract-level information on each round of financing, by breaking down each legal document into many of its component terms.

The two data sources were combined to match VC firm, fund, and company-level data from the VE database with financing data from the VDTD database. Highly incomplete data points were systematically dropped, leaving a total of 6012 VC firm-company pairs. These observations correspond to 1528 total rounds of financing for 1073 companies from a total of 1136 unique venture capital funds. Because this paper looks at variation in individual contracts, I collapse the firm-company pairs into 1528 discrete rounds of financing.

2.1.1 Sample selection issues

Whereas the VE database contains data points from the 1960s to the present day, the VDTD database only contains data from rounds of financing raised since the year 2000. This may alleviate data quality issues associated with the VE database, although the method by which VC Experts obtain the VE data may be subject to selection bias. However, as Kaplan and Strömberg (2003) point out, selection biases are not of much concern as, like the authors, I do not attempt to measure performance but rather characterize the underlying contracts. Bengtsson and Sensoy (2009) further suggest that the data is relatively free from selection issues as the contract data stem from mandatory legal filings.

In addition, many studies of venture capital are characterized by survivorship bias, as unsuccessful firms fail to raise further rounds of financing, disappearing from the sample. Although further testing may be warranted, I do not believe my conclusions would be affected

as I seek to merely characterize individual contracts and not quantify performance over companies' or VC funds' lifetimes.

2.2 Description

The dataset contains rounds of financing raised between 2000 and 2009, skewing toward the latter half of the decade. Figure 1 offers a look at the distribution of rounds of financing raised per year. Rounds raised in 2007 are broken into *pre-crisis* and *post-crisis*, taking into account the liquidity crunch caused by the financial crisis of August 2007.

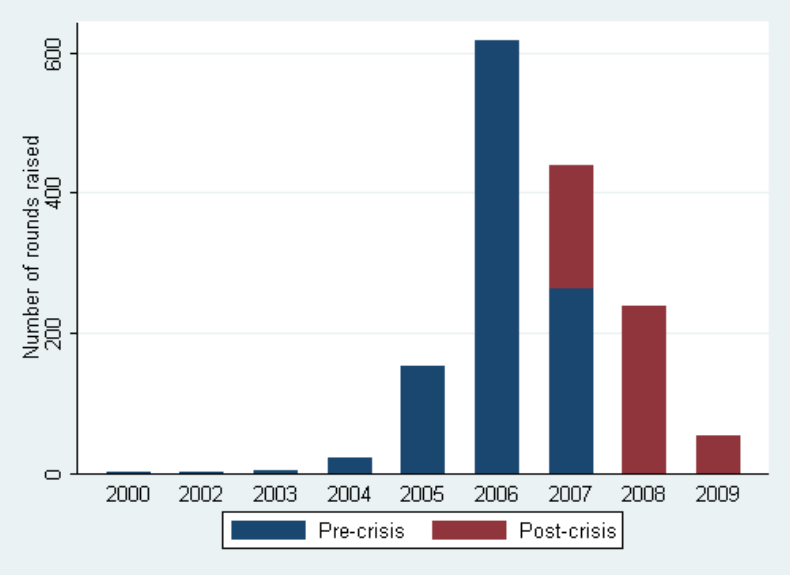


Figure 1: Distribution of years financing was raised

Financial crisis contagion into Venture Capital

Starting in August 2007, financial markets abruptly lost liquidity. Firms were unable to borrow and investors were unable to market their securities with ease and rapidity. Although the subprime mortgage market was impacted first, the loss of liquidity quickly spread to debt markets. A *credit crunch* resulted in seemingly-unrelated markets, as investors were unwilling to loan money, particularly to illiquid or risky firms. As the market for funds in the venture capital asset class may have been affected by the loss of credit, special care should be given to rounds of financing raised before and after the financial crisis. I mark the observations as *pre-crisis* if they were financed before August 9, 2007, a date consistent with Getter, Jickling, Labonte, and Murphy (2007), the Congressional Research Service's inquiry into the financial crisis. Rounds raised after this date are marked *post-crisis* accordingly.

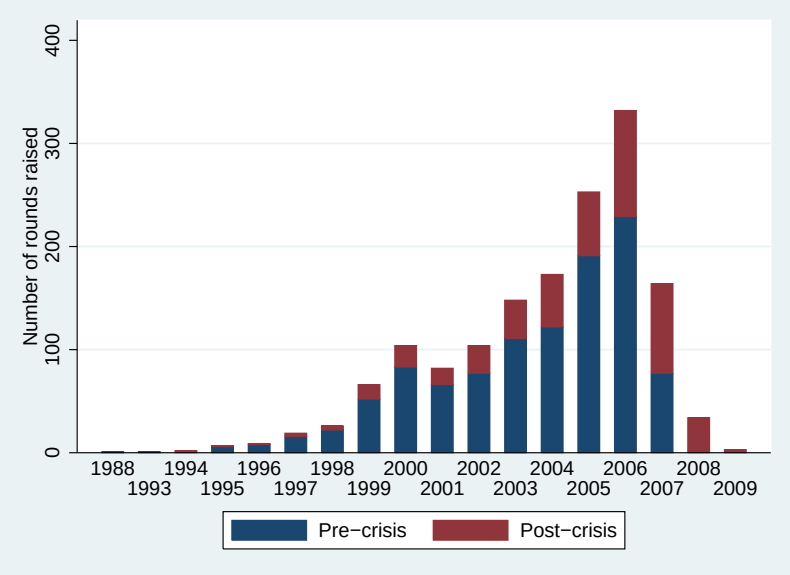


Figure 2: Distribution of years the first round of financing was raised

Although the dataset covers rounds of financing solely from 2000 to 2009, it should be noted that the companies involved are not necessarily only startups. Figure 2 depicts the year the portfolio companies raised their first round, as early as 1988. This can be seen as a proxy for the year the companies were founded, to give a better representation of the companies included in the data. Like Figure 1, I break down the number of rounds raised before and after the financial crisis of 2007.

Table 1 reports summary statistics for the quantitative variables of interest. The investment amount ranged from $100,000 to $160 million, with a mean of $11.36 million and median of $7 million. The post-money valuation granted averaged $58.15 million. An average of 4.04 investors joined in the syndicate, with a median of 3 investors. On average, each company in the database received 4.87 rounds of financing.

	Investment amount ($m)	Post-money valuation ($m)	Number of investors	Number of rounds company received
Mean	11.36	58.15	4.04	4.87
S.D.	14.12	89.16	2.67	2.70
Min	0.01	0.13	1	1
Median	7	30.35	3	4
Max	160	1118.43	24	21
Range	159.99	1118.30	23	20
N	1528	1528	1528	1528

Table 1: Summary statistics for quantitative variables

Due to the financial crisis, it may be interesting to see how the amounts companies were able to raise differ before and after the crisis, if at all. Likewise, the post-money valuations granted to portfolio companies may vary before and after the crisis due to the credit crunch and decreased liquidity in financial markets. Table 2 reports summary statistics for these two variables, before and after the crisis. Interestingly, the investment amount and post-money valuation both increase after the crisis, although this is very likely confounded by the round of financing and year. Later rounds of financing, as I show later, are generally associated with both higher investment and higher valuations.

	Investment amount		Post-money valuation	
	Pre-crisis	Post-crisis	Pre-crisis	Post-crisis
Mean	10.6	13.1	47.4	82.7
S.D.	13.4	15.5	63.6	126.5
Median	7	8.25	26.6	41.3
N	1062	466	1062	466

Table 2: Summary statistics for quantitative variables, pre- and post-crisis

Table 3 shows a breakdown of the companies by their industry and sector. The VE database provides the sector, whereas the VDTD database provides a more rigidly defined industry. Indeed, a cross tabulation reports that the industry and sector do not always match up naturally. For example, the 294 observations within Biotechnology do not all fall within the "Medical, Health, and Life Science" sector. Several portfolio companies in the Biotechnology industry are categorized as Information Technology or Non-High Technology. Whereas the industry has more variation, I defer to the sector as a more accurate and useful instrument to describe the portfolio companies.

Consistent with venture capital, the Software, Biotechnology, IT services, and Medical Device industries are the most represented in the database. Not surprisingly, a majority of the investments in the dataset fall within the Information Technology and Medical sectors. A total of 951 investments are in IT companies, along with 421 investments in the medical space.

The data also contains information on the companies' geographic region. Hochberg et al. (2007) find varying performance effects for the portfolio companies of better-networked venture capitalists. It may be interesting to see whether contracts negotiated for West coast companies differ from those on the East coast, particularly if VC firms specialize and compete amongst the other VCs in their region. Table 4 displays the frequency of each geographic region in the dataset. Silicon Valley and New England are heavily represented, along with more modest representation by Southern California, the Southwest, the Midwest, and New

Industry	Sector			Total
	Information Technology	Medical, Health, Life Science	Non-High Technology	
Software	357	3	3	363
Biotechnology	1	284	9	294
IT Services	167	0	2	169
Medical Devices and Equipment	0	107	0	107
Telecommunications	96	1	0	97
Semiconductors	89	1	6	96
Industrial/Energy	10	2	72	84
Media and Entertainment	53	7	7	67
Business Products and Services	39	1	16	56
Electronics/Instrumentation	40	0	4	44
Consumer Products and Services	12	0	23	35
Networking and Equipment	30	0	0	30
Computers and Peripherals	23	0	0	23
Healthcare Services	8	15	0	23
Financial Services	15	0	7	22
Retailing/Distribution	10	0	5	15
Advanced Materials/Chemicals	0	0	1	1
Other	0	0	1	1
Total	951	421	156	1528

Table 3: Portfolio companies' industries and sectors

York. The distribution of the companies' sectors and regions appear to be consistent with VC activity over the time period (2000-2009), suggesting the data is a fairly representative sample.

Region	Frequency	Percent
Silicon Valley	564	36.9
New England	327	21.4
Southern California	155	10.1
Southwest	103	6.7
Midwest	92	6.0
New York State	89	5.8
Southeast	70	4.6
DC/Metroplex	62	4.1
Northwest	40	2.6
Colorado	11	0.7
Sacramento/Northern California	7	0.5
Alaska/Hawaii/Puerto Rico	4	0.3
Philadelphia Metro	3	0.2
Canada	1	0.0
Total	1528	100

Table 4: Portfolio companies' geographic regions

Round of Financing	Frequency	Percent
Common Stock	3	0.2
Series A	438	28.7
Series B	448	29.3
Series C	368	24.1
Series D	158	10.3
Series E or greater	113	7.4
Total	1528	100

Table 5: Distribution of rounds of financing obtained

The investment-level data includes information on the round of financing raised by the company. The round of financing roughly corresponds to the stage in a company's lifecycle. Table 5 shows a fairly even split between Series A, Series B, and Series C rounds, as well as a number of Series D and Series E and later rounds. There is substantial variation in the stages of investment in the data.

The data also contains information on the round direction. Table 6a reports the frequency of down, flat, and up rounds, before and after the financial crisis of 2007. A round

	Pre-crisis		Post-crisis		Overall	
Direction	Frequency	Percent	Frequency	Percent	Frequency	Percent
Down Round	136	18.5	57	15.0	193	17.3
Flat Round	89	12.1	44	11.6	133	11.9
Up Round	512	69.5	278	73.4	790	70.8
Total	737	100	379	100	1116	100

(a) Reported

	Pre-crisis		Post-crisis		Overall	
Direction	Frequency	Percent	Frequency	Percent	Frequency	Percent
Down Round	139	18.2	70	17.2	209	17.9
Flat Round	69	9.0	29	7.1	98	8.4
Up Round	557	72.8	307	75.6	864	73.8
Total	765	100	406	100	1171	100

(b) Calculated

Table 6: Distribution of round directions

is considered an *up round* if the percentage change in the company's valuation over two successive rounds is positive, and a *down round* if the percentage change is negative. A *flat round* is one in which the valuation remains constant from round to round.

Within the 1528 rounds of financing in the database, the database contains multiple round information for 353 companies. For these companies, I can calculate the change in valuation between two successive rounds using the equations below.

$$\text{Pre-money valuation} = \text{Post-money valuation} - \text{Investment amount} \tag{1}$$

$$\%\Delta\text{Valuation} = \frac{\text{Pre-money valuation}_{current}}{\text{Post-money valuation}_{previous}} - 1 \tag{2}$$

Curiously, several of the round directions calculated differ from the round directions reported in the VDTD database. Table 6b tabulates the frequency of down, flat, and up rounds, using the round direction as calculated instead of given. Generally, it appears that the data from the VDTD database offers a slight margin to differentiate a flat round from a down or an up round. Although there is a slight discrepancy here, I defer to the given data, noting that the conclusions presented in this paper are unaffected.

Both tables point to the fact that the number of up rounds did not decrease due to

the credit crunch caused by the financial crisis. In fact, the number of up rounds actually increased after the crisis, and the number of down rounds actually decreased. A selection effect, in which VCs preferred to invest in companies with higher valuations, cannot be ruled out here. The data appears fairly consistent, however, suggesting that perhaps the crisis did not affect the round direction. A formal regression analysis, presented later in this paper, will determine the effect of the financial crisis.

2.3 Definition and distribution of deal terms

I focus on five key contract terms on which I have data: the type of preferred stock, liquidation preference for the current round, multiple of the liquidation preference, anti-dilution protection, and pay-to-play penalties. In this section, I define each term and the choices available, and their expected effects on investors and entrepreneurs.

The financial security chosen to finance the deal is very important. Compared to common stock, preferred stock has a liquidation preference in that shareholders receive their return prior to holders of common stock in the event of a sale or acquisition. **Conventional convertible** stock is preferred stock that can be converted by the shareholder into common stock. Thus, the holder of conventional convertible stock chooses whether to receive his return through the liquidation preference or equity. **Participating preferred** stock, on the other hand, entitles the holder to receive *both* the liquidation preference and the equity position, a feature referred to as "double dipping". Unlike conventional convertible stock, participating preferred stockholders *participate* in the liquidation as well as converting into an equity holding. Participating preferred is more beneficial for the investor, as investors receive a great portion of the return upon liquidation. In addition, the company has to reach a lower exit target in order to return the same amount to investors as with conventional convertible preferred stock.

Perhaps the most important term other than price is the liquidation preference for the current round. The liquidation preference refers to the order in which each round's investors receive their preference upon an exit. When a round is raised with **senior liquidation preference**, the current series receives its preference first, followed by older series. Under **pari passu** (Latin for *with equal step*), the current round and older rounds are equivalent in status and share pro-rata in the liquidation. With a **junior liquidation preference**, the current round receives its liquidation secondary to other rounds. Certainly, the more senior the preference is, the more beneficial for investors it is.

The multiple of the liquidation preference is negotiated at the same time as the preference. Most often, rounds are financed with a **1x** multiple, although higher multiples, such as **2x**

or **3x**, are not uncommon. In a liquidity event, the multiple denotes how much of the original investment per share is returned to the investor before the common stock receives consideration. For example, an investment of $2 million with a 1.5x multiple would receive a $3 million preference in the return. The higher the multiple, the great portion of the proceeds the investor receives upon an exit.

Next, the database contains information on anti-dilution protection. Anti-dilution provisions protect investors in the case of future down rounds. If the company sells stock at a lower valuation than the current round at some point in the future, these provisions automatically adjust the conversion price downward. As a result, investors are less impacted when their investment is diluted, and are less likely to oppose a future round of financing when the company greatly requires capital. With a **weighted average** anti-dilution provision, the conversion price is adjusted to take into account the new price and the number of new shares issued. More severely, a **full ratchet** provision adjusts the conversion price downward to the new round's share price. Full ratchet anti-dilution provisions are more beneficial for investors, as the conversion price "rachets down" completely, protecting investors more extensively.

Finally, the database contains information on pay-to-play penalties for investors. With a pay-to-play provision, each investor must keep **paying**, or participating in future rounds of financing, in order to keep **playing**, or maintaining preferred stock, in the company. Pay-to-play penalties may provide for the conversion of preferred stock into common stock or shadow preferred stock, which may lose some or all of the liquidation preference. Other penalties may include the loss of anti-dilution protections or the right to participate in future rounds. By strengthening disincentives, pay-to-play provisions ensure that investors agree to back a company in future rounds, even if the company struggles.

Table 7 reports the distribution of the frequency of these provisions within the financing contracts in the database. Panel A reports that participating preferred stock is more frequently used than conventional convertible preferred stock. Panel B reports a fairly even split between pari passu and senior liquidation preferences. Panel C suggests that the multiple of the liquidation preference falls within 0 - 1x, inclusive, a majority of the time. Panel D reports the frequency of anti-dilution protection, largely favoring weighted average provisions as opposed to the full ratchet. Panel E displays the inclusion of pay-to-play penalties within financing contracts, reporting no penalties in close to 84% of financing contracts in the sample.

Table 7: Distribution of terms within financing contracts

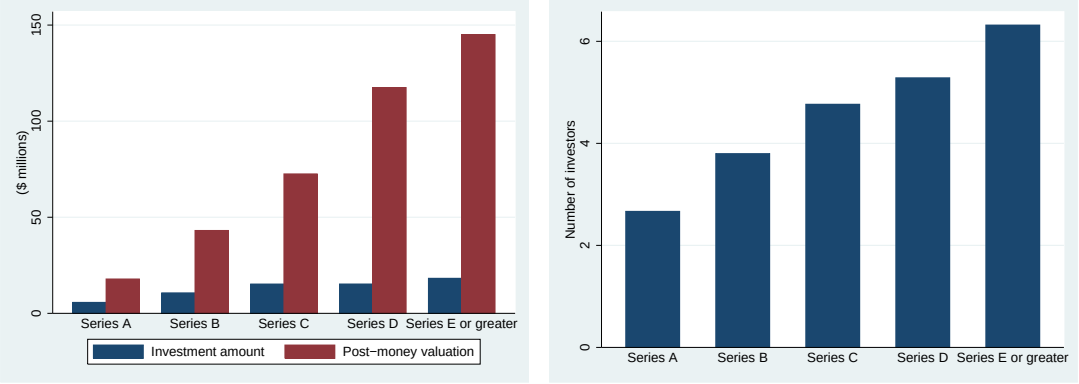
	Frequency	Percent
A. Type of Preferred Stock		
Participating Preferred Stock	995	65.2
Conventional Convertible Preferred Stock	526	34.5
Not Applicable	5	0.3
Total	1526	100
B. Liquidation Preference for the Current Round		
Junior	8	0.5
Pari Passu	578	38.0
Senior	542	35.6
Not Applicable	394	25.9
Total	1522	100
C. Multiple of the Liquidation Preference		
0 - 1x	1414	92.6
$>$ 1x	113	7.4
Total	1527	100
D. Anti-dilution Protection		
Full Ratchet	117	7.8
Weighted Average	1380	92.2
Total	1497	100
E. Pay-to-Play Penalties		
Any Pay-to-Play Penalty	251	16.4
Conversion of Preferred Stock into Common Stock	185	12.1
Conversion of Preferred Stock into Shadow Preferred Stock	49	3.2
Loss of Anti-Dilution Rights	16	1.1
Loss of Right to Participate in Future	1	0.1
No Pay-to-Play Penalties	1277	83.6
Total	1528	100

3 Analysis

Before examining the effect of each of the contract terms, it is useful to look at how the quantitative variables differ across several controls. The amount invested and post-money valuation may be confounded by factors such as the company's stage (seed, early stage, or late stage) or round of financing raised and the direction of the round (down round, flat round, or up round). In this section, I present several cross tabulations before proceeding with regression analysis.

3.1 Cross tabulations

First, I show how the quantitative variables differ by the round of financing raised. Figure 3a shows the investment amount and post-money valuation across the different rounds of financing, while Figure 3b shows the average number of investors in the syndicate for each round. Table 8 offers summary statistics that correspond to these figures.



(a) (b)

Figure 3: Means of quantitative variables, by round of financing

As expected, the investment amount and post-money valuation increase in each successive round. As each further round denotes a later stage in a company's lifecycle, the investment amount increases as companies generally require greater amounts of capital as they grow and mature. Not surprisingly, the increasing post-money valuations imply that companies that raise round after round are worth more as they grow. Interestingly, the number of investors in each deal increases in each successive round. This may suggest that VCs who are investing greater amounts of capital are seeking a larger syndicate to support their investment, or perhaps individual VCs would prefer to invest smaller amounts and syndicate the investment. Regression analysis will determine whether the round is a key factor or merely a confounding variable.

	Round of financing				
	Series A	Series B	Series C	Series D	Series E or greater
Investment amount					
Mean	5.7	10.7	15.3	15.3	18.2
S.D.	8.0	13.3	16.9	13.4	18.4
Median	4.0	7.7	10.7	12.0	13.0
Post-money valuation					
Mean	17.9	43.1	72.6	117.5	145.1
S.D.	28.6	59.2	69.8	143.9	160.0
Median	11.8	29.0	50.3	76.5	83.0
Round number of investors					
Mean	2.67	3.80	4.77	5.28	6.32
S.D.	1.61	2.06	2.81	2.9	3.89
Median	2	3	4	5	6
Total (**N=1525)**	438	448	368	158	113

Table 8: Summary statistics for quantitative variables, by round raised

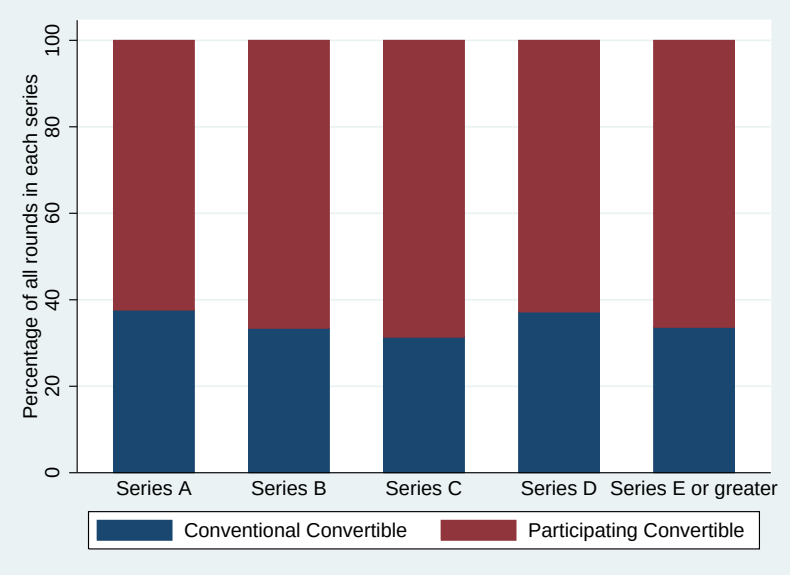


Figure 4: Type of preferred stock, by round of financing

Another important variable that can differ by round is the choice of preferred stock. It may be the case that earlier stage investors may opt for a liquidation more frequently than later stage investors. However, as Figure 4 shows, the choice between conventional convertible and participating preferred stock remains largely consistent over the rounds, with 30-40% of rounds opting for the conventional convertible security and 60-70% in favor of participating preferred stock.

Next, I look at how the quantitative variables differ based on the round direction. Companies raising down rounds are expected to have lower valuations and fewer investors, as down rounds may signal less favorable alternative sources of capital. Table 9 reports summary statistics for the investment amount, post-money valuation, and number of investors based on the round direction. It should come as no surprise that the investment amount and post-money valuation are higher in up rounds than in down rounds. However, the number of investors for each round appears to be largely unaffected by the direction of the round— the size of the syndicate remains fairly constant across all three round direction with a median of four investors.

In Table 10, I cross tabulate each of the contract terms with the direction of the round. It may be the case that certain provisions are written in to protect investors during down rounds, or investors cede certain terms to portfolio companies during up rounds. Panel A shows that conventional convertible preferred stock is used more frequently in up rounds than in down rounds, replacing the use of participating preferred stock. Panel B shows an interesting reversal between the use of senior liquidation preference and subordinate

	Round direction		
	Down Round	Flat Round	Up Round
Investment amount			
Mean	9.1	10.8	14.8
S.D.	9.4	12.7	16.5
Median	6.0	6.0	10.0
Post-money valuation			
Mean	35.2	57.0	84.5
S.D.	33.3	53.7	112.0
Median	23.0	42.7	47.1
Round number of investors			
Mean	4.26	4.58	4.57
S.D.	2.38	3.11	2.81
Median	4	4	4
Total (**N=1508)**	193	133	790

Table 9: Summary statistics for quantitative variables, by round direction

liquidation preference, whether junior or pari passu. Whereas senior liquidation preference is greatly preferred in down rounds, pari passu appears with greater frequency during up rounds. Panel C shows a greater frequency of a *lower* multiple of the liquidation preference in up rounds. This may attest to the idea that more investor protection, in the form of a higher liquidation multiple, is required for a down round. Panel D similarly shows a greater use of full ratchet anti-dilution protection in down rounds compared to up rounds. Panel E shows the more frequent use of pay-to-play penalties in down rounds than up rounds.

Next, I cross tabulate summary statistics for the investment amount, post-money valuation, and number of investors per round by each of the terms. Table 11 reports the mean, standard deviation, and median for these three quantitative variables. First, conventional convertible appears to be associated with a slightly higher investment amount and a substantially higher post-money valuation. The number of investors, however, is higher for participating preferred stock than for conventional convertible preferred stock.

Then, I look at differences by liquidation preference. Because the number of deals in the dataset with a junior liquidation preference is quite low (n=8), I combine the observations which exhibit a liquidation preference of junior and pari passu, as both of these provisions are subordinate to rounds with a senior liquidation preference. Regardless, there does not

Table 10: Distribution of terms within financing contracts, by round direction

	Round direction			
	Down Round	Flat Round	Up Round	N/A
A. Type of Preferred Stock				
% Conventional Convertible	27.5	18.1	37.5	37.3
% Participating Preferred	72.0	81.2	62.2	62.4
% Not Applicable	0.5	0.8	0.3	0.3
Total (**N=1506**)	193	133	789	391
B. Liquidation Preference				
% Junior	1.04	0	0.8	0
% Pari Passu	29.5	26.3	61.3	0
% Senior	69.4	72.9	37.8	0.8
% Not Applicable	0	0.8	0.1	99.2
Total (**N=1506**)	193	133	788	392
C. Multiple of the Liquidation Preference				
% 0 - 1x	88.6	77.4	94.9	95.4
% > 1x	11.4	22.6	5.1	4.6
Total (**N=1507**)	193	133	789	392
D. Anti-dilution Protection				
% Full Ratchet	12.2	18.6	5.8	5.8
% Weighted Average	87.8	81.4	94.2	94.2
Total (**N=1479**)	189	129	779	382
E. Pay-to-Play Penalties				
% Any Pay-to-Play Penalty	25.4	24.8	12.5	16.6
% No Pay-to-Play Penalties	74.6	75.2	87.5	83.4
Total (**N=1508**)	193	133	790	392

Table 11: Summary statistics for quantitative variables, by contract term

	Type of preferred stock		Liquidation preference		Liquidation multiple	
	Conventional Convertible	Participating Preferred	Junior	Senior	0 - 1x	> 1x
Investment amount						
Mean	12.6	10.8	13.6	12.9	11.6	7.8
S.D.	14.8	13.8	14.8	15.6	14.4	9.6
Median	7.9	7.0	10.0	8.0	7.3	4.0
Post-money valuation						
Mean	77.2	48.4	81.0	62.7	59.1	45.3
S.D.	113.9	71.1	113.7	77.8	91.4	52.1
Median	35.9	27.3	44.8	38.9	30.4	26.5
Round number of investors						
Mean	3.93	4.11	4.40	4.66	4.05	4.02
S.D.	2.84	2.57	2.69	2.89	2.68	2.50
Median	3	4	4	4	3	3
Total	526	995	542	586	1414	113

Table 12: Summary statistics for quantitative variables, by contract term (continued)

	Anti-dilution protection		Pay-to-Play penalties	
	Full Ratchet	Weighted Average	Any Pay-to-Play Penalty	No Pay-to-Play Penalties
Investment amount				
Mean	8.6	11.6	11.5	11.3
S.D.	8.7	14.0	11.9	14.5
Median	5.0	7.2	7.7	7.0
Post-money valuation				
Mean	51.5	58.6	51.0	59.6
S.D.	62.8	90.8	55.1	94.4
Median	32.0	30.4	34.2	29.3
Round number of investors				
Mean	4.33	4.03	4.95	3.86
S.D.	3.31	2.62	2.91	2.58
Median	3	3	4	3
Total	117	1380	251	1277

appear to be much difference in the quantitative variables among these types.

However, a high multiple of the liquidation preference appears to be associated with lower investment amounts and lower valuations. The number of investors, however, is almost identical. The liquidation preference (junior, pari passu, or senior) may be linked with the multiple. Regression analysis will examine the effect of these two term sheet provisions.

In Table 12, I continue by cross tabulating the quantitative variables with anti-dilution provisions and pay-to-play penalties. I find lower investment amounts and slightly lower valuations for rounds raised with a full ratchet provision compared to a weighted average anti-dilution provision. Pay-to-play penalties, however, report very consistent investment amounts and post-money valuations but strikingly different numbers of investors. Whereas rounds raised without pay-to-play penalties average fewer than four investors, rounds raised with pay-to-play penalties average close to five investors, a notable difference. If statistically significant, this may be an interesting result to investigate.

3.2 Regression analysis

Having looked at how the three quantitative terms vary by round of financing, round direction, and each of the five provisions written into the financing agreements, I proceed with regression analysis for a more formal analysis.

3.2.1 Methodology

There are four key dependent variables of interest: investment amount, post-money valuation, percentage stake acquired by investors, and number of VC firms in the investment syndicate. I attempt to determine a relationship between multiple independent variables and each of these four variables. For the investment amount and post-money valuation, I apply a log transformation to the dollar amounts, as the values differ substantially. A log transformation has the benefit of normalizing the data. The independent variables in the regression function include each of the contract terms (viz., type of preferred stock, liquidation preference, liquidation multiple, anti-dilution protection, and pay-to-play penalties) as well as the portfolio company sector and region. In addition, I control for the round of financing, round year, and round direction, and include an indicator variable for the financial crisis.

To set up the regression analysis, I generate dummy indicators for each possible provision of the contract terms. I arrange the default (omitted) values to be those which are more entrepreneur-friendly. Thus, the indicators which appear in the regression tables are provisions that tend to be more investor-friendly. For the choice of preferred stock, I denote conventional convertible to be the default, and participating preferred stock to be more

investor-friendly. Next, I mark senior liquidation preference to be investor-friendly in relation to a subordinate preference, such as junior or pari passu. I consider a lower liquidation multiple to be more founder-friendly, as management is able to better share in proceeds upon an exit. For anti-dilution protection, the full ratchet provision is believed to be more investor-friendly, as investors are able to lower the conversion price completely in a future down round. Finally, I regard no pay-to-play penalties to be investor-friendly, as the lack of any penalty confers upon the investor the right to withdraw from future rounds of financing without harm. By aligning the regression function with these default values for the indicator variables, the sign of the beta coefficients indicate the effect of investor-friendly provisions on the dependent variables.

For the control variables, I assign "Other" as the base region, compared to California and the Northeast. I mark "Non-High Technology" as the default sector, in order to evaluate effects relating to IT and Medical companies. Next, I set Series A as the base round of financing and 2000 as the base year. For round direction, I assign a flat round as the default direction, compared to down and up rounds. I likewise set pre-crisis as the omitted variable, to analyze any differences between the dependent variables after the financial crisis.

I proceed straightforwardly with ordinary least squares linear regressions for investment amount, post-money valuation, and percentage stake. I use a Poisson regression to fit the number of investors, as it is a count variable. With enough observations, a fixed effects model would be useful to control for company-level variation. Unfortunately, I only have multiple round information on 353 companies, rendering a fixed effects estimation model entirely ineffective. Further testing may attempt to incorporate such a model into an extended regression analysis.

3.3 Regression results

Regression results for the investment amount are presented in Table 13; for post-money valuation, Table 14; for percentage stake, Table 15; and for the number of investors syndicating the round, Table 16.

3.3.1 Investment amount

Table 13 shows the regression on the log of the amount invested by VCs. Three of the contract terms produce statistically significant effects on the investment amount at the 1% level: > 1x liquidation multiple, full ratchet anti-dilution provisions, and no pay-to-play penalties. The beta coefficients for each of these terms is negative, reporting that these investor-friendly provisions are associated with negative investment amounts. Investors appear to be financing

deals with less capital and obtaining *more* beneficial term sheets.

I propose two explanations for this result. First, there may be a selection effect here, with risk as an omitted variable. As I do not have substantial company-level data on growth projections, I cannot directly observe risk. If risk is indeed an omitted variable, the data may show that smaller investment amounts represent riskier companies, as investors would hesitate to invest large sums into more uncertain companies. As investment opportunities for venture capitalists become more risky, investors may require more protection for their investments, and demand more advantageous provisions. Investors may prefer a high liquidation multiple in order to recoup a multiple of the investment amount in a liquidity event. VCs would further prefer stronger anti-dilution protection, as it is likely the company may raise a down round in the future. In addition, investors may require no pay-to-play penalties, establishing no commitment to invest in the company in future rounds. This risk explanation is consistent with the regression analysis, although the relationship cannot be stated conclusively.

Another explanation for these results may be a quality effect. Figure 3a and Table 8 previously showed an increasing investment amount over the round of financing raised by a company, a helpful proxy for the company's stage. If progressive rounds of financing represent maturing companies with a greater ability to exit successfully, higher investment amounts may represent companies in which venture capitalists place greater confidence. Furthermore, more quality companies likely have greater bargaining power, as entrepreneurs would likely have alternative financing options. Thus, founders would be able to obtain more friendly provisions, such as a lower liquidation multiple for investors, weighted average anti-dilution provisions (weaker protection for VCs), and pay-to-play penalties, disadvantaging investors. Consistent with this effect, the data show higher investment amounts to be associated with more founder-friendly provisions.

Consistent with what is known of the technology industry, particularly during the time period of 2000 to 2009, the data shows a negative relationship between the IT sector and the investment amount. This confirms anecdotal evidence of technology companies, particularly internet startups, requiring less capital to grow. Interestingly, if IT companies are less risky compared to companies operating within biotechnology, this observation is inconsistent with the selection effect described above. The data also reports a propensity for investors to place less capital into companies after the financial crisis of 2007. This finding is expected, and confirms some evidence of a "credit crunch" contagion into venture capital.

3.3.2 Post-money valuation

Next, I move on to analyzing the determinants of post-money valuation in Table 14. The post-money can be considered the price of investment, with entrepreneurs seeking the highest price and venture capitalists the lowest price. The data shows a clear, negative relationship between two investor-friendly provisions and the valuation. This is a surprising result, as investors obtain both beneficial terms and a lower price. Specifically, participating preferred stock, no pay-to-play penalties, and senior liquidation preferences (when controlling for the round of financing) are statistically significant.

These findings are consistent with the quality effect described previously. Higher valuations reflect stronger companies, which may have alternate sources of funding. These companies may be able to use VC competition to their advantage, bidding up the valuation as well as obtaining critical provisions.

On the other hand, the risk effect is also consistent with the regression analysis. Companies who may be riskier would receive lower valuations on average, reflecting founders selling equity at a low price if they face few alternatives. In this situation, founders may further need to grant VCs certain provisions in order to receive financing. Either the risk effect or quality effect may explain the results of the regression analysis.

Interestingly, the effect of the financial crisis is not statistically significant. If the credit crunch after 2007 were to severely affect venture capital, one would expect valuations to drop, as companies would scramble to raise funds in illiquid markets. However, the data does not show any evidence of this effect.

The data also suggests that valuations are higher for California-based companies, statistically significant at the 5% level. This may be a reflection of weaker relationships among the venture capitalists on the West coast, as Hochberg et al. (2007) address. On the other hand, this finding may indicate a difference in entrepreneurial talent or a more founder-friendly environment in California. Investigating these possibilities, however, is beyond the scope of this paper.

3.3.3 Percentage stake

Another dependent variable I regress is the percentage stake obtained by investors in the current round. I approximate the percentage stake to be the investment amount divided by the post-money valuation. The data shows a statistically significant negative relationship between two of the contract terms (viz., a high liquidation multiple and full ratchet anti-dilution protection) and the percentage stake. This suggests that investors trade off the decision to receive either a higher equity stake or more friendly provisions.

Table 13: Determinants of ln(investment amount)

	(1)	(2)	(3)	(4)	(5)
Participating preferred stock	-0.091	-0.080	-0.075	-0.066	-0.071
	(-1.41)	(-1.25)	(-1.17)	(-1.06)	(-1.13)
Senior liquidation preference	0.001	-0.006	0.005	-0.062	-0.064
	(0.01)	(-0.08)	(0.06)	(-0.86)	(-0.89)
$>$ 1x liquidation multiple	-0.423***	-0.393***	-0.379**	-0.384***	-0.375**
	(-3.57)	(-3.35)	(-3.20)	(-3.32)	(-3.24)
Full ratchet anti-dilution	-0.299**	-0.320**	-0.310**	-0.338**	-0.338**
	(-2.64)	(-2.84)	(-2.75)	(-3.08)	(-3.08)
No pay-to-play penalties	-0.259**	-0.254**	-0.254**	-0.243**	-0.237**
	(-3.17)	(-3.09)	(-3.09)	(-3.02)	(-2.96)
IT sector		-0.305**	-0.299**	-0.290**	-0.291**
		(-3.07)	(-3.00)	(-2.98)	(-2.99)
Medical sector		0.075	0.088	0.116	0.118
		(0.69)	(0.80)	(1.09)	(1.11)
California		0.091	0.083	0.080	0.084
		(1.15)	(1.03)	(1.02)	(1.06)
Northeast		0.047	0.060	0.065	0.074
		(0.56)	(0.70)	(0.78)	(0.88)
Post-financial crisis			-0.241*		-0.245*
			(-2.15)		(-2.23)
Year effects	No	No	Yes	Yes	Yes
Round effects	No	No	No	Yes	Yes
Round direction effects	Yes	Yes	Yes	Yes	Yes
Constant	2.004***	2.130***	2.954*	2.190	2.187
	(16.20)	(12.83)	(2.57)	(1.92)	(1.92)
Observations	1474	1474	1474	1474	1474

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 14: Determinants of ln(post-money valuation)

	(1)	(2)	(3)	(4)	(5)
Participating preferred stock	-0.313***	-0.302***	-0.267***	-0.250***	-0.251***
	(-5.77)	(-5.57)	(-4.94)	(-5.13)	(-5.14)
Senior liquidation preference	-0.022	-0.024	-0.015	-0.131*	-0.131*
	(-0.36)	(-0.39)	(-0.25)	(-2.35)	(-2.35)
> 1x liquidation multiple	-0.140	-0.126	-0.112	-0.138	-0.137
	(-1.40)	(-1.26)	(-1.12)	(-1.53)	(-1.52)
Full ratchet anti-dilution	-0.071	-0.067	-0.053	-0.108	-0.108
	(-0.74)	(-0.70)	(-0.56)	(-1.27)	(-1.27)
No pay-to-play penalties	-0.239***	-0.256***	-0.269***	-0.251***	-0.251***
	(-3.47)	(-3.66)	(-3.88)	(-4.02)	(-4.01)
IT sector		-0.170*	-0.143	-0.142	-0.142
		(-2.01)	(-1.71)	(-1.87)	(-1.87)
Medical sector		0.034	0.042	0.081	0.082
		(0.36)	(0.46)	(0.98)	(0.99)
California		0.145*	0.135*	0.122*	0.123*
		(2.15)	(1.99)	(2.00)	(2.01)
Northeast		0.032	0.015	0.031	0.032
		(0.45)	(0.21)	(0.48)	(0.49)
Post-financial crisis			-0.032		-0.028
			(-0.34)		(-0.33)
Year effects	No	No	Yes	Yes	Yes
Round effects	No	No	No	Yes	Yes
Round direction effects	Yes	Yes	Yes	Yes	Yes
Constant	3.641***	3.676***	4.214***	3.574***	3.574***
	(34.87)	(26.10)	(4.35)	(4.04)	(4.04)
Observations	1474	1474	1474	1474	1474

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 15: Determinants of percentage stake

	(1)	(2)	(3)	(4)	(5)
Participating preferred stock	0.040***	0.040***	0.034***	0.033***	0.032***
	(4.32)	(4.38)	(3.74)	(3.65)	(3.58)
Senior liquidation preference	0.008	0.007	0.007	0.017	0.017
	(0.74)	(0.62)	(0.63)	(1.69)	(1.65)
> 1x liquidation multiple	-0.052**	-0.047**	-0.046**	-0.043**	-0.041*
	(-3.04)	(-2.81)	(-2.74)	(-2.60)	(-2.51)
Full ratchet anti-dilution	-0.041*	-0.046**	-0.047**	-0.041**	-0.041**
	(-2.55)	(-2.84)	(-2.92)	(-2.64)	(-2.65)
No pay-to-play penalties	-0.011	-0.009	-0.006	-0.007	-0.006
	(-0.95)	(-0.73)	(-0.51)	(-0.62)	(-0.54)
IT sector		-0.028*	-0.032*	-0.031*	-0.031*
		(-1.94)	(-2.23)	(-2.20)	(-2.21)
Medical sector		0.027	0.028	0.025	0.025
		(1.73)	(1.77)	(1.63)	(1.65)
California		0.003	0.005	0.006	0.007
		(0.22)	(0.41)	(0.57)	(0.62)
Northeast		0.003	0.009	0.006	0.008
		(0.19)	(0.70)	(0.53)	(0.66)
Post-financial crisis			-0.040**		-0.041**
			(-2.50)		(-2.61)
Year effects	No	No	Yes	Yes	Yes
Round effects	No	No	No	Yes	Yes
Round direction effects	Yes	Yes	Yes	Yes	Yes
Constant	0.271***	0.281***	0.275	0.254	0.253
	(15.30)	(11.80)	(1.68)	(1.56)	(1.56)
Observations	1474	1474	1474	1474	1474

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 16: Determinants of number of investors

	(1)	(2)	(3)	(4)	(5)
Participating preferred stock	0.015	0.010	0.011	0.023	0.023
	(0.55)	(0.36)	(0.38)	(0.82)	(0.81)
Senior liquidation preference	0.084**	0.075*	0.083**	0.037	0.036
	(2.78)	(2.48)	(2.75)	(1.20)	(1.20)
> 1x liquidation multiple	-0.062	-0.045	-0.040	-0.061	-0.061
	(-1.19)	(-0.87)	(-0.77)	(-1.17)	(-1.16)
Full ratchet anti-dilution	0.022	-0.007	-0.003	-0.032	-0.031
	(0.45)	(-0.14)	(-0.05)	(-0.65)	(-0.65)
No pay-to-play penalties	-0.262***	-0.241***	-0.241***	-0.233***	-0.232***
	(-8.01)	(-7.20)	(-7.17)	(-6.92)	(-6.90)
IT sector		-0.054	-0.050	-0.052	-0.052
		(-1.20)	(-1.11)	(-1.17)	(-1.16)
Medical sector		0.194***	0.201***	0.215***	0.215***
		(4.09)	(4.21)	(4.48)	(4.49)
California		-0.083*	-0.084*	-0.092**	-0.092**
		(-2.43)	(-2.41)	(-2.64)	(-2.64)
Northeast		-0.033	-0.029	-0.024	-0.023
		(-0.90)	(-0.78)	(-0.66)	(-0.63)
Post-financial crisis			-0.031		-0.027
			(-0.62)		(-0.55)
Series B				0.298**	0.297**
				(3.03)	(3.03)
Series C				0.531***	0.531***
				(5.42)	(5.42)
Series D				0.685***	0.684***
				(6.73)	(6.72)
Series E or greater				0.839***	0.838***
				(8.26)	(8.26)
Year effects	No	No	Yes	Yes	Yes
Round direction effects	Yes	Yes	Yes	Yes	Yes
Constant	1.577***	1.609***	2.189***	1.912***	1.912***
	(30.94)	(22.62)	(5.64)	(4.77)	(4.77)
Observations	1474	1474	1474	1474	1474

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This regression analysis may corroborate the selection effect discussed previously. The trade-off between equity and friendly provisions may be greatest when company volatility is high. Investors may be taking smaller stakes in highly risky companies in favor of a high liquidation preference and full ratchet anti-dilution protection. If there is a strong chance the company may raise a down round in the future, an investor may prefer to protect his investment by lowering the conversion price by the full ratchet, as well as obtaining a high multiple of the liquidation preference. The more volatile the company may be in the future, the greater propensity the investor has to prefer these two provisions in favor of equity. Support for this theory comes from IT being associated with smaller percentage stakes taken, as IT companies have highly fluctuating valuations over time. This finding is consistent with risk being an omitted variable.

Surprisingly, participating preferred stock is associated with higher equity stakes in the company. When investors take a high equity stake in the company, company founders and other top management keep less equity in their company. By choosing to require participating preferred stock in lieu of conventional convertible stock, VCs ensure they *always* receive their liquidation preference upon an exit, leaving less of a return to management. By obtaining a greater equity stake as well as participating preferred stock, investors appear to be challenging entrepreneurs to aim for a large exit target as opposed to a more moderate sale.

Consider an investment of $5 million at a 1x liquidation multiple, for which investors obtain a 50% stake at a post-money valuation of $10 million. If the company exits at a modest $20 million valuation, participating preferred shareholders would receive their liquidation of $5 million as well as convert to common stock. This would leave management with 50% of the remaining $15 million, or a mere $7.5 million for a relatively small 50% return after doubling the company's valuation. If the liquidation multiple were higher than 1x, management would be even further dissuaded from selling at such a low valuation. If the founders were to stall and seek a higher exit[3], to the delight of the company's investors, the liquidation preference would not materially affect the return to senior management. Therefore, participating preferred stock serves to align the interests of founders and VCs, leading both to seek a substantial exit target.

In addition to this finding, the regression analysis reports smaller stakes taken by companies after the second half of 2007, when the financial crisis may have impacted liquidity and the free flow of credit. As expected, this is consistent with VCs generally scaling back their investments.

[3]Of course, venture capital funds generally have a limited lifetime, often ten years. Although a VC may opt to exit an investment to liquidate the fund's holdings depending on the stage of the fund, I relax this possibility in this analysis.

3.3.4 Number of investors

Finally, I analyze the determinants of the number of investors who join a VC syndicate in Table 16. The first interesting result is the negative relationship between no pay-to-play penalties and the number of investors, statistically significant even when controlling for round, year, and round direction effects. Conventional wisdom would say that pay-to-play penalties tend to be introduced when companies appear to be troubled, to encourage reluctant investors to continue to participate in future rounds of financing. That is, pay-to-play penalties are considered an example of the classic *stick* in the "carrot and stick" model.

The data shows that pay-to-play penalties appear to be associated with a greater number of investors. That is, when investment syndicates are larger, pay-to-play penalties are more likely to be introduced. This is consistent with the idea that founders have negotiating power when many investors are interested. As founders are able to play investors off each other, they are able to introduce penalties such as relinquishing the liquidation preference. Thus, this observation is consistent with the quality effect discussed previously.

Next, I find that senior liquidation preference is statistically significant until I control for round effects, at which point the liquidation preference immediately loses significance. As expected, senior liquidation preference is more important in future rounds, although little can be said for its effect on the number of investors.

One new finding supported by the data is that the number of investors increases over the course of a company's stage, as the company raises successive rounds. Compared to a Series A round of financing, Series B rounds average 0.3 greater investors, Series C receive 0.5 more investors, Series D an average of 0.7 additional investors, and Series E and later rounds see greater than 0.8 more investors per round.

Two other interesting observations can be gathered from the analysis. First, the medical sector is associated with approximately 0.2 greater investors on average, compared to the base sector, "Non-High Technology". Next, companies operating on the west coast, specifically California, generally can expect to receive 0.09 fewer investors in the syndicate on average. Indeed, there appears to be a difference between venture capitalists' tendencies to syndicate investments between sectors and across geographic regions.

4 Conclusions

This paper adds to the literature regarding the factors affecting venture capital investment.

4.1 Summary

As best as I can tell, this is the first paper to examine the effect of the various provisions on the term sheet on the quantitative variables normally thought of as exogenous factors. Certain contract terms do not merely align incentives between entrepreneurs and venture capitalists; they may materially affect the return to investors. As a result, contract provisions affect the amount invested and the price obtained for that investment.

I find the amount invested to be negatively influenced by investor-friendly provisions, suggesting that either VCs seek out investments by selecting risky opportunities, or are forced to cede provisions to more quality companies. Analysis for the post-money valuation granted supports both the risk and quality effects, as investors appear to receive more advantageous provisions as well as a lower price for their investment. One or both of these omitted variables may appear in this analysis.

My analysis of the determinants of percentage stake corroborates a strong incentive effect between entrepreneurs and investors of seeking a high return and rejecting modest exit targets. A strong positive relationship between participating preferred stock and the equity stake acquired reduces the returns to entrepreneurs unless the company exits at a high valuation.

I also look at the number of investors per round of financing. Most notably, I find the number of investors syndicating each round increases in each successive round of financing the company raises. I provide evidence that the number of investors is greatest in Series E and later rounds, followed by Series D, Series C, Series B, and Series A rounds.

4.2 Implications

This paper has important ramifications for entrepreneurs and venture capitalists. If entrepreneurs have bargaining power, they may be able to obtain more favorable terms as opposed to ceding important provisions to investors. The data points to the ability of portfolio companies to negotiate terms. The quality effect reflects confident entrepreneurs being able to obtain favorable terms, while the risk effect suggests investors require more advantageous terms in order to complete the round of financing. Clearly, these terms have value.

Although this paper does not conclusively determine which of the proposed effects wins out, it would certainly be interesting to study. Future studies may be able to extend my analysis and quantify risk and quality in a meaningful fashion. Regardless, the findings expressed in this paper are consistent with what is known of venture capital and consistent with the theory that trading off terms between investors and founders occurs in practice.

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